



RADIO TEST REPORT

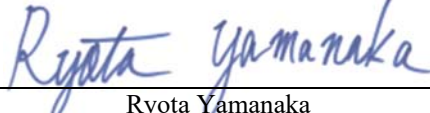
Test Report No. : 13274888H-C

Applicant : SOURCENEXT CORPORATION
Type of EUT : POCKETALK S
Model Number of EUT : PTS
FCC ID : 2AOJA-PTS
Test regulation : FCC Part 15 Subpart C: 2019
*Bluetooth (BR/EDR) 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 U.S. Government.
8. The information provided from the customer for this report is identified in SECTION 1.

Date of test: November 19 to December 11, 2019

Representative test engineer:


Ryota Yamanaka
Engineer
Consumer Technology Division

Approved by:


Takayuki Shimada
Leader
Consumer Technology Division



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http://japan.ul.com/resources/emc_accruited/

- ☐ This report contains data that are not covered by the NVLAP accreditation.
☒ There is no testing item of "Non-accreditation".

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REVISION HISTORY

Original Test Report No.: 13274888H-C

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13274888H-C	April 2, 2020	-	-

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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CONTENTS	PAGE
SECTION 1: Customer information.....	5
SECTION 2: Equipment under test (EUT).....	5
SECTION 3: Test specification, procedures & results.....	8
SECTION 4: Operation of EUT during testing.....	12
SECTION 5: Conducted Emission.....	14
SECTION 6: Radiated Spurious Emission	15
SECTION 7: Antenna Terminal Conducted Tests.....	17
APPENDIX 1: Test data	18
Conducted Emission	18
20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation.....	26
Number of Hopping Frequency	30
Dwell time.....	32
Maximum Peak Output Power.....	35
Average Output Power.....	36
Radiated Spurious Emission	38
Conducted Spurious Emission	49
Conducted Emission Band Edge compliance	55
APPENDIX 2: Test instruments	57
APPENDIX 3: Photographs of test setup	59
Conducted Emission	59
Radiated Spurious Emission	60
Worst Case Position	61

SECTION 1: Customer information

Company Name	:	SOURCENEXT CORPORATION
Address	:	Shiodome City Center 33F, 1-5-2 Higashi Shimbashi Minato-ku, Tokyo 105-7133, Japan
Telephone Number	:	+81-50-5533-9606
Facsimile Number	:	+81-3-6430-6405
Contact Person	:	Yukio Aotani

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (EUT) other than the Receipt Date
- SECTION 4: Operation of EUT 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 (EUT)

2.1 Identification of EUT

Type of Equipment	:	POCKETALK S
Model No.	:	PTS
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.8 V (Lithium-ion battery) AC 100 V to AC 240 V (AC Adapter)
Receipt Date of Sample	:	November 14, 2019
Country of Mass-production	:	China
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: PTS (referred to as the EUT in this report) is a POCKETALK S.

There are 2 versions. One has eSIM and SIM slot. Another has only SIM slot. Also there are some color variations.

General Specification

Operating Temperature	:	0 deg. C to +40 deg. C
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Radio Specification (1/2)

WLAN (IEEE802.11b/g/a/n-20/n-40)

Type of radio	IEEE802.11b	IEEE802.11g/n-20	IEEE802.11n-40	IEEE802.11a/n-20	IEEE802.11n-40
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	2422 MHz - 2452 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)		OFDM (64QAM, 16QAM, QPSK, BPSK)	
Channel spacing	5 MHz			20 MHz	40 MHz
Antenna type	Planar Inverted-F Antenna				
Antenna Gain	2.4 GHz: 1.25 dBi 5 GHz: 0.36 dBi				
Clock frequency	26 MHz				

Bluetooth (BR/EDR, Low Energy)

	BR/EDR	Low Energy
Frequency of operation	2402 MHz - 2480 MHz	
Type of modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8DPSK)	GFSK
Channel spacing	1 MHz	2 MHz
Antenna type	Planar Inverted-F Antenna	
Antenna Gain	1.25 dBi	
Clock frequency	26 MHz	

GNSS

Radio Type	Receiver
Frequency of Operation	See table below.
Antenna type	Planar Inverted-F Antenna
Antenna Gain	-0.45 dBi
Clock frequency	26 MHz

Supported GNSS and GNSS signals

GNSS	RNSS Frequency Band / Frequency [MHz]		
	1559 to 1610	1215 to 1300	1164 to 1215
BDS	☐ B1I 1561.098	-	-
Galileo	☐ E1 1575.42	☐ E6 1278.75	☐ E5a 1176.45 ☐ E5b 1207.14
GLONASS	☒ G1 1598.0625 - 1605.375	☐ G2 1242.9375 - 1248.625	-
GPS	☒ L1 1575.42	☐ L2 1227.6	☐ L5 1176.45
SBAS	☐ L1 1575.42	-	☐ L5 1176.45

- ☒ Supported GNSS signal
☐ Not supported GNSS signal

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Radio Specification (2/2)

GSM

Equipment Type	Transceiver	
Frequency of Operation	[Up Link] PCS1900: 1850 MHz to 1910 MHz GSM850: 824 MHz to 849 MHz	[Down Link] PCS1900: 1930 MHz to 1990 MHz GSM850: 869 MHz to 894 MHz
Type of Modulation	GMSK, 8-PSK	
Multi-Slot Class	GPRS:12(4 Down/4 Up/5 Sum) EGPRS:12(4 Down/4 Up/5 Sum)	
Voice & Data communication	Data only	
Antenna Type	Planar Inverted-F Antenna	
Antenna Gain	PCS1900: 1850 MHz to 1910 MHz: -4.61 dBi GSM850 824 MHz to 849 MHz: -4.81 dBi	

WCDMA

Equipment Type	Transceiver	
Frequency of Operation	[Up Link] Band 2: 1850 MHz to 1910 MHz Band 5: 824 MHz to 849 MHz	[Down Link] Band 2: 1930 MHz to 1990 MHz Band 5: 869 MHz to 894 MHz
Type of Modulation	QPSK	
Voice & Data communication	Data only	
Antenna Type	Planar Inverted-F Antenna	
Antenna Gain	Band 2: 1850 MHz to 1910 MHz: -4.61 dBi Band 5 824 MHz to 849 MHz: -4.81 dBi	

LTE

Equipment Type	Transceiver	
Frequency of Operation	[Up Link] Band 2: 1850 MHz to 1910 MHz Band 5: 824 MHz to 849 MHz Band 7: 2500 MHz to 2570 MHz Band 26: 814 MHz to 849 MHz	[Down Link] Band 2: 1930 MHz to 1990 MHz Band 5: 869 MHz to 894 MHz Band 7: 2620 MHz to 2690 MHz Band 26: 859 MHz to 894 MHz
Type of Modulation	QPSK, 16QAM, 64QAM	
Voice & Data communication	Data only	
Antenna Gain	Band 2: 1850 MHz to 1910 MHz: -4.61 dBi Band 5: 824 MHz to 849 MHz: -4.81 dBi Band 7: 2500 MHz to 2570 MHz: -2.15 dBi Band 26: 814 MHz to 849 MHz: -4.81 dBi	

*This test report applies to Bluetooth (BR/EDR) parts.

* WLAN and Bluetooth do not transmit simultaneously.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz,
and 5725-5850 MHz

* 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 ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	27.68 dB 0.33870 MHz AV, Phase: L	Complied a)	-
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1) ISED: RSS-247 5.1 (b)	See data.	Complied b)	Conducted
20dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1) ISED: RSS-247 5.1 (a)		Complied b)	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1)(iii) ISED: RSS-247 5.1 (d)		Complied c)	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(a)(1)(iii) ISED: RSS-247 5.1 (d)		Complied d)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(a)(b)(1) ISED: RSS-247 5.4 (b)		Complied e)	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	10.5 dB 4882.000 MHz Horizontal, AV	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)

The EUT is a battery-operated device and test was performed with the full-charged battery.
This EUT provides 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.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	ISED: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

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

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the 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	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

Conducted emission

using Item	Frequency range	Uncertainty (+/-)
AMN (LISN)	0.009 MHz to 0.15 MHz	3.4 dB
	0.15 MHz to 30 MHz	2.9 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
		4.8 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB
	6 GHz to 18 GHz	5.2 dB
1 m	10 GHz to 26.5 GHz	5.5 dB
	26.5 GHz to 40 GHz	5.5 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 / ISED Lab Company Number: 2973C

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Test site	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	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	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	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	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.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
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	3.1 x 5.0	-	-
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 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 EUT 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), 20dB Bandwidth	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
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 the test items based on Bluetooth Core specification. *EUT has the power settings by the software as follows; Power settings: 0 Software: 1.1.5 *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.

*1) Conducted emission test only

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	POCKETALK S	PTS	868792030071602 *AT 868792030075926 *RE	SOURCENEXT CORPORATION	EUT
B	AC Adaptor	UB-305-0510	K10-1126479	UNIFIVE	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	1.0	Shielded	Shielded	-

*AT: Antenna Terminal Conducted Tests, RE: Radiated Spurious Emission 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.

1) For the tests on EUT with other peripherals (as a whole system)

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.

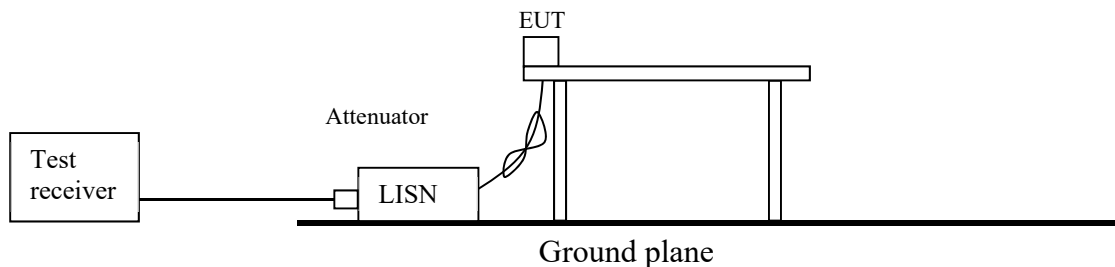
The EUT was connected to a LISN (AMN).

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 m 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 frequency 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.

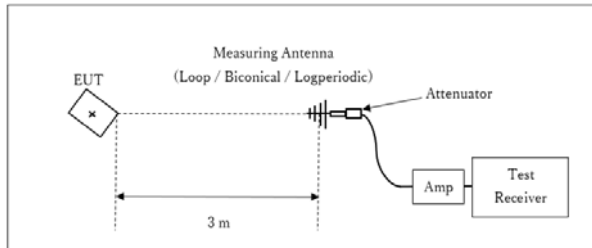
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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 v05r02.

Figure 2: Test Setup

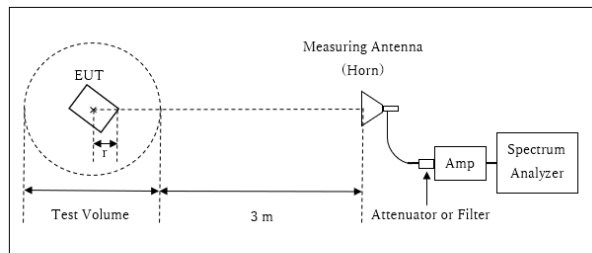
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT

× : Center of turn table

Distance Factor: $20 \times \log (4.0 \text{ m} / 3.0 \text{ m}) = 2.50 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 4.0 \text{ m}$

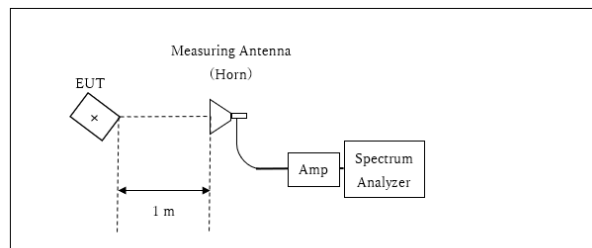
Test Volume : 2.0 m

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

r = 0.0 m

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

10 GHz - 26.5 GHz



× : Center of turn table

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 *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	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) 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.

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

Test data : APPENDIX

Test result : Pass

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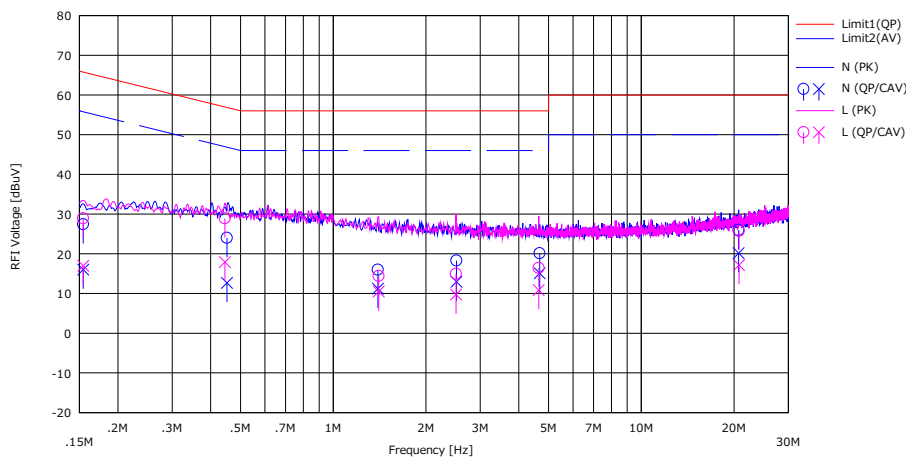
Facsimile : +81 596 24 8124

APPENDIX 1: Test data

Conducted Emission (AC 120 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5 2441 MHz

Limit : FCC_Part 15 Subpart C(15.207)

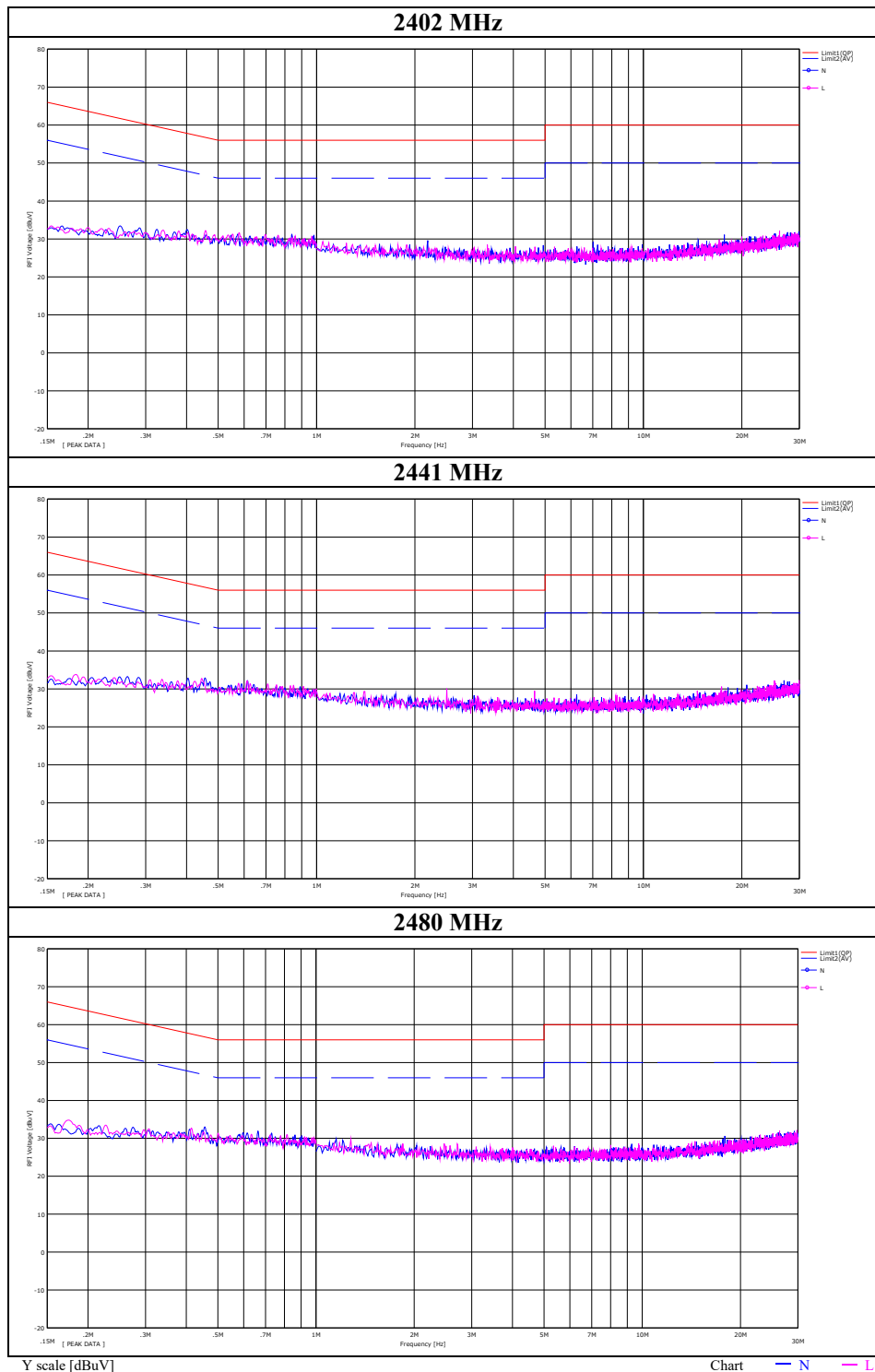


No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]			<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15425	13.90	2.50	0.15	13.38	27.43	16.03	65.80	55.80	38.37	39.77	N	
2	0.45175	10.40	-0.90	0.15	13.42	23.97	12.67	56.80	46.80	32.83	34.13	N	
3	1.39600	2.25	-2.50	0.23	13.49	15.97	11.22	56.00	46.00	40.03	34.78	N	
4	2.51200	4.40	-0.90	0.29	13.57	18.26	12.96	56.00	46.00	37.74	33.04	N	
5	4.68100	5.93	0.90	0.49	13.68	20.10	15.07	56.00	46.00	35.90	30.93	N	
6	20.70000	8.60	2.80	3.24	14.11	25.95	20.15	60.00	50.00	34.05	29.85	N	
7	0.15425	15.33	3.41	0.20	13.38	28.91	16.99	65.80	55.80	36.89	38.81	L	
8	0.44495	15.30	4.30	0.21	13.41	28.92	17.92	57.00	47.00	28.08	29.08	L	
9	1.40500	0.60	-3.30	0.30	13.49	14.39	10.49	56.00	46.00	41.61	35.51	L	
10	2.50300	1.00	-4.20	0.36	13.57	14.93	9.73	56.00	46.00	41.07	36.27	L	
11	4.64500	2.20	-3.40	0.57	13.67	16.44	10.84	56.00	46.00	39.56	35.16	L	
12	20.76000	8.30	-0.30	3.33	14.11	25.74	17.14	60.00	50.00	34.26	32.86	L	

