



RADIO TEST REPORT

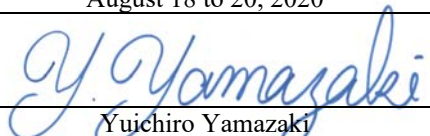
Test Report No. : 13454495H-B-R1

Applicant : DENSO CORPORATION
Type of EUT : Control Box
Model Number of EUT : DNNS087
FCC ID : HYQDNNS087
Test regulation : FCC Part 15 Subpart C: 2020
For Permissive Change
*Bluetooth (BR / EDR) parts
Test Result : Complied (Refer to SECTION 3.2)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. 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.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The information provided from the customer for this report is identified in SECTION 1.

Date of test: August 18 to 20, 2020

Representative test engineer:


Yuichiro Yamazaki
Engineer
Consumer Technology Division

Approved by:


Tsubasa Takayama
Leader
Consumer Technology Division



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- ☐ This report contains data that are not covered by the NVLAP accreditation.
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REVISION HISTORY

Original Test Report No.: 13454495H-B

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13454495H-B	August 26, 2020	-	-
1	13454495H-B-R1	October 16, 2020	P. 1	Change of A2LA logo to NVLAP combined ILAC MRK mark
1	13454495H-B-R1	October 16, 2020	P. 1	Change the sentence No.5 due to the logo change Delete the sentence No.8 (original report)
1	13454495H-B-R1	October 16, 2020	P. 7	Correction of Test Specification
1	13454495H-B-R1	October 16, 2020	P. 8	Correction of sentence for FCC Part 15.203 Antenna requirement
1	13454495H-B-R1	October 16, 2020	P. 10	Change the test location's information due to the logo change
1	13454495H-B-R1	October 16, 2020	P. 11	Addition of Software information
1	13454495H-B-R1	October 16, 2020	P. 36	Addition of Test equipment: Local ID: MTR-10 and MHA-17

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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.....	7
SECTION 4: Operation of EUT during testing.....	11
SECTION 6: Radiated Spurious Emission	16
SECTION 7: Antenna Terminal Conducted Tests.....	18
APPENDIX 1: Test data	19
20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation	19
Number of Hopping Frequency	23
Dwell time.....	25
Maximum Peak Output Power	28
Average Output Power.....	29
Radiated Spurious Emission	31
Conducted Spurious Emission	42
Conducted Emission Band Edge compliance	48
APPENDIX 2: Test instruments	50
APPENDIX 3: Photographs of test setup	51
Radiated Spurious Emission	51
Antenna Terminal Conducted Tests.....	52

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi-ken, 448-8661 Japan
Telephone Number	:	+81-566-26-5919
Facsimile Number	:	+81-566-25-4920
Contact Person	:	Isamu Suzuki

The information provided from the customer is as follows;

- Applicant, Type of EUT, Model Number of EUT, 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	:	Control Box
Model Number	:	DNNS087
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 12 V
Receipt Date	:	August 7, 2020
Country of Mass-production	:	United States of America
Condition	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	:	No Modification by the test lab.

2.2 Product Description

Model: DNNS087 (referred to as the EUT in this report) is a Control Box.

General Specification

Clock frequency(ies) in the system : 533 MHz
32.768 kHz, 37.4 MHz (Crystal)

Operating Temperature : -30 deg. C - +70 deg. C

Radio Specification

Radio Type : Transceiver

	IEEE802.11b *1)	IEEE802.11g/n *1) (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5720 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5710 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5690 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	ASSEMBLY WiFi Antenna				
Antenna Connector type	MHF PLUG				
Antenna Gain	-3.2 dBi				

	GPS	Bluetooth Ver.4.1 with EDR function *1)
Frequency of operation	1575.42 MHz	2402 MHz - 2480 MHz
Type of modulation	BPSK	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK) LE: GFSK
Channel spacing	-	BT: 1 MHz LE: 2 MHz
Antenna type	ANTENNA ASSY, GPS	ASSEMBLY WiFi Antenna
Antenna Connector type	FAKRA	MHF PLUG
Antenna Gain	26.5 dBi	-3.2 dBi

*1) This test report applies to Bluetooth.