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

Conducted Emission (AC 120 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5



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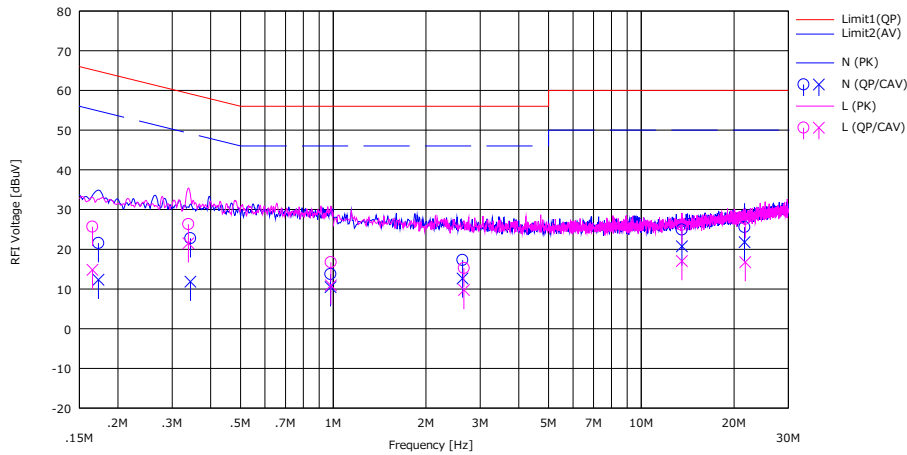
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission (AC 240 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5 2441 MHz

Limit : FCC_Part 15 Subpart C(15.207)

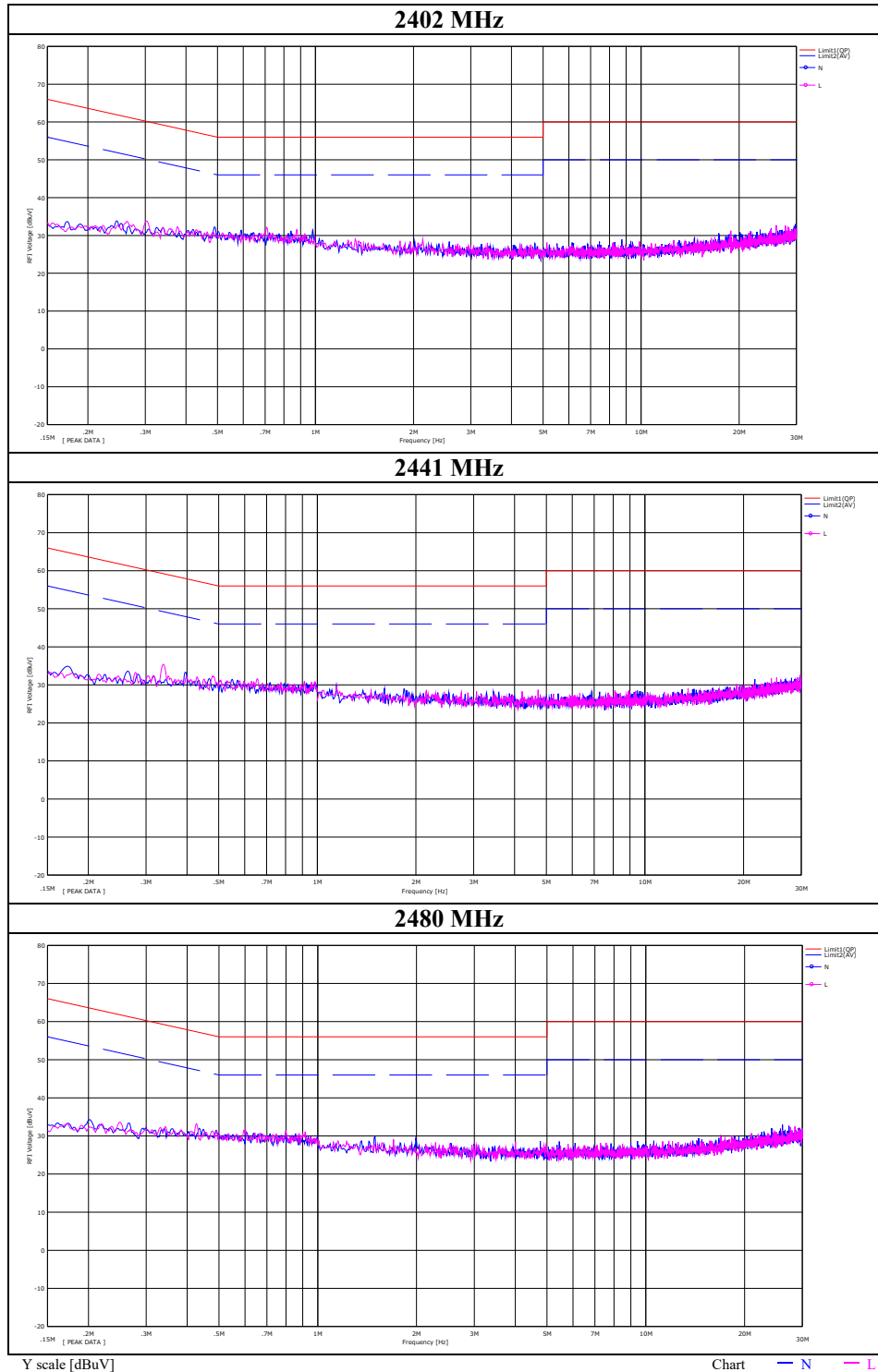


No.	Freq. [MHz]	Reading		LISN [dB]	LOSS [dB]	Results		Limit		Margin		Phase	Comment
		[QP] [dBuV]	[CAV] [dBuV]			[QP] [dBuV]	[CAV] [dBuV]	[QP] [dBuV]	[AV] [dBuV]	[QP] [dB]	[AV] [dB]		
1	0.17295	8.01	-1.20	0.15	13.38	21.54	12.33	64.80	54.80	43.26	42.47	N	
2	0.34380	9.20	-1.70	0.15	13.40	22.75	11.85	59.10	49.10	36.35	37.25	N	
3	0.98045	0.10	-3.20	0.20	13.46	13.76	10.46	56.00	46.00	42.24	35.54	N	
4	2.62900	3.43	-1.22	0.29	13.57	17.29	12.64	56.00	46.00	38.71	33.36	N	
5	13.54000	9.16	5.00	1.81	13.94	24.91	20.75	60.00	50.00	35.09	29.25	N	
6	21.64000	8.00	4.20	3.44	14.13	25.57	21.77	60.00	50.00	34.43	28.23	N	
7	0.16530	12.10	1.25	0.20	13.38	25.68	14.83	65.20	55.20	39.52	40.37	L	
8	0.33870	12.70	7.90	0.22	13.40	26.32	21.52	59.20	49.20	32.88	27.68	L	
9	0.98215	3.00	-2.80	0.26	13.46	16.72	10.92	56.00	46.00	39.28	35.08	L	
10	2.65600	1.30	-4.20	0.36	13.58	15.24	9.74	56.00	46.00	40.76	36.26	L	
11	13.54000	10.30	1.20	1.90	13.94	26.14	17.04	60.00	50.00	33.86	32.96	L	
12	21.74000	9.97	-0.90	3.53	14.13	27.63	16.76	60.00	50.00	32.37	33.24	L	

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

Conducted Emission (AC 240 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5



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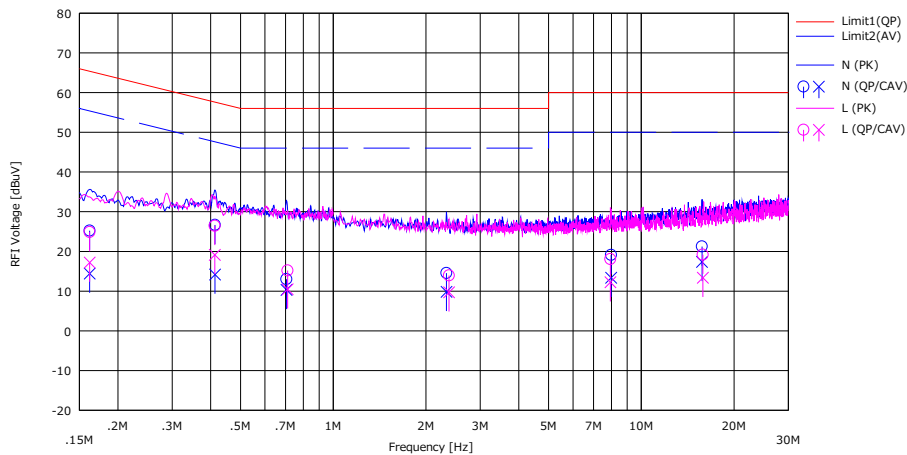
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Emission (AC 120 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, 3DH5 2441 MHz

Limit : FCC_Part 15 Subpart C(15.207)

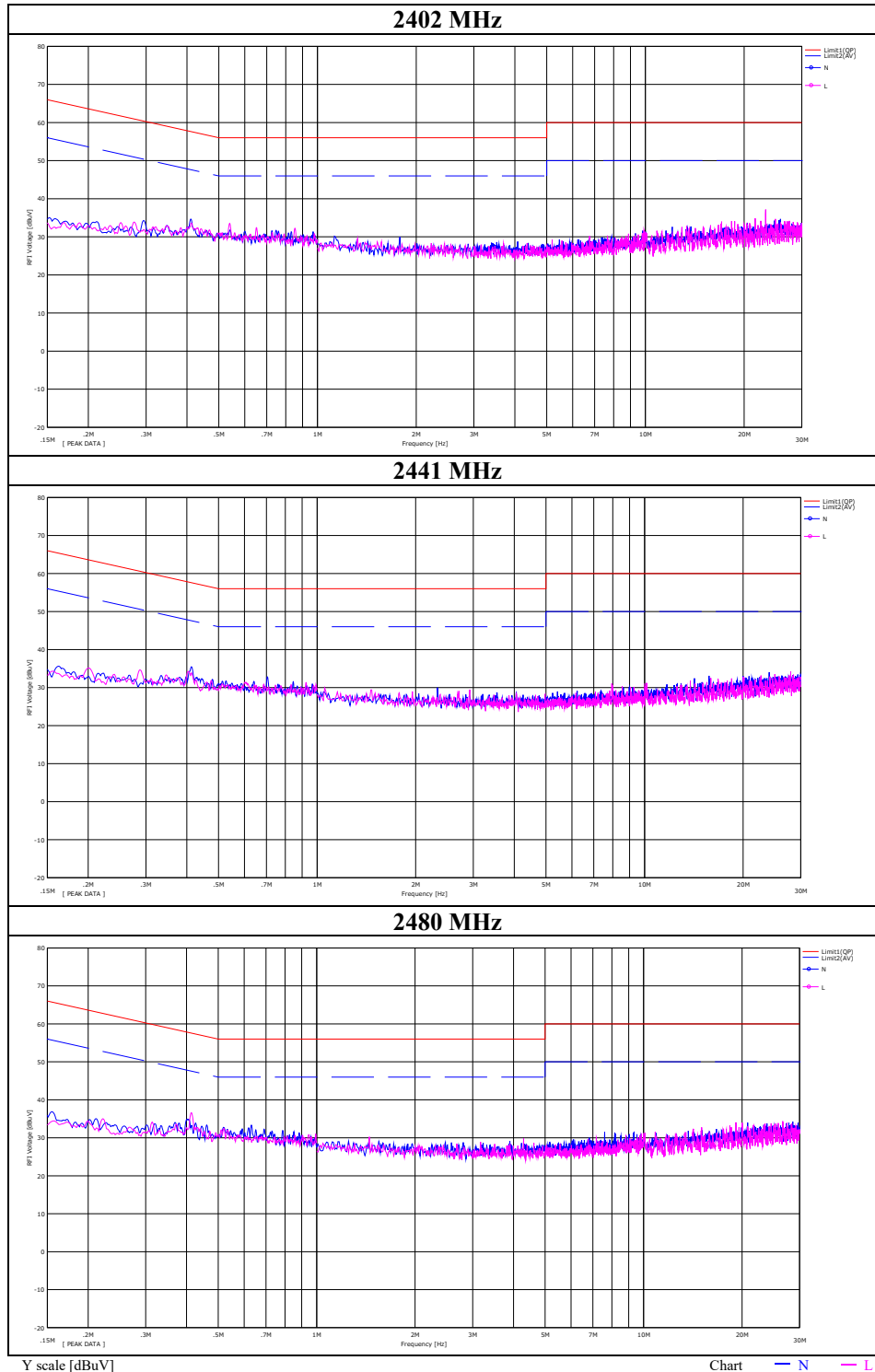


No.	Freq. [MHz]	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		[QP]	[CAV]			[QP]	[CAV]	[QP]	[AV]	[QP]	[AV]		
1	0.16190	11.70	0.90	0.15	13.38	25.23	14.43	65.40	55.40	40.17	40.97	N	
2	0.41350	13.10	0.60	0.15	13.41	26.66	14.16	57.60	47.60	30.94	33.44	N	
3	0.70505	-0.61	-3.31	0.17	13.44	13.00	10.30	56.00	46.00	43.00	35.70	N	
4	2.33200	0.70	-4.00	0.29	13.55	14.54	9.84	56.00	46.00	41.46	36.16	N	
5	7.98400	4.41	-1.29	0.88	13.80	19.09	13.39	60.00	50.00	40.91	36.61	N	
6	15.74000	5.00	1.10	2.25	14.00	21.25	17.35	60.00	50.00	38.75	32.65	N	
7	0.16190	11.30	3.60	0.20	13.38	24.88	17.18	65.40	55.40	40.52	38.22	L	
8	0.41265	12.80	5.50	0.21	13.41	26.42	19.12	57.60	47.60	31.18	28.48	L	
9	0.71100	1.50	-3.20	0.23	13.44	15.17	10.47	56.00	46.00	40.83	35.53	L	
10	2.37700	0.00	-4.20	0.36	13.56	13.92	9.72	56.00	46.00	42.08	36.28	L	
11	7.93900	3.30	-2.50	0.96	13.80	18.06	12.26	60.00	50.00	41.94	37.74	L	
12	15.84000	2.80	-3.00	2.36	14.00	19.16	13.36	60.00	50.00	40.84	36.64	L	

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

Conducted Emission (AC 120 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, 3DH5



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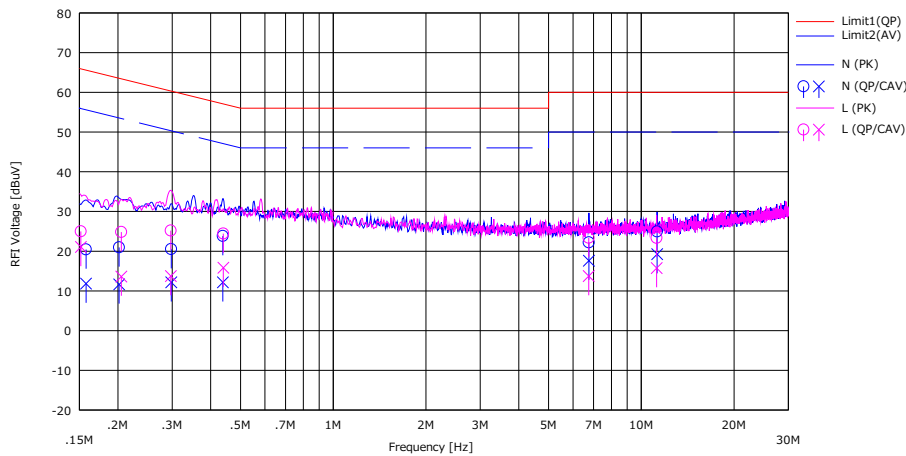
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Facsimile : +81 596 24 8124

Conducted Emission (AC 240 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, 3DH5 2441 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		<QP> [dBuV]	<CAV> [dBuV]			<QP> [dBuV]	<CAV> [dBuV]	<QP> [dBuV]	<AV> [dBuV]	<QP> [dB]	<AV> [dB]		
1	0.15765	6.90	-1.70	0.15	13.38	20.43	11.83	65.60	55.60	45.17	43.77	N	
2	0.20185	7.40	-1.90	0.15	13.39	20.94	11.64	63.50	53.50	42.56	41.86	N	
3	0.29790	6.96	-1.40	0.15	13.40	20.51	12.15	60.30	50.30	39.79	38.15	N	
4	0.43815	10.25	-1.40	0.15	13.41	23.81	12.16	57.10	47.10	33.29	34.94	N	
5	6.76000	7.70	3.10	0.74	13.75	22.19	17.59	60.00	50.00	37.81	32.41	N	
6	11.26000	9.70	4.00	1.36	13.89	24.95	19.25	60.00	50.00	35.05	30.75	N	
7	0.15170	11.40	7.50	0.20	13.38	24.98	21.08	65.90	55.90	40.92	34.82	L	
8	0.20525	11.20	0.00	0.21	13.39	24.80	13.60	63.40	53.40	38.60	39.80	L	
9	0.29705	11.55	0.10	0.22	13.40	25.17	13.72	60.30	50.30	35.13	36.58	L	
10	0.43985	10.80	2.20	0.21	13.41	24.42	15.82	57.10	47.10	32.68	31.28	L	
11	6.75100	8.80	-0.80	0.81	13.75	23.36	13.76	60.00	50.00	36.64	36.24	L	
12	11.22000	8.00	0.40	1.44	13.89	23.33	15.73	60.00	50.00	36.67	34.27	L	

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

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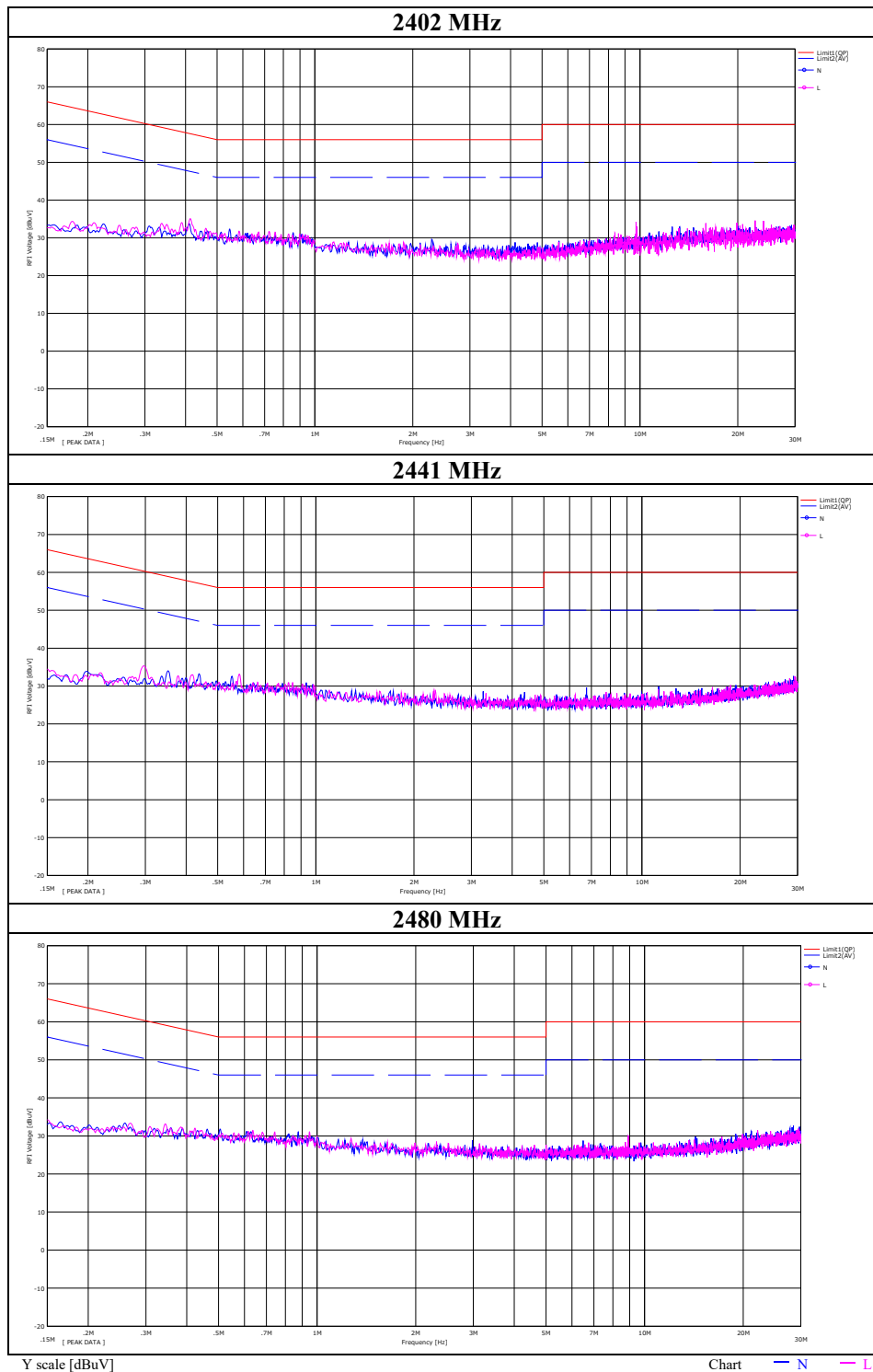
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Conducted Emission (AC 240 V)

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date December 11, 2019
Temperature / Humidity 23 deg. C / 30 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, 3DH5



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

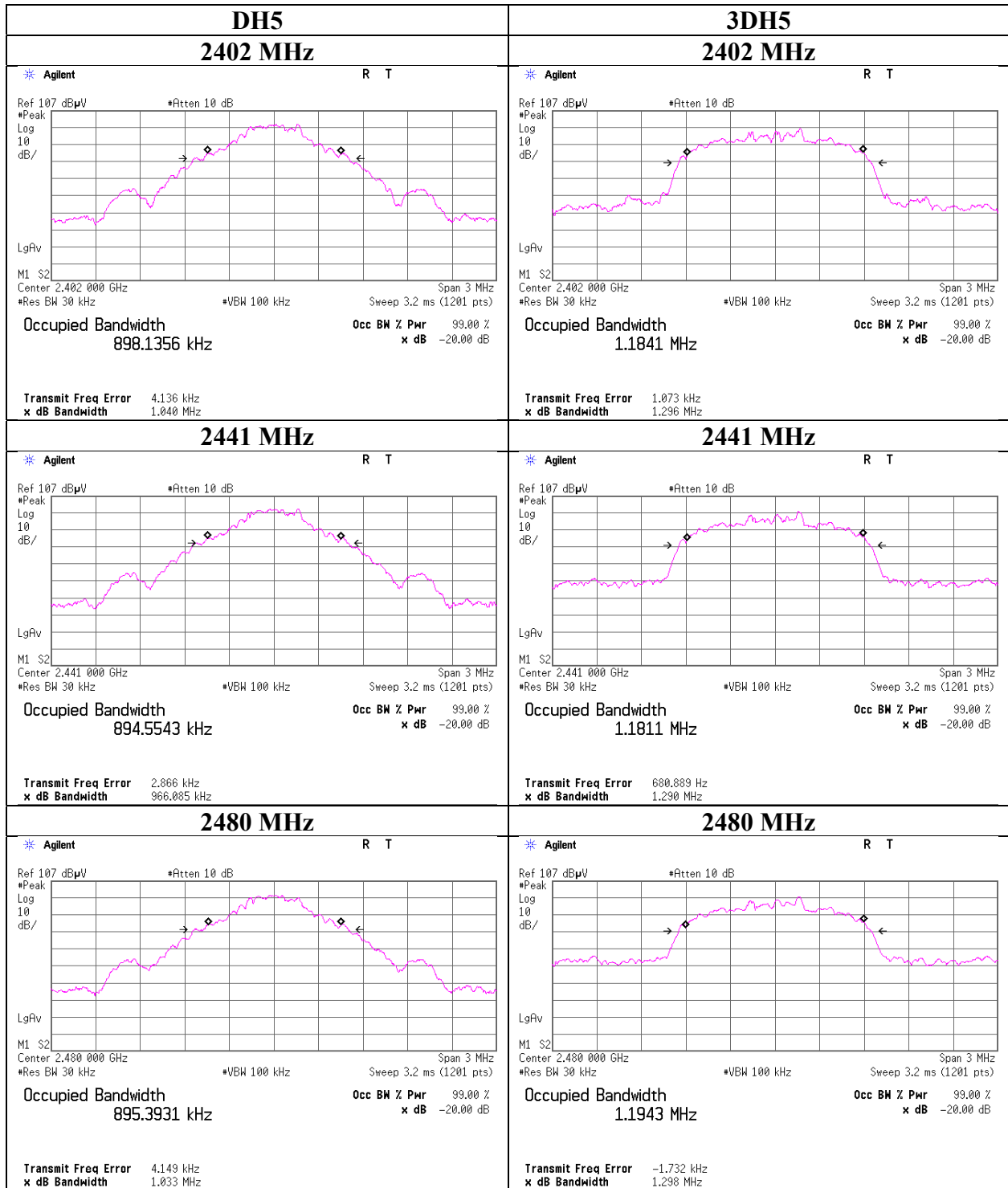
Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.040	898.1	1.000	>= 0.693
DH5	2441.0	0.966	894.6	1.000	>= 0.644
DH5	2480.0	1.033	895.4	1.000	>= 0.689
DH5	Hopping On	-	78568.7	-	-
3DH5	2402.0	1.296	1184.1	1.000	>= 0.864
3DH5	2441.0	1.290	1181.1	1.000	>= 0.860
3DH5	2480.0	1.298	1194.3	1.000	>= 0.865
3DH5	Hopping On	-	78673.5	-	-

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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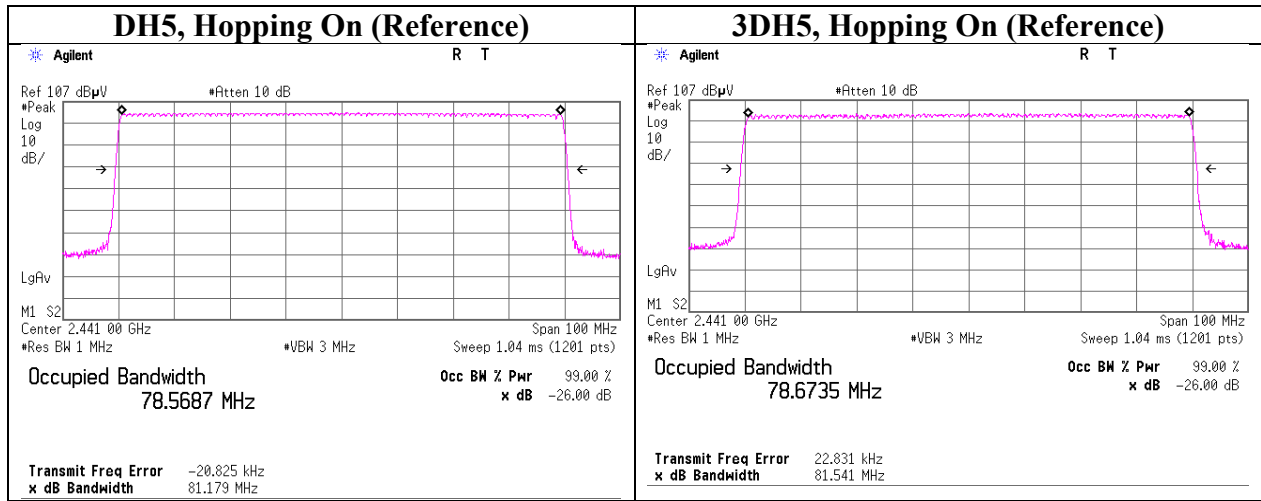
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20dB Bandwidth and 99% Occupied Bandwidth



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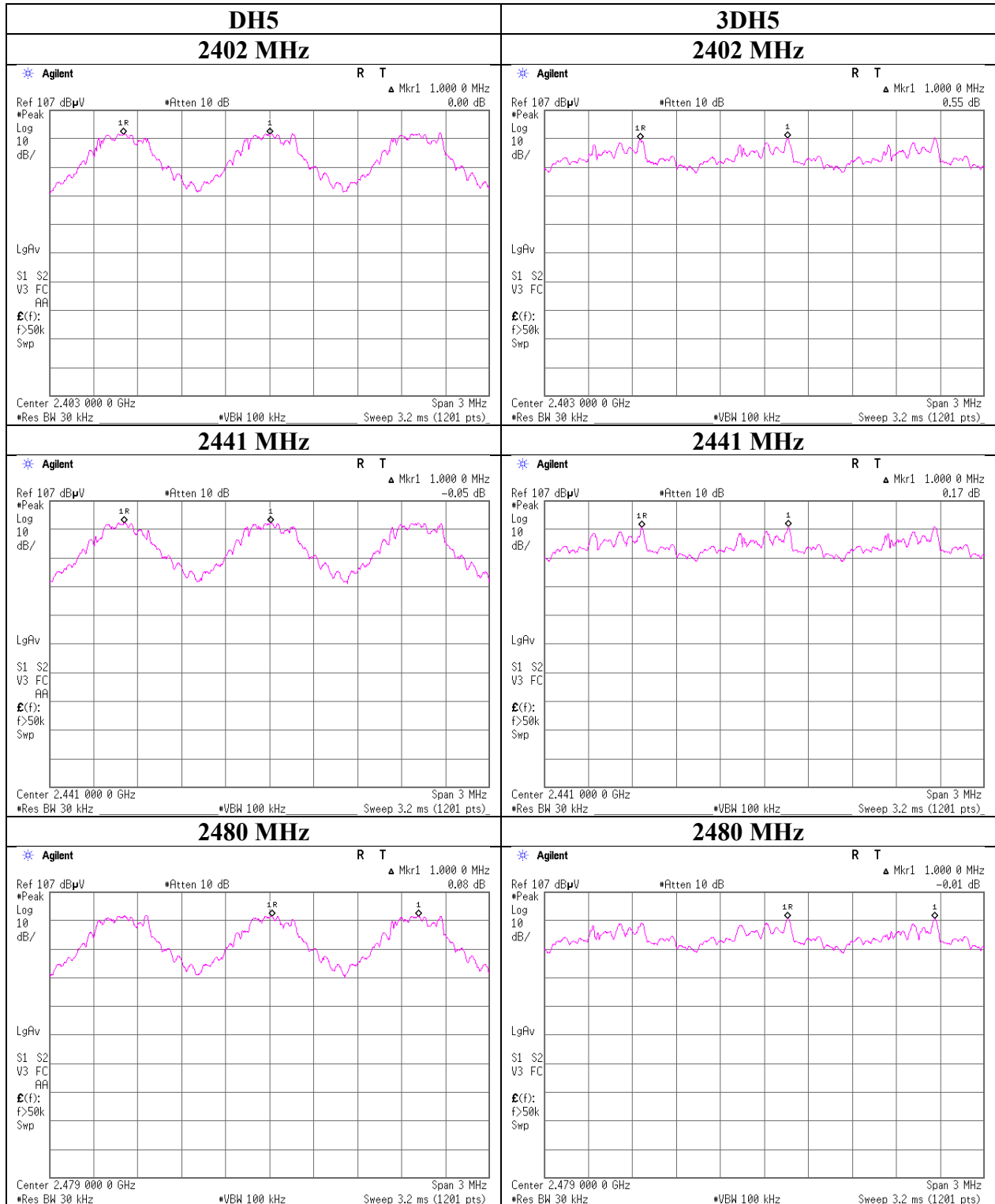
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Carrier Frequency Separation