*Wireless LAN 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 June 26, 2020 and effective July 27, 2020

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

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	N/A	N/A	*1)
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 a)	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 a)	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 b)	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 c)	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 d)	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	4.0 dB 576.927 MHz, QP Horizontal	Complied# e) / f)	Conducted/ Radiated (above 30 MHz) *2)

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

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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

a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)

b) Refer to APPENDIX 1 (data of Number of Hopping Frequency)

c) Refer to APPENDIX 1 (data of Dwell time)

d) Refer to APPENDIX 1 (data of Maximum Peak Output Power)

e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)

f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:

Complied The data of this test item has enough margin, more than the measurement uncertainty.

Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

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

FCC 15.31 (e)

The EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage.

Instead of a new battery, DC power supply was used for the test.

That does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

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	ISED: 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.

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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

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
0.5 m	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
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 the test items based on Bluetooth Core specification. Power settings: 10 dBm Software: BT Validation.exe Ver.1.0.0.0 BT Chip vendor: Software file No. XXX.0728.hcd (Date: December 1, 2019, Storage location: Driven by connected PC) *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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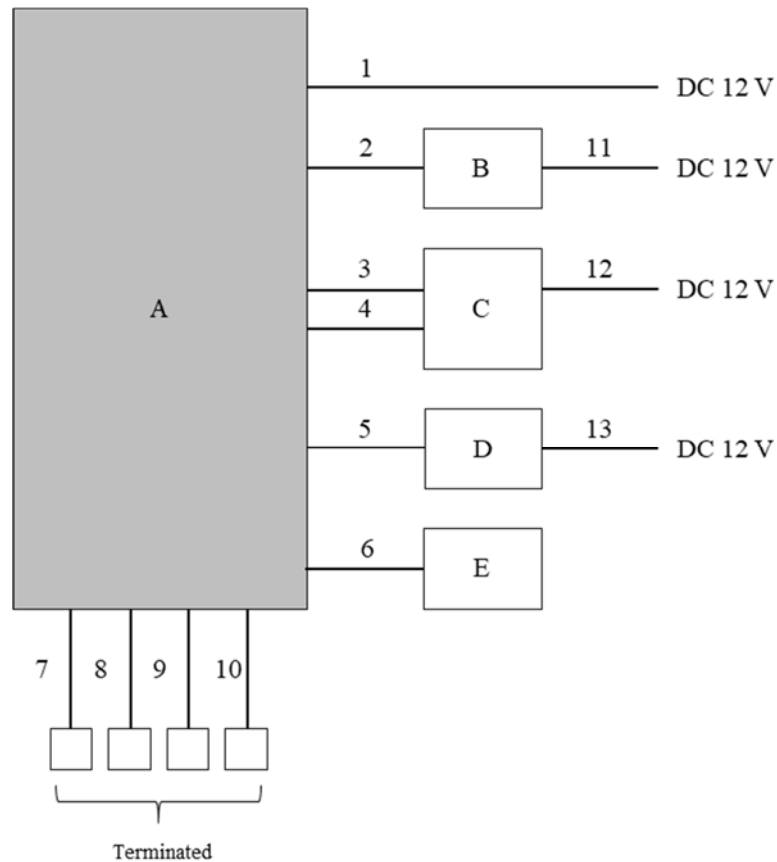
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4.2 Configuration and peripherals

For Radiated Spurious Emission 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	Remarks
A	Control Box	DNNS087	00000028	DENSO CORPORATION	EUT
B	Touch Pad	39060-TJB-3030-D AN0-1-0013	6	VISTEON CORPORATION	-
C	Jig (cPhy)	cPhy	No.1	MICROCHIP	-
D	Display	39710-TJBA-A1	16150222	Panasonic Automotive Systems	-
E	GPS Antenna	39835-THRA-A112-M1 26050003	31	Yokowo Co.,Ltd	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal and DC Cable	2.2	Unshielded	Unshielded	-
3	MOST Cable (Red)	1.8	Shielded	Shielded	-
4	MOST Cable (Green)	1.8	Shielded	Shielded	-
5	LVDS Cable	1.3	Shielded	Shielded	-
6	GNSS Antenna Cable	0.4	Shielded	Shielded	-
7	Camera Cable	2.0	Unshielded	Unshielded	-
8	USB Cable	2.0	Shielded	Shielded	-
9	USB Cable