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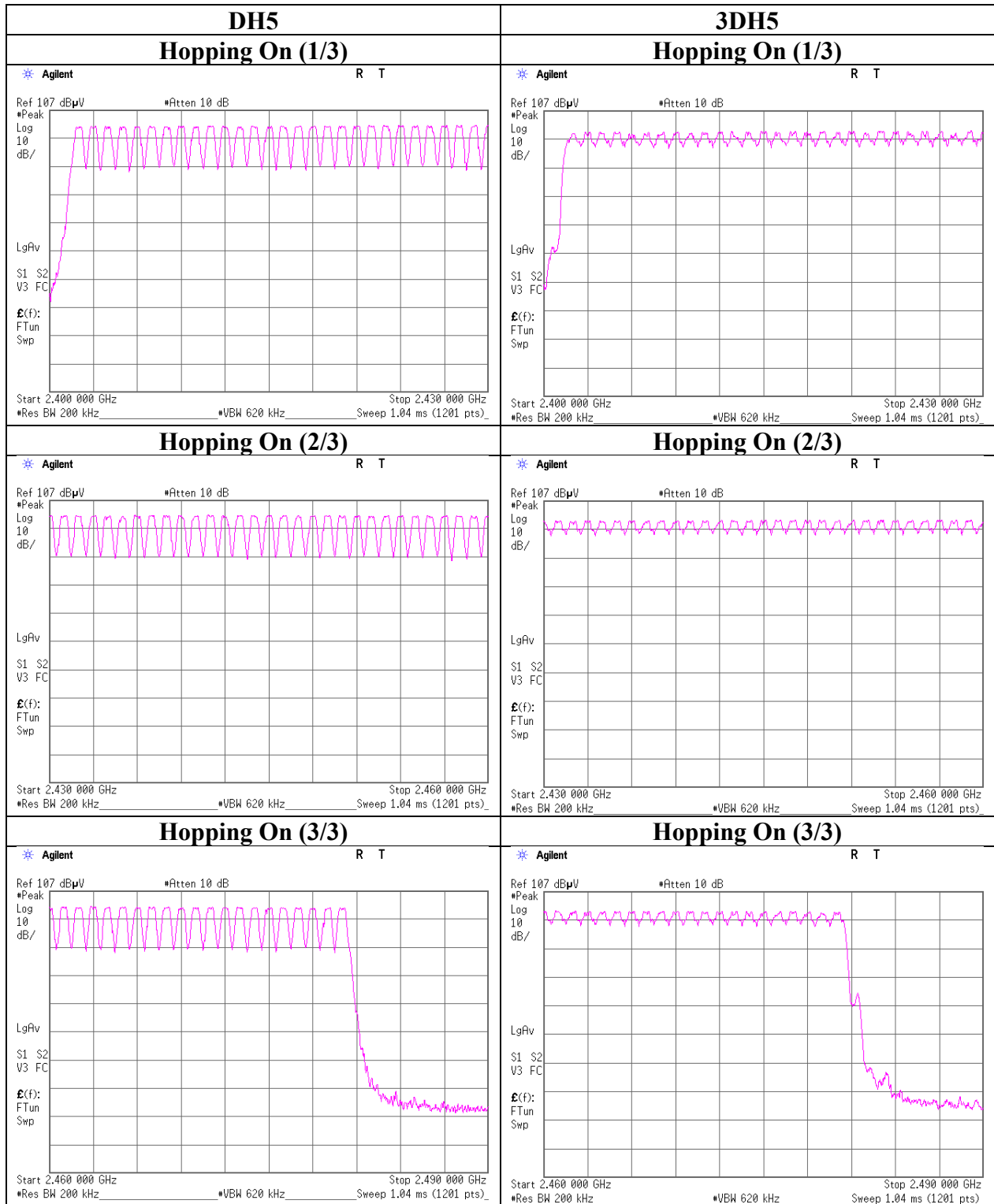
Number of Hopping Frequency

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % 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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Telephone : +81 596 24 8999

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Dwell time

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % 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	50.0 times	/	5 sec.	x 31.6 sec. = 316 times	0.375	118	400
DH3	25.6 times	/	5 sec.	x 31.6 sec. = 162 times	1.631	264	400
DH5	17.2 times	/	5 sec.	x 31.6 sec. = 109 times	2.877	314	400
3DH1	49.6 times	/	5 sec.	x 31.6 sec. = 314 times	0.383	120	400
3DH3	26.8 times	/	5 sec.	x 31.6 sec. = 170 times	1.629	277	400
3DH5	18.2 times	/	5 sec.	x 31.6 sec. = 116 times	2.887	335	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

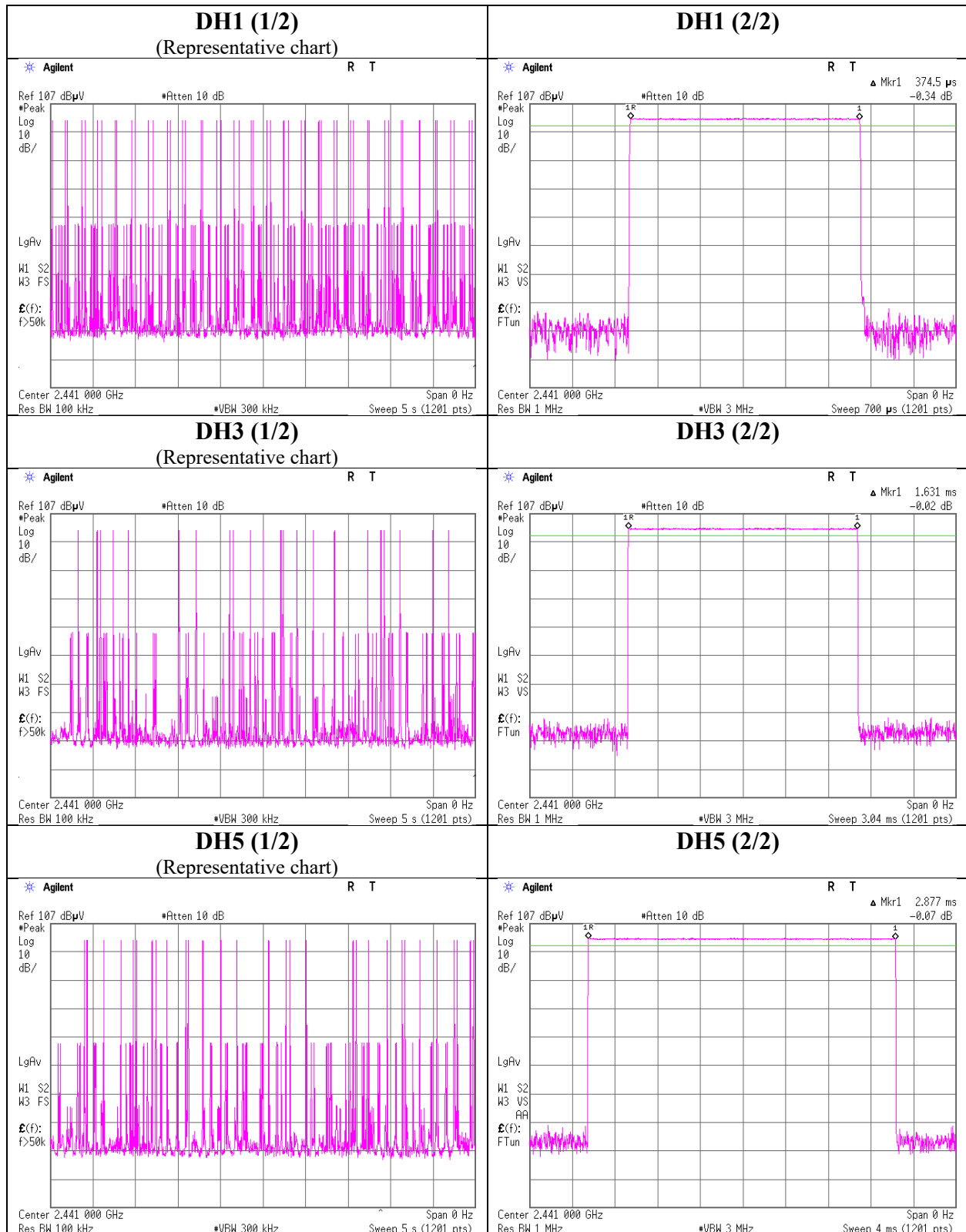
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	50	51	50	49	50
DH3	22	24	25	27	30	25.6
DH5	22	19	12	14	19	17.2
3DH1	50	50	50	49	49	49.6
3DH3	28	23	32	27	24	26.8
3DH5	20	21	16	18	16	18.2

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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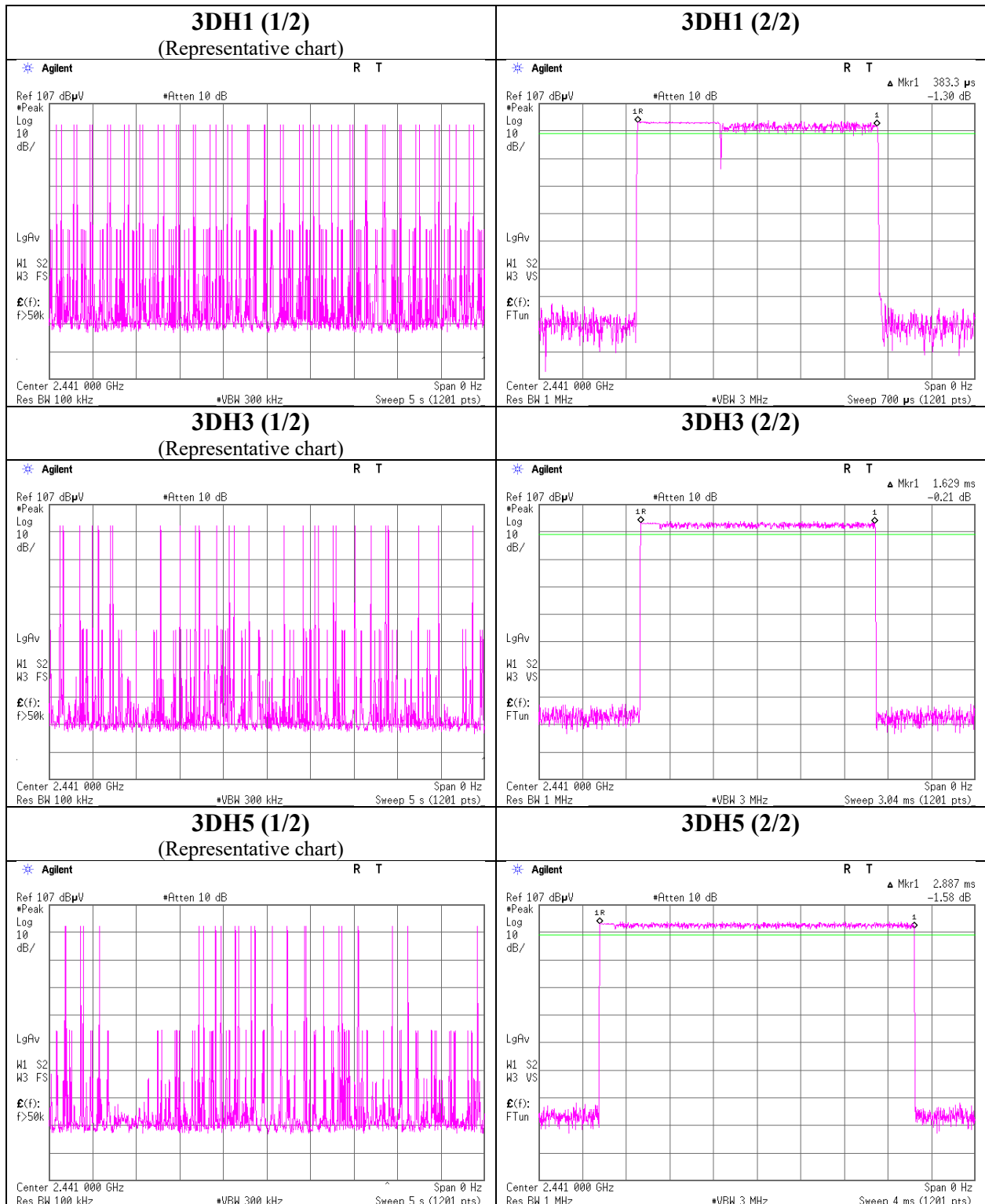
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Dwell time



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Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Maximum Peak Output Power

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % 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	-5.83	1.00	10.06	5.23	3.33	20.96	125	15.73	1.25	6.48	4.45	36.02	4000	29.54
DH5	2441.0	-5.48	1.00	10.06	5.58	3.61	20.96	125	15.38	1.25	6.83	4.82	36.02	4000	29.19
DH5	2480.0	-6.24	1.00	10.06	4.82	3.03	20.96	125	16.14	1.25	6.07	4.05	36.02	4000	29.95
2DH5	2402.0	-6.87	1.00	10.06	4.19	2.62	20.96	125	16.77	1.25	5.44	3.50	36.02	4000	30.58
2DH5	2441.0	-6.32	1.00	10.06	4.74	2.98	20.96	125	16.22	1.25	5.99	3.97	36.02	4000	30.03
2DH5	2480.0	-6.86	1.00	10.06	4.20	2.63	20.96	125	16.76	1.25	5.45	3.51	36.02	4000	30.57
3DH5	2402.0	-6.72	1.00	10.06	4.34	2.72	20.96	125	16.62	1.25	5.59	3.62	36.02	4000	30.43
3DH5	2441.0	-6.17	1.00	10.06	4.89	3.08	20.96	125	16.07	1.25	6.14	4.11	36.02	4000	29.88
3DH5	2480.0	-6.69	1.00	10.06	4.37	2.74	20.96	125	16.59	1.25	5.62	3.65	36.02	4000	30.40

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 SAR testing)

Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
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	-7.42	1.00	10.06	3.64	2.31	1.13	4.77	3.00
DH5	2441.0	-6.98	1.00	10.06	4.08	2.56	1.13	5.21	3.32
DH5	2480.0	-7.65	1.00	10.06	3.41	2.19	1.13	4.54	2.84
2DH5	2402.0	-10.70	1.00	10.06	0.36	1.09	1.13	1.49	1.41
2DH5	2441.0	-9.94	1.00	10.06	1.12	1.29	1.13	2.25	1.68
2DH5	2480.0	-10.08	1.00	10.06	0.98	1.25	1.13	2.11	1.63
3DH5	2402.0	-10.69	1.00	10.06	0.37	1.09	1.13	1.50	1.41
3DH5	2441.0	-9.93	1.00	10.06	1.13	1.30	1.13	2.26	1.68
3DH5	2480.0	-10.06	1.00	10.06	1.00	1.26	1.13	2.13	1.63

Sample Calculation:

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

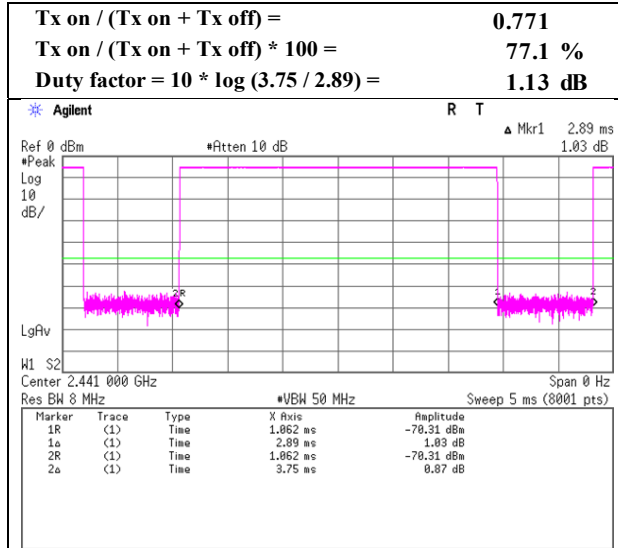
Result (Burst power average) = Time average + Duty factor

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

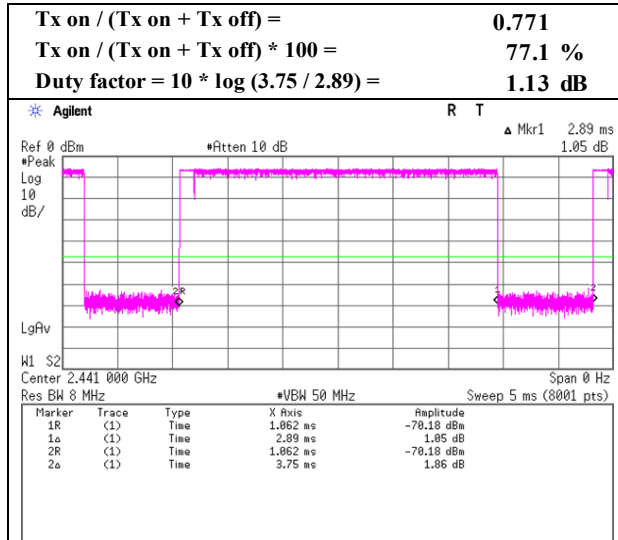
Burst Rate Confirmation

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off

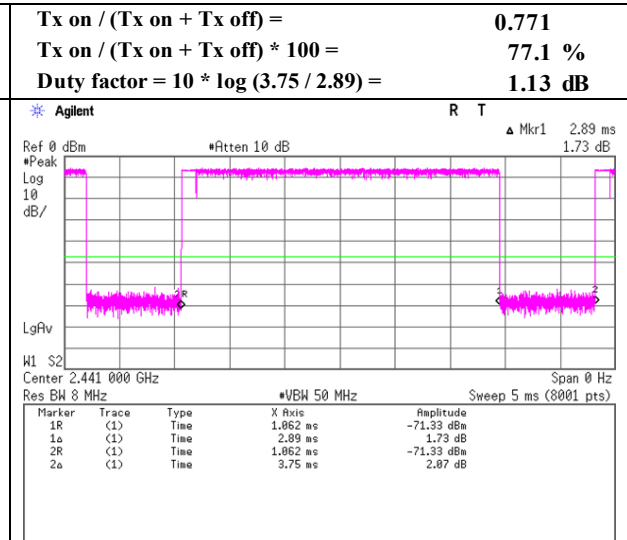
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz - 18 GHz) (18 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.	40.000	QP	22.7	14.8	7.2	32.2	-	12.5	40.0	27.6	
Hori.	110.000	QP	22.5	11.7	8.2	32.1	-	10.2	43.5	33.3	
Hori.	250.000	QP	22.0	11.8	9.6	32.0	-	11.3	46.0	34.7	
Hori.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Hori.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	25.0	
Hori.	800.000	QP	21.8	20.8	13.0	31.5	-	24.1	46.0	21.9	
Hori.	2390.000	PK	42.0	27.9	5.9	31.9	-	43.9	73.9	30.0	
Hori.	4804.000	PK	41.9	31.7	8.1	31.3	-	50.4	73.9	23.5	Floor noise
Hori.	7206.000	PK	40.4	36.2	9.5	32.4	-	53.8	73.9	20.1	Floor noise
Hori.	9608.000	PK	39.2	38.0	10.4	32.8	-	54.9	73.9	19.0	Floor noise
Hori.	2390.000	AV	33.7	27.9	5.9	31.9	1.1	36.8	53.9	17.2	*1)
Hori.	4804.000	AV	33.2	31.7	8.1	31.3	-	41.7	53.9	12.2	Floor noise
Hori.	7206.000	AV	31.2	36.2	9.5	32.4	-	44.6	53.9	9.4	Floor noise
Hori.	9608.000	AV	30.0	38.0	10.4	32.8	-	45.7	53.9	8.3	Floor noise
Vert.	40.000	QP	22.6	14.8	7.2	32.2	-	12.4	40.0	27.6	
Vert.	110.000	QP	22.4	11.7	8.2	32.1	-	10.2	43.5	33.4	
Vert.	250.000	QP	21.9	11.8	9.6	32.0	-	11.3	46.0	34.7	
Vert.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	25.0	
Vert.	800.000	QP	21.8	20.8	13.0	31.5	-	24.1	46.0	21.9	
Vert.	2390.000	PK	42.1	27.9	5.9	31.9	-	44.0	73.9	29.9	
Vert.	4804.000	PK	41.4	31.7	8.1	31.3	-	49.9	73.9	24.0	Floor noise
Vert.	7206.000	PK	40.5	36.2	9.5	32.4	-	53.9	73.9	20.1	Floor noise
Vert.	9608.000	PK	39.4	38.0	10.4	32.8	-	55.1	73.9	18.8	Floor noise
Vert.	2390.000	AV	33.5	27.9	5.9	31.9	1.1	36.5	53.9	17.4	*1)
Vert.	4804.000	AV	32.4	31.7	8.1	31.3	-	40.9	53.9	13.0	Floor noise
Vert.	7206.000	AV	31.1	36.2	9.5	32.4	-	44.4	53.9	9.5	Floor noise
Vert.	9608.000	AV	30.2	38.0	10.4	32.8	-	45.8	53.9	8.1	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 $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
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)

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

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	96.0	27.9	5.9	31.9	97.9	-	-	Carrier
Hori.	2400.000	PK	41.1	27.9	5.9	31.9	43.0	77.9	34.9	
Vert.	2402.000	PK	96.8	27.9	5.9	31.9	98.7	-	-	Carrier
Vert.	2400.000	PK	41.4	27.9	5.9	31.9	43.3	78.7	35.4	

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

***All other emissions were complied 20dBc limit.**

UL Japan, Inc.

Ise EMC Lab.

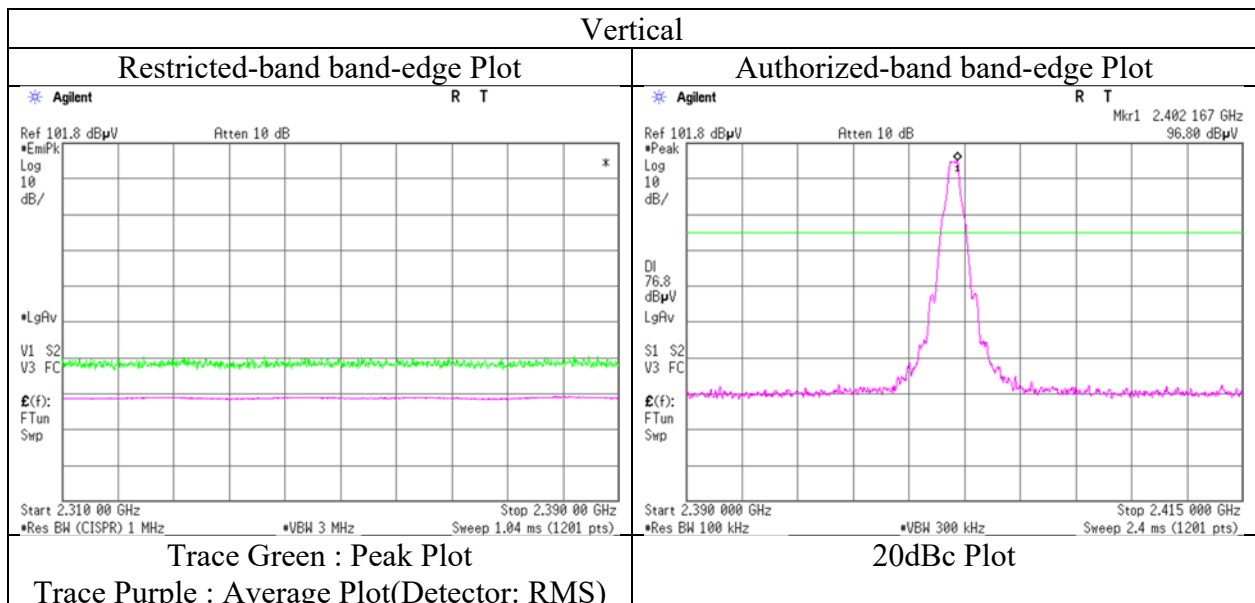
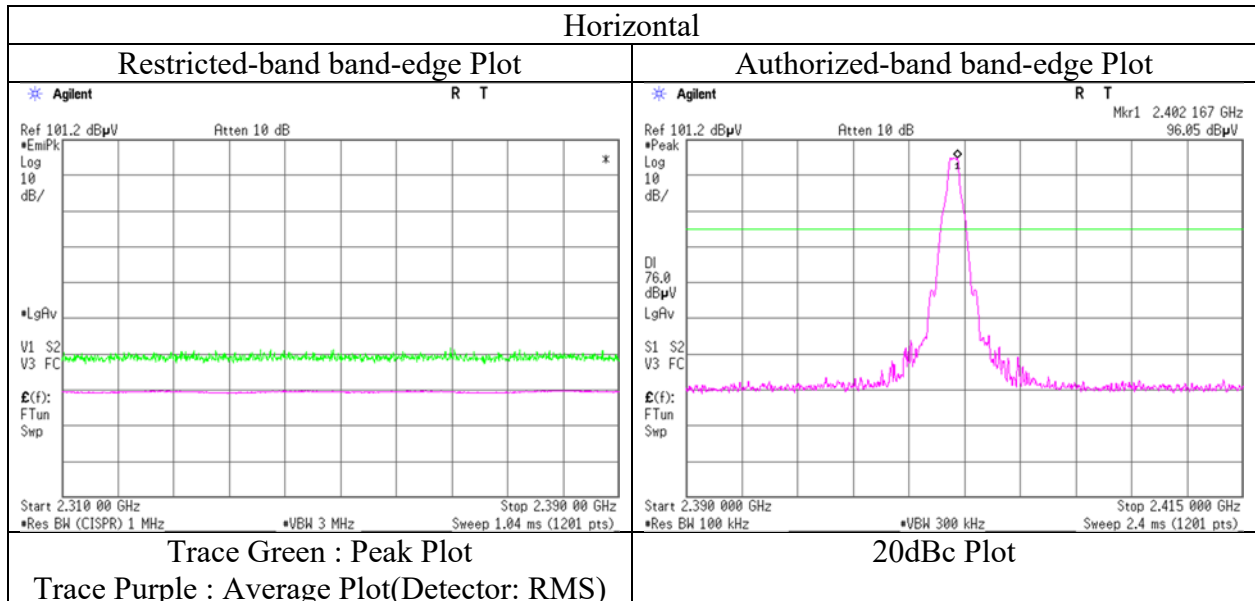
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274888H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 22, 2019
Temperature / Humidity	21 deg. C / 35 % RH
Engineer	Akihiko Maeda (1 GHz -10 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.

Ise EMC Lab.

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Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz - 18 GHz) (18 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.	40.000	QP	22.7	14.8	7.2	32.2	-	12.5	40.0	27.5	
Hori.	110.000	QP	22.5	11.7	8.2	32.1	-	10.2	43.5	33.3	
Hori.	250.000	QP	21.9	11.8	9.6	32.0	-	11.3	46.0	34.7	
Hori.	400.000	QP	21.8	15.7	10.7	32.0	-	16.2	46.0	29.8	
Hori.	610.000	QP	21.8	19.3	12.0	32.0	-	21.0	46.0	25.0	
Hori.	800.000	QP	21.9	20.8	13.0	31.5	-	24.2	46.0	21.8	
Hori.	4882.000	PK	40.9	31.6	8.1	31.2	-	49.3	73.9	24.6	
Hori.	7323.000	PK	40.3	36.5	9.5	32.5	-	53.9	73.9	20.1	Floor noise
Hori.	9764.000	PK	39.0	38.3	10.5	32.9	-	54.9	73.9	19.0	Floor noise
Hori.	4882.000	AV	33.9	31.6	8.1	31.2	1.1	43.4	53.9	10.5	
Hori.	7323.000	AV	31.1	36.5	9.5	32.5	-	44.6	53.9	9.3	Floor noise
Hori.	9764.000	AV	30.1	38.3	10.5	32.9	-	46.0	53.9	7.9	Floor noise
Vert.	40.000	QP	22.6	14.8	7.2	32.2	-	12.4	40.0	27.6	
Vert.	110.000	QP	22.3	11.7	8.2	32.1	-	10.1	43.5	33.4	
Vert.	250.000	QP	21.4	11.8	9.6	32.0	-	10.8	46.0	35.2	
Vert.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	24.9	
Vert.	800.000	QP	21.7	20.8	13.0	31.5	-	24.1	46.0	22.0	
Vert.	4882.000	PK	40.3	31.6	8.1	31.2	-	48.7	73.9	25.2	Floor noise
Vert.	7323.000	PK	40.2	36.5	9.5	32.5	-	53.8	73.9	20.2	Floor noise
Vert.	9764.000	PK	39.4	38.3	10.5	32.9	-	55.3	73.9	18.6	Floor noise
Vert.	4882.000	AV	32.4	31.6	8.1	31.2	-	40.9	53.9	13.0	Floor noise
Vert.	7323.000	AV	31.0	36.5	9.5	32.5	-	44.6	53.9	9.3	Floor noise
Vert.	9764.000	AV	30.1	38.3	10.5	32.9	-	46.0	53.9	7.9	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 $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

***All other emissions were complied 20dBc limit.**

Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz - 18 GHz) (18 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.	40.000	QP	22.7	14.8	7.2	32.2	-	12.5	40.0	27.5	
Hori.	110.000	QP	22.4	11.7	8.2	32.1	-	10.2	43.5	33.3	
Hori.	250.000	QP	22.0	11.8	9.6	32.0	-	11.3	46.0	34.7	
Hori.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Hori.	610.000	QP	21.7	19.3	12.0	32.0	-	21.0	46.0	25.0	
Hori.	800.000	QP	21.8	20.8	13.0	31.5	-	24.1	46.0	21.9	
Hori.	2483.500	PK	46.0	27.7	6.0	31.8	-	47.8	73.9	26.1	
Hori.	4960.000	PK	40.4	31.6	8.1	31.2	-	48.9	73.9	25.0	Floor noise
Hori.	7440.000	PK	40.3	36.6	9.5	32.5	-	53.9	73.9	20.0	Floor noise
Hori.	9920.000	PK	39.5	38.5	10.5	33.0	-	55.6	73.9	18.4	Floor noise
Hori.	2483.500	AV	35.3	27.7	6.0	31.8	1.1	38.2	53.9	15.7	*1)
Hori.	4960.000	AV	33.1	31.6	8.1	31.2	-	41.6	53.9	12.3	Floor noise
Hori.	7440.000	AV	31.1	36.6	9.5	32.5	-	44.7	53.9	9.2	Floor noise
Hori.	9920.000	AV	30.2	38.5	10.5	33.0	-	46.2	53.9	7.7	Floor noise
Vert.	40.000	QP	22.7	14.8	7.2	32.2	-	12.5	40.0	27.5	
Vert.	110.000	QP	22.7	11.7	8.2	32.1	-	10.4	43.5	33.1	
Vert.	250.000	QP	21.4	11.8	9.6	32.0	-	10.8	46.0	35.2	
Vert.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	25.0	
Vert.	800.000	QP	21.7	20.8	13.0	31.5	-	24.1	46.0	22.0	
Vert.	2483.500	PK	44.5	27.7	6.0	31.8	-	46.4	73.9	27.5	
Vert.	4960.000	PK	41.0	31.6	8.1	31.2	-	49.5	73.9	24.4	Floor noise
Vert.	7440.000	PK	40.2	36.6	9.5	32.5	-	53.8	73.9	20.1	Floor noise
Vert.	9920.000	PK	39.3	38.5	10.5	33.0	-	55.3	73.9	18.6	Floor noise
Vert.	2483.500	AV	35.4	27.7	6.0	31.8	1.1	38.4	53.9	15.5	*1)
Vert.	4960.000	AV	32.8	31.6	8.1	31.2	-	41.3	53.9	12.6	Floor noise
Vert.	7440.000	AV	31.2	36.6	9.5	32.5	-	44.8	53.9	9.1	Floor noise
Vert.	9920.000	AV	30.2	38.5	10.5	33.0	-	46.2	53.9	7.7	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 $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

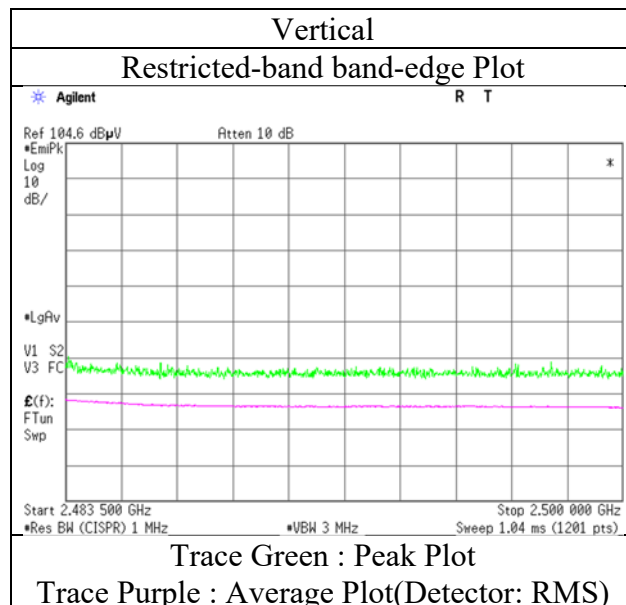
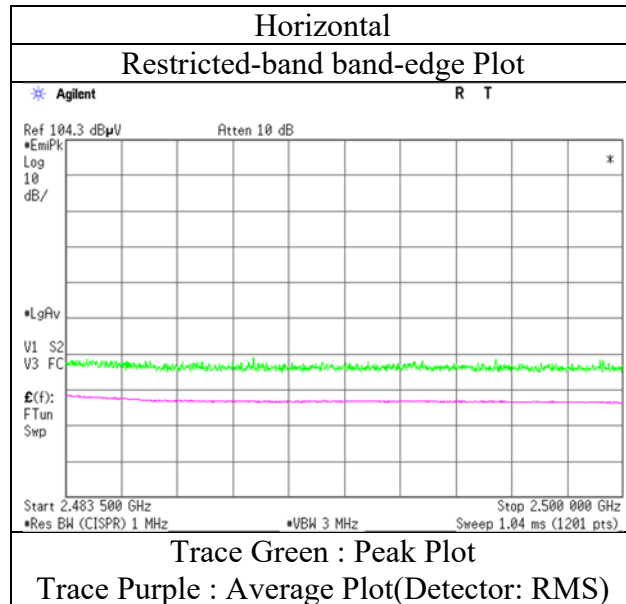
*1) Not Out of Band emission(Leakage Power)

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

***All other emissions were complied 20dBc limit.**

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274888H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 22, 2019
Temperature / Humidity	21 deg. C / 35 % RH
Engineer	Akihiko Maeda
	(1 GHz -10 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.

UL Japan, Inc.

Ise EMC Lab.

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

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Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz – 18 GHz) (18 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.	40.000	QP	22.7	14.8	7.2	32.2	-	12.5	40.0	27.6	
Hori.	110.000	QP	22.3	11.7	8.2	32.1	-	10.1	43.5	33.4	
Hori.	250.000	QP	21.9	11.8	9.6	32.0	-	11.2	46.0	34.8	
Hori.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Hori.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	24.9	
Hori.	800.000	QP	21.8	20.8	13.0	31.5	-	24.1	46.0	21.9	
Hori.	2390.000	PK	42.2	27.9	5.9	31.9	-	44.1	73.9	29.8	
Hori.	4804.000	PK	41.4	31.7	8.1	31.3	-	49.9	73.9	24.0	Floor noise
Hori.	7206.000	PK	40.1	36.2	9.5	32.4	-	53.5	73.9	20.4	Floor noise
Hori.	9608.000	PK	39.2	38.0	10.4	32.8	-	54.9	73.9	19.0	Floor noise
Hori.	2390.000	AV	33.4	27.9	5.9	31.9	1.1	36.4	53.9	17.5	*1)
Hori.	4804.000	AV	32.4	31.7	8.1	31.3	-	40.9	53.9	13.0	Floor noise
Hori.	7206.000	AV	31.2	36.2	9.5	32.4	-	44.5	53.9	9.4	Floor noise
Hori.	9608.000	AV	30.1	38.0	10.4	32.8	-	45.7	53.9	8.2	Floor noise
Vert.	40.000	QP	22.8	14.8	7.2	32.2	-	12.6	40.0	27.4	
Vert.	110.000	QP	22.6	11.7	8.2	32.1	-	10.4	43.5	33.1	
Vert.	250.000	QP	21.5	11.8	9.6	32.0	-	10.9	46.0	35.2	
Vert.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	24.9	
Vert.	800.000	QP	21.8	20.8	13.0	31.5	-	24.1	46.0	21.9	
Vert.	2390.000	PK	42.8	27.9	5.9	31.9	-	44.7	73.9	29.2	
Vert.	4804.000	PK	41.5	31.7	8.1	31.3	-	50.0	73.9	23.9	Floor noise
Vert.	7206.000	PK	40.3	36.2	9.5	32.4	-	53.7	73.9	20.2	Floor noise
Vert.	9608.000	PK	39.2	38.0	10.4	32.8	-	54.8	73.9	19.1	Floor noise
Vert.	2390.000	AV	33.7	27.9	5.9	31.9	1.1	36.7	53.9	17.2	*1)
Vert.	4804.000	AV	32.5	31.7	8.1	31.3	-	41.0	53.9	12.9	Floor noise
Vert.	7206.000	AV	31.3	36.2	9.5	32.4	-	44.6	53.9	9.3	Floor noise
Vert.	9608.000	AV	30.1	38.0	10.4	32.8	-	45.8	53.9	8.1	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 $20\log(4.0\text{ m} / 3.0\text{ m}) = 2.5\text{ dB}$
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)

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

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	94.2	27.9	5.9	31.9	96.1	-	-	Carrier
Hori.	2400.000	PK	40.2	27.9	5.9	31.9	42.2	76.1	33.9	
Vert.	2402.000	PK	95.5	27.9	5.9	31.9	97.4	-	-	Carrier
Vert.	2400.000	PK	42.0	27.9	5.9	31.9	43.9	77.4	33.6	

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

***All other emissions were complied 20dBc limit.**

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Ise EMC Lab.

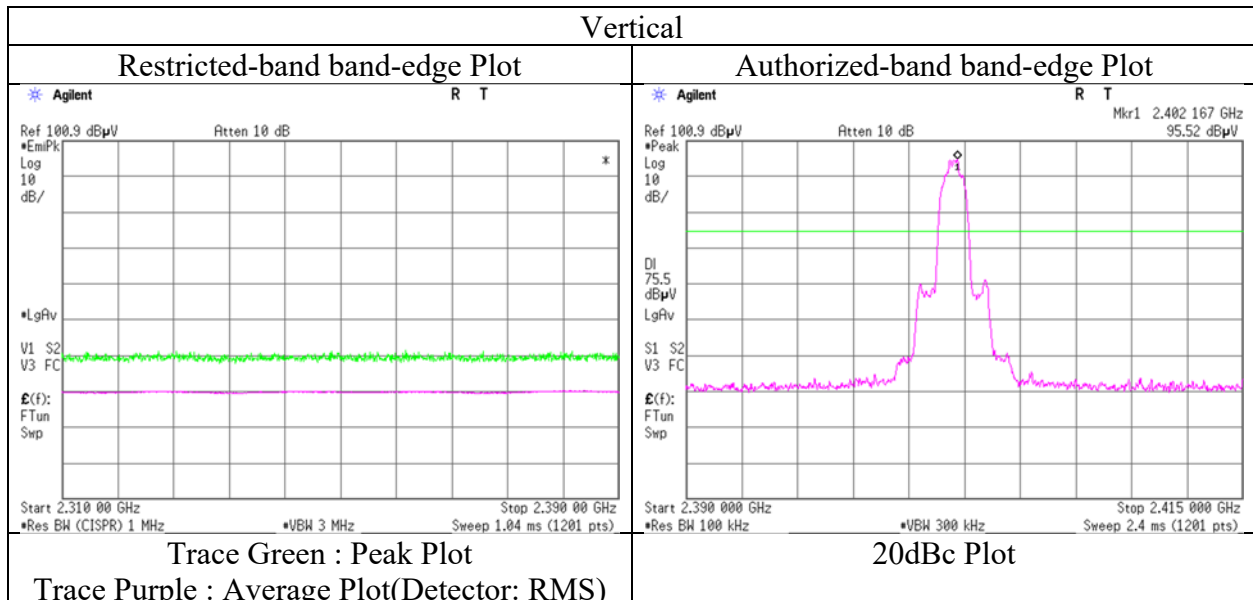
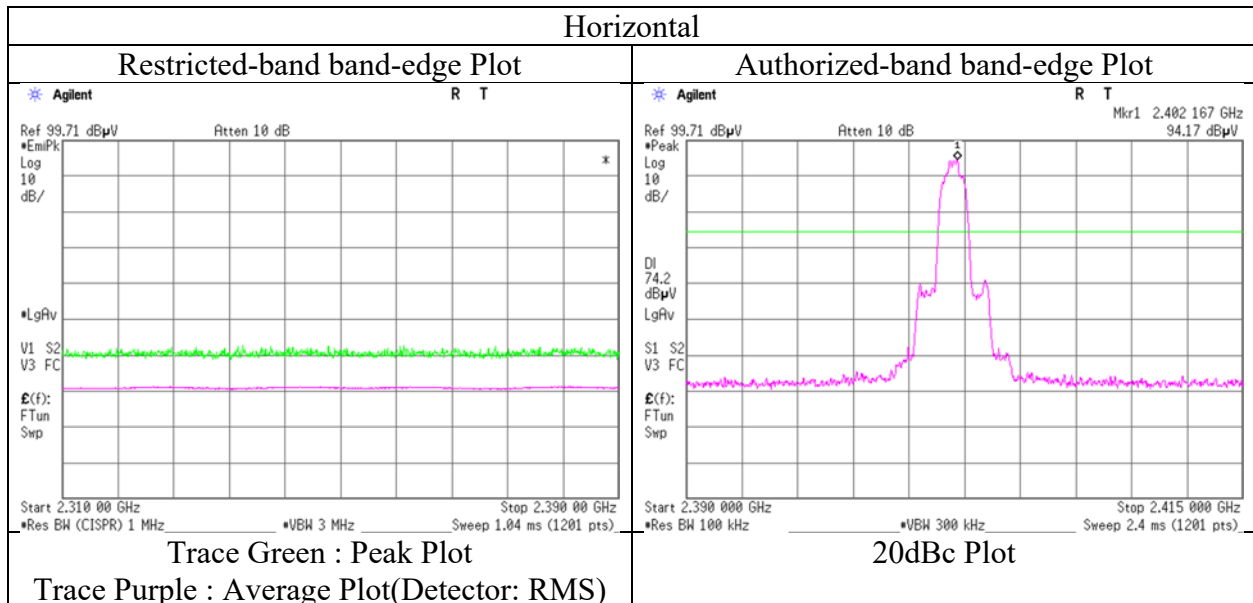
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Facsimile : +81 596 24 8124

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274888H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 22, 2019
Temperature / Humidity	21 deg. C / 35 % RH
Engineer	Akihiko Maeda (1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 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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Ise EMC Lab.

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Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz – 18 GHz) (18 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.	40.000	QP	22.6	14.8	7.2	32.2	-	12.4	40.0	27.6	
Hori.	110.000	QP	22.3	11.7	8.2	32.1	-	10.1	43.5	33.4	
Hori.	250.000	QP	21.9	11.8	9.6	32.0	-	11.2	46.0	34.8	
Hori.	400.000	QP	21.7	15.7	10.7	32.0	-	16.1	46.0	29.9	
Hori.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	25.0	
Hori.	800.000	QP	22.0	20.8	13.0	31.5	-	24.3	46.0	21.7	
Hori.	4882.000	PK	40.9	31.6	8.1	31.2	-	49.4	73.9	24.5	Floor noise
Hori.	7323.000	PK	40.2	36.5	9.5	32.5	-	53.8	73.9	20.1	Floor noise
Hori.	9764.000	PK	39.1	38.3	10.5	32.9	-	55.0	73.9	18.9	Floor noise
Hori.	4882.000	AV	32.7	31.6	8.1	31.2	-	41.1	53.9	12.8	Floor noise
Hori.	7323.000	AV	31.3	36.5	9.5	32.5	-	44.8	53.9	9.1	Floor noise
Hori.	9764.000	AV	30.3	38.3	10.5	32.9	-	46.1	53.9	7.8	Floor noise
Vert.	40.000	QP	22.5	14.8	7.2	32.2	-	12.3	40.0	27.7	
Vert.	110.000	QP	22.5	11.7	8.2	32.1	-	10.2	43.5	33.3	
Vert.	250.000	QP	21.4	11.8	9.6	32.0	-	10.8	46.0	35.2	
Vert.	400.000	QP	21.1	15.7	10.7	32.0	-	15.5	46.0	30.5	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	24.9	
Vert.	800.000	QP	21.7	20.8	13.0	31.5	-	24.0	46.0	22.0	
Vert.	4882.000	PK	41.4	31.6	8.1	31.2	-	49.9	73.9	24.0	Floor noise
Vert.	7323.000	PK	40.2	36.5	9.5	32.5	-	53.8	73.9	20.1	Floor noise
Vert.	9764.000	PK	39.4	38.3	10.5	32.9	-	55.3	73.9	18.6	Floor noise
Vert.	4882.000	AV	32.9	31.6	8.1	31.2	-	41.4	53.9	12.5	Floor noise
Vert.	7323.000	AV	31.4	36.5	9.5	32.5	-	44.9	53.9	9.0	Floor noise
Vert.	9764.000	AV	30.3	38.3	10.5	32.9	-	46.2	53.9	7.7	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 Duty cycle correction factor.**

***All other emissions were complied 20dBc limit.**

Radiated Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4 No.3 No.3 No.3
Date November 22, 2019 December 6, 2019 December 7, 2019 December 9, 2019
Temperature / Humidity 21 deg. C / 35 % RH 23 deg. C / 40 % RH 20 deg. C / 35 % RH 23 deg. C / 44 % RH
Engineer Akihiko Maeda Ryota Yamanaka Takafumi Noguchi Yuta Moriya
(1 GHz -10 GHz) (10 GHz - 18 GHz) (18 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.	40.000	QP	22.6	14.8	7.2	32.2	-	12.4	40.0	27.6	
Hori.	110.000	QP	22.2	11.7	8.2	32.1	-	10.0	43.5	33.5	
Hori.	250.000	QP	21.8	11.8	9.6	32.0	-	11.2	46.0	34.8	
Hori.	400.000	QP	21.6	15.7	10.7	32.0	-	16.0	46.0	30.0	
Hori.	610.000	QP	21.7	19.3	12.0	32.0	-	21.0	46.0	25.0	
Hori.	800.000	QP	21.9	20.8	13.0	31.5	-	24.2	46.0	21.8	
Hori.	2483.500	PK	47.9	27.7	6.0	31.8	-	49.7	73.9	24.2	
Hori.	4960.000	PK	41.3	31.6	8.1	31.2	-	49.8	73.9	24.1	Floor noise
Hori.	7440.000	PK	40.2	36.6	9.5	32.5	-	53.8	73.9	20.1	Floor noise
Hori.	9920.000	PK	39.5	38.5	10.5	33.0	-	55.6	73.9	18.4	Floor noise
Hori.	2483.500	AV	36.8	27.7	6.0	31.8	1.1	39.8	53.9	14.1	*1)
Hori.	4960.000	AV	32.9	31.6	8.1	31.2	-	41.4	53.9	12.5	Floor noise
Hori.	7440.000	AV	31.2	36.6	9.5	32.5	-	44.8	53.9	9.1	Floor noise
Hori.	9920.000	AV	30.3	38.5	10.5	33.0	-	46.3	53.9	7.6	Floor noise
Vert.	40.000	QP	22.9	14.8	7.2	32.2	-	12.7	40.0	27.3	
Vert.	110.000	QP	22.4	11.7	8.2	32.1	-	10.2	43.5	33.3	
Vert.	250.000	QP	21.6	11.8	9.6	32.0	-	11.0	46.0	35.0	
Vert.	400.000	QP	21.1	15.7	10.7	32.0	-	15.5	46.0	30.5	
Vert.	610.000	QP	21.8	19.3	12.0	32.0	-	21.1	46.0	25.0	
Vert.	800.000	QP	21.6	20.8	13.0	31.5	-	24.0	46.0	22.0	
Vert.	2483.500	PK	47.4	27.7	6.0	31.8	-	49.3	73.9	24.7	
Vert.	4960.000	PK	42.1	31.6	8.1	31.2	-	50.6	73.9	23.3	Floor noise
Vert.	7440.000	PK	41.3	36.6	9.5	32.5	-	54.8	73.9	19.1	Floor noise
Vert.	9920.000	PK	40.3	38.5	10.5	33.0	-	56.4	73.9	17.5	Floor noise
Vert.	2483.500	AV	36.9	27.7	6.0	31.8	1.1	39.9	53.9	14.0	*1)
Vert.	4960.000	AV	32.6	31.6	8.1	31.2	-	41.1	53.9	12.8	Floor noise
Vert.	7440.000	AV	31.4	36.6	9.5	32.5	-	45.0	53.9	9.0	Floor noise
Vert.	9920.000	AV	30.3	38.5	10.5	33.0	-	46.4	53.9	7.6	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 $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

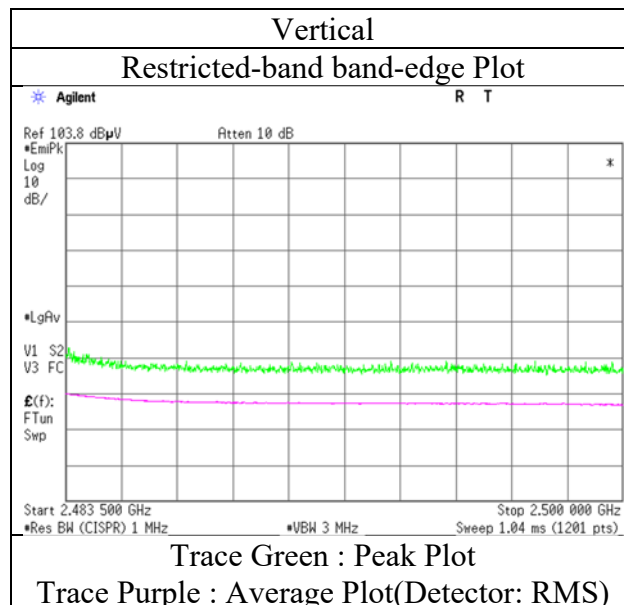
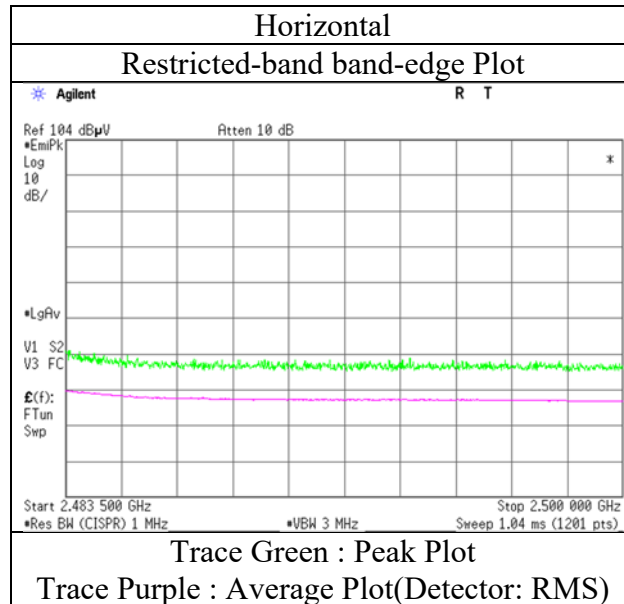
*1) Not Out of Band emission(Leakage Power)

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

***All other emissions were complied 20dBc limit.**

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274888H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	November 22, 2019
Temperature / Humidity	21 deg. C / 35 % RH
Engineer	Akihiko Maeda (1 GHz -10 GHz)
Mode	Tx, Hopping Off, 3DH5 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.

UL Japan, Inc.

Ise EMC Lab.

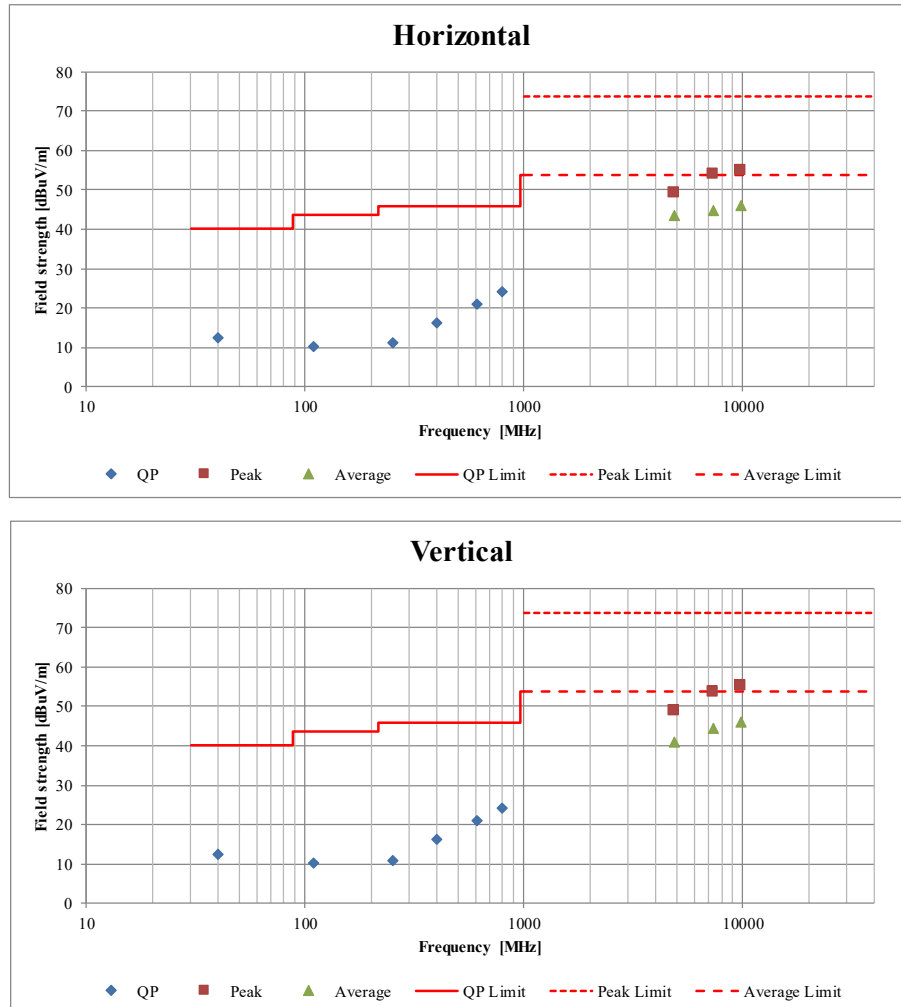
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

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Radiated Spurious Emission (Plot data, Worst case)

Report No.	13274888H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.4	No.3	No.3	No.3
Date	November 22, 2019	December 6, 2019	December 7, 2019	December 9, 2019
Temperature / Humidity	21 deg. C / 35 % RH	23 deg. C / 40 % RH	20 deg. C / 35 % RH	23 deg. C / 44 % RH
Engineer	Akihiko Maeda (1 GHz -10 GHz)	Ryota Yamanaka (10 GHz - 18 GHz)	Takafumi Noguchi (18 GHz -26.5 GHz)	Yuta Moriya (Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz			

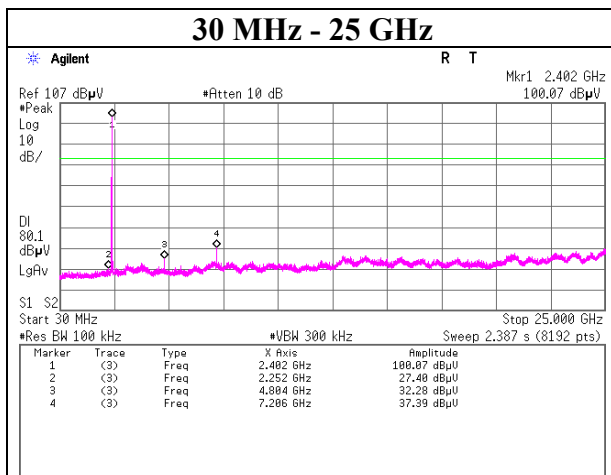
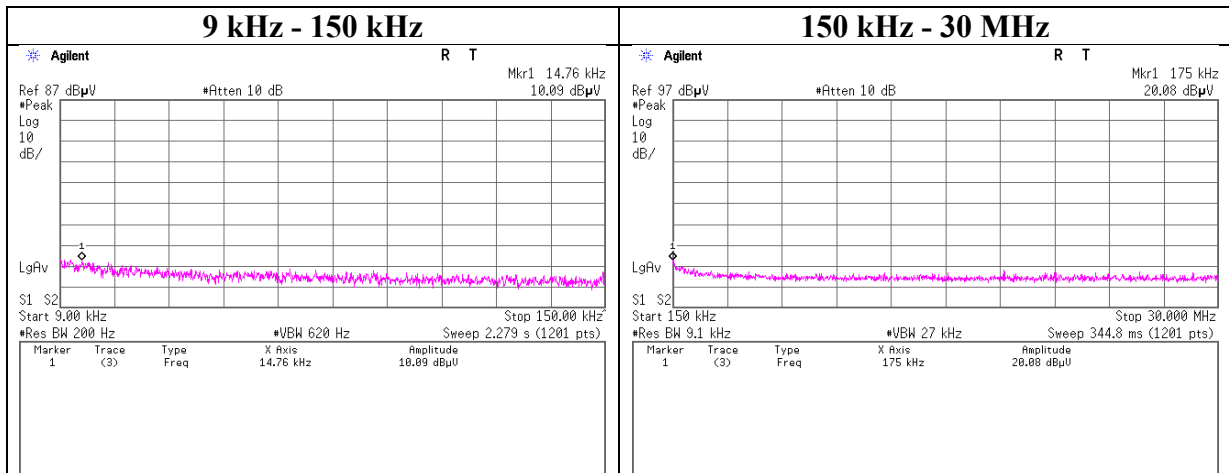


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2402 MHz



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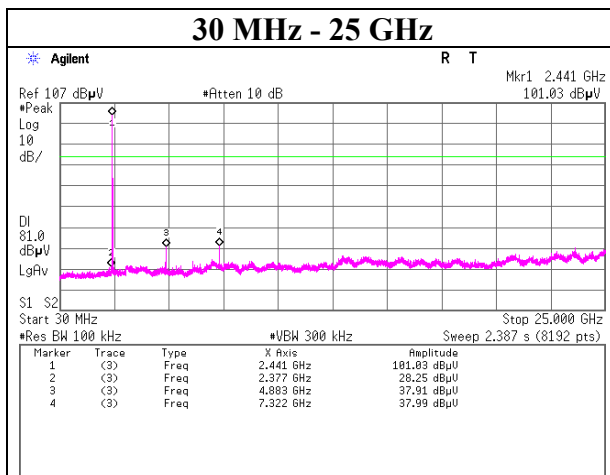
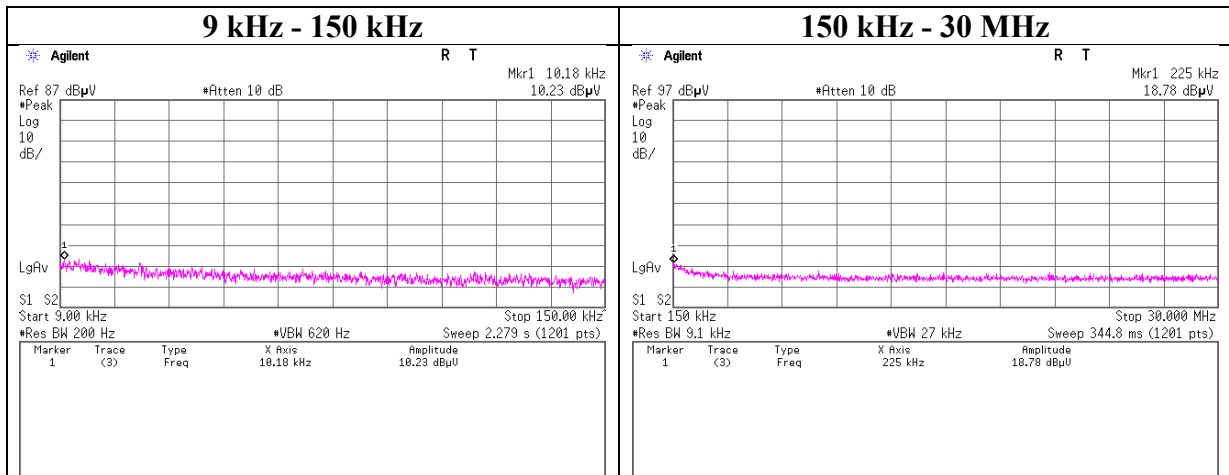
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, DH5

2441 MHz



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Ise EMC Lab.

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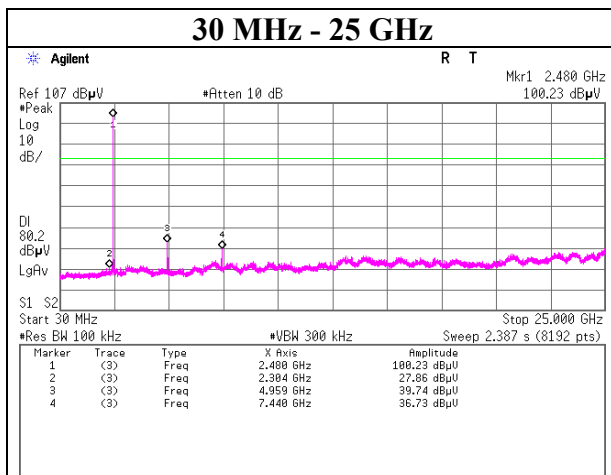
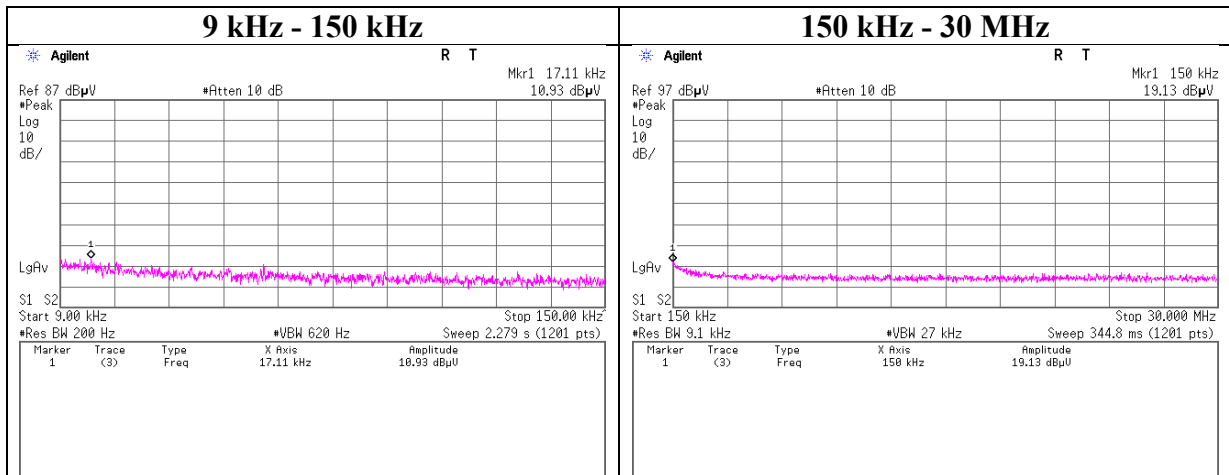
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off, DH5

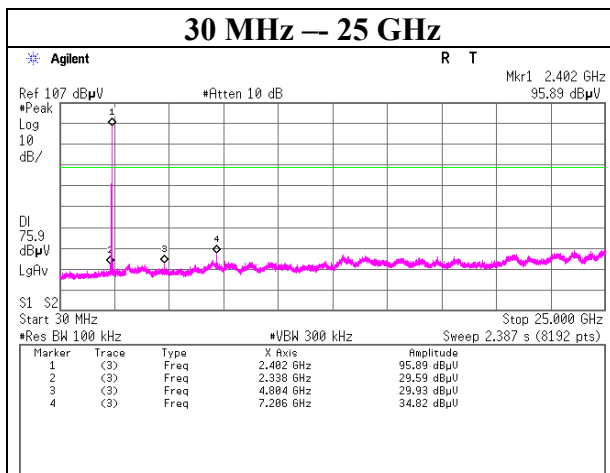
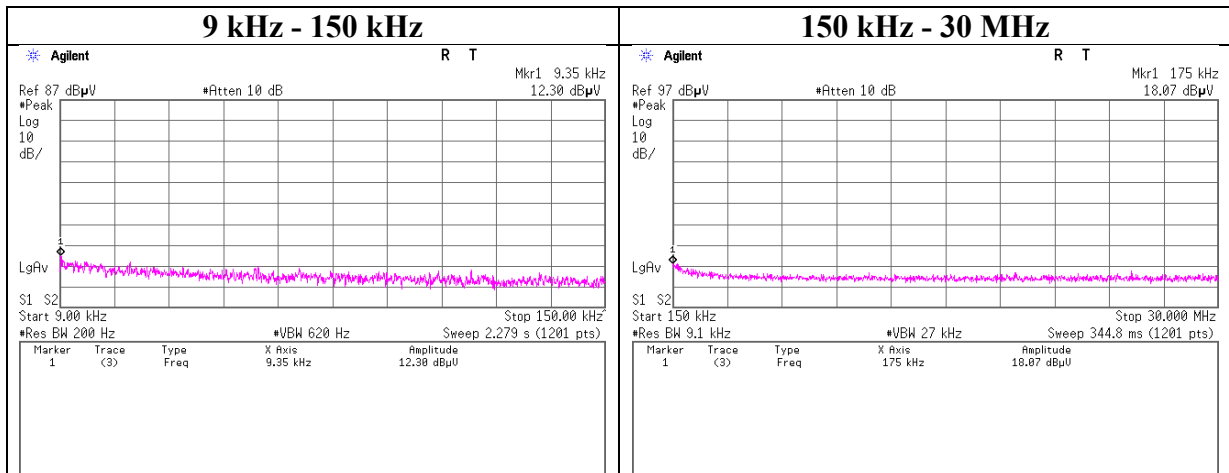
2480 MHz



Conducted Spurious Emission

Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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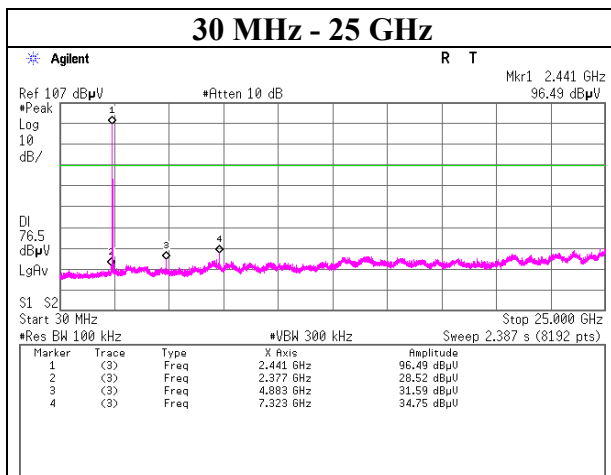
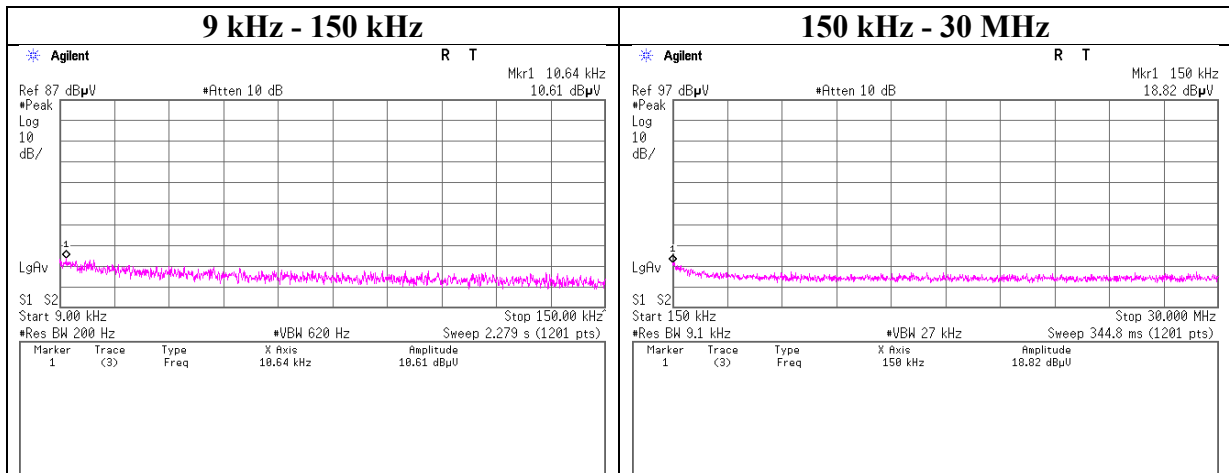
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % RH
Engineer Takafumi Noguchi
Mode Tx, Hopping Off, 3DH5

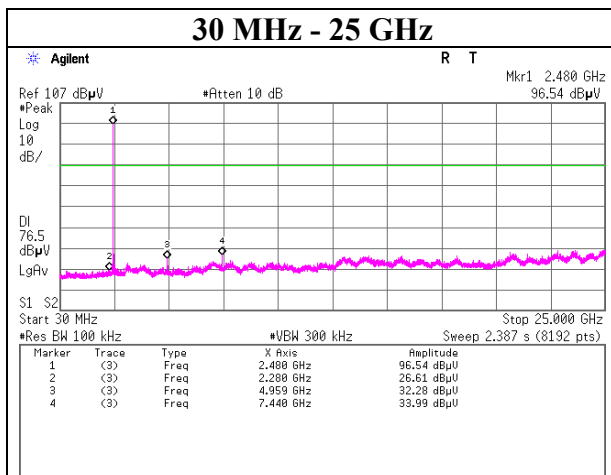
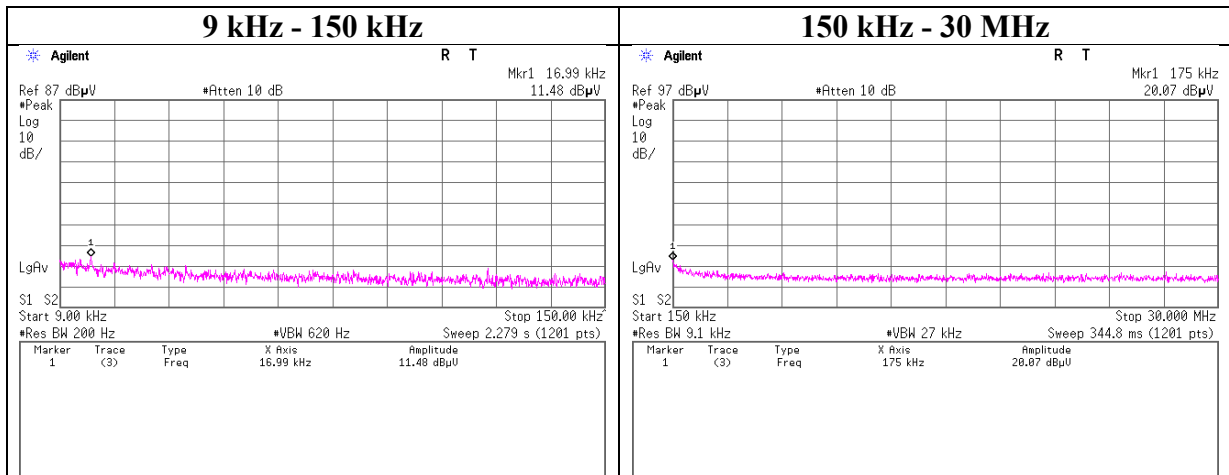
2441 MHz



Conducted Spurious Emission

Report No.	13274888H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	November 19, 2019
Temperature / Humidity	22 deg. C / 43 % RH
Engineer	Takafumi Noguchi
Mode	Tx, Hopping Off, 3DH5

2480 MHz



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Ise EMC Lab.

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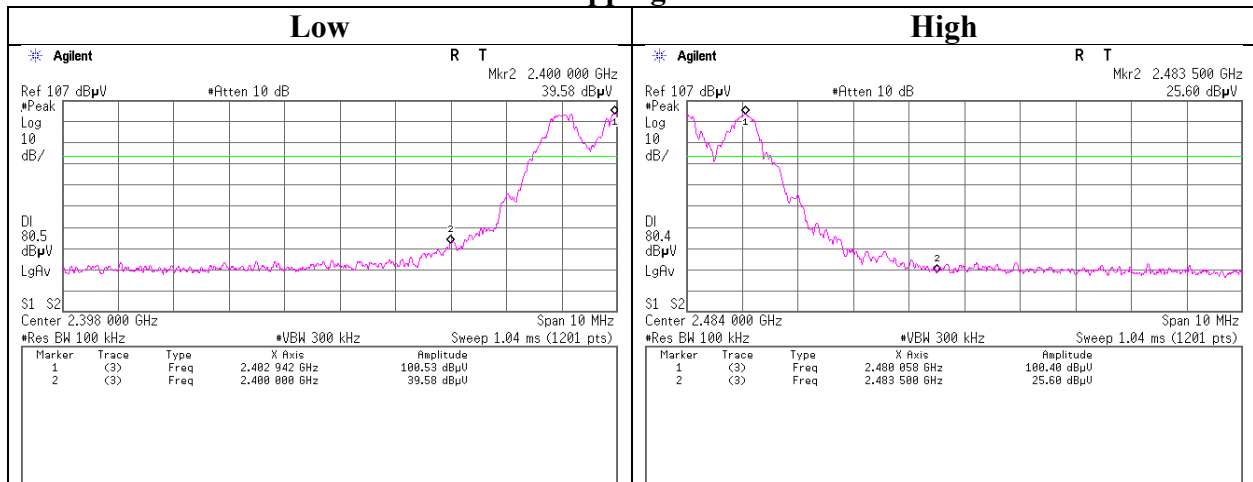
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

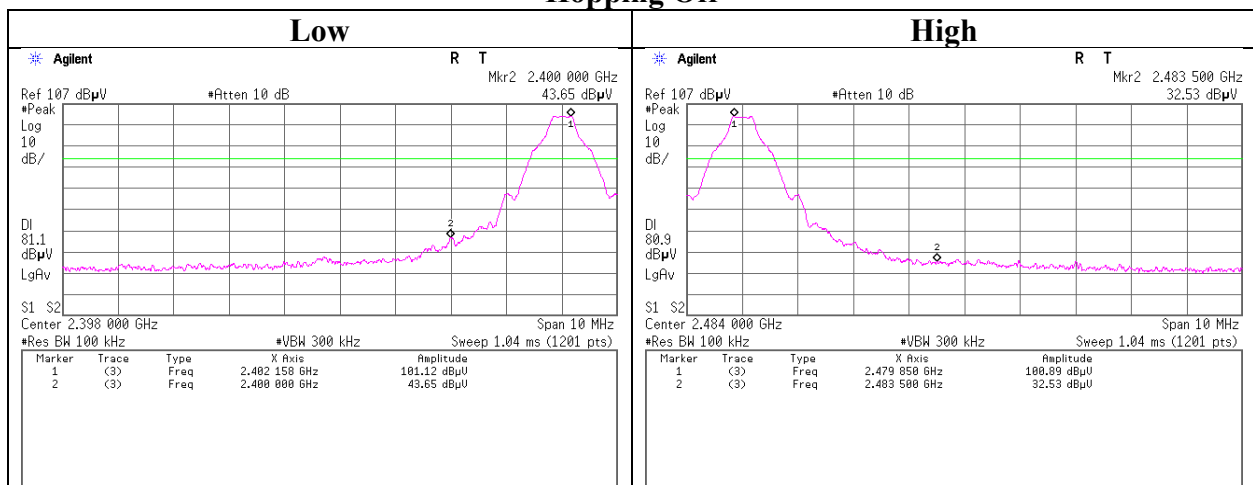
Conducted Emission Band Edge compliance

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % RH
Engineer Takafumi Noguchi
Mode Tx DH5

Hopping On



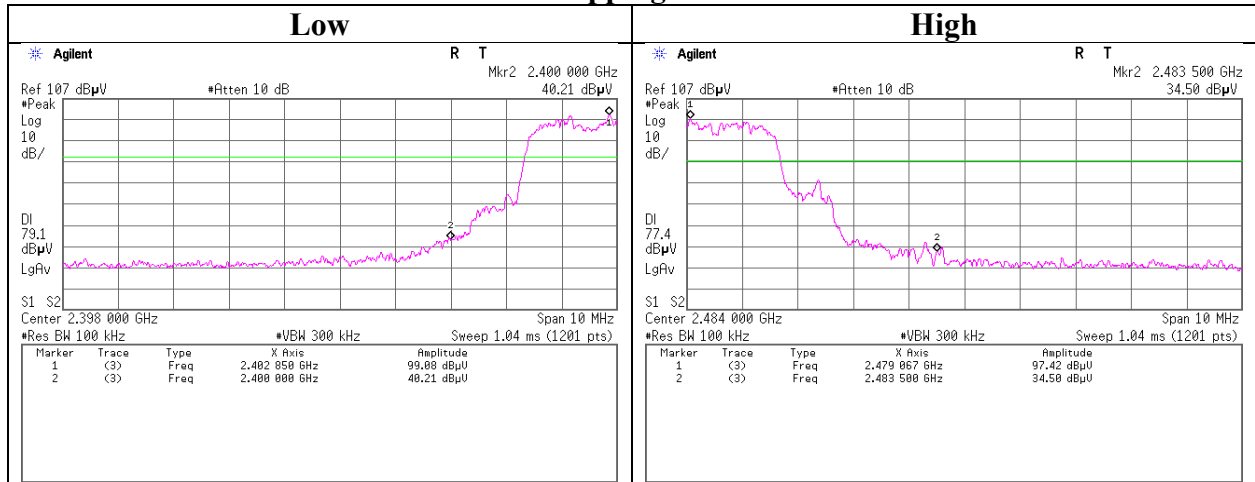
Hopping Off



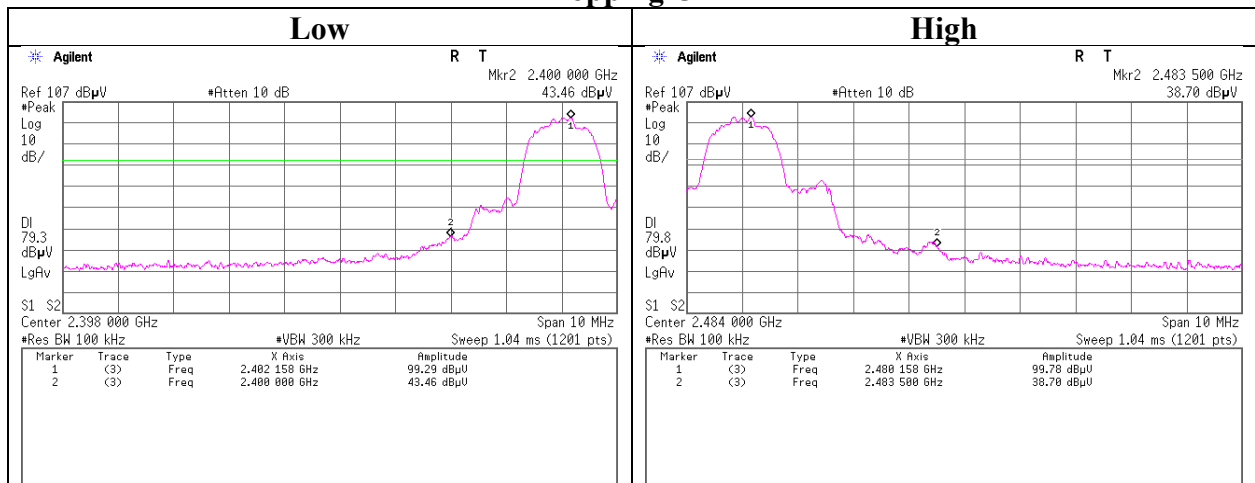
Conducted Emission Band Edge compliance

Report No. 13274888H
Test place Ise EMC Lab. No.6 Measurement Room
Date November 19, 2019
Temperature / Humidity 22 deg. C / 43 % RH
Engineer Takafumi Noguchi
Mode Tx 3DH5

Hopping On



Hopping Off



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

APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
AT	141334	Attenuator(10dB)	Suhner	6810.19-A	-	12/09/2019	12/31/2020	12
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/07/2019	11/30/2020	12
AT	141835	Power sensor	AGILENT	N1923A	MY54070004	08/02/2019	08/31/2020	12
AT	141812	Power Meter	AGILENT	8990B	MY51000271	08/02/2019	08/31/2020	12
AT	141561	Thermo-Hygrometer	CUSTOM	CTH-201	1401	01/11/2019	01/31/2020	12
AT	141194	Antenna Terminal Measurement Software	UL Japan	-	-	-	-	-
AT/RE	141885	Spectrum Analyzer	AGILENT	E4448A	US44300523	11/21/2019	11/30/2020	12
RE	178648	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170306	10/08/2019	10/31/2020	12
RE	141293	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCB	602	01/10/2019	01/31/2020	12
RE	141226	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S304	03/05/2019	03/31/2020	12
RE	141580	MicroWave System Amplifier	AGILENT	83017A	MY39500779	03/05/2019	03/31/2020	12
RE	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/1902S579(5m)	03/05/2019	03/31/2020	12
RE	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/29/2019	01/31/2020	12
RE	142183	Measure	KOMELON	KMC-36	-	-	-	-
RE	141554	Thermo-Hygrometer	CUSTOM	CTH-180	1301	01/11/2019	01/31/2020	12
RE	142008	AC3 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	06/30/2020	24
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	09/26/2019	09/30/2020	12
RE/CE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/02/2019	08/31/2020	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/08/2019	02/29/2020	12
RE	141323	Coaxial cable	UL Japan	-	-	07/02/2019	07/31/2020	12
RE/CE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141266	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	9111B-191	08/24/2019	08/31/2020	12
RE	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	2019/6/11	2020/6/30	12
RE	141424	Biconical Antenna	Schwarzbeck	VHA9103+BBA9106	1915	08/24/2019	08/31/2020	12
CE	142227	Measure	KOMELON	KMC-36	-	-	-	-
CE	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	03/13/2019	03/31/2020	12
CE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	01/11/2019	01/31/2020	12
CE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	06/30/2020	24
CE	141357	LISN(AMN)	Schwarzbeck	NSLK8127	8127-729	07/05/2019	07/31/2020	12
CE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	01/29/2019	01/31/2020	12
CE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-P	-/04178	06/18/2019	06/30/2020	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/02/2019	12/31/2020	12

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*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 Spurious Emission test
 AT: Antenna Terminal Conducted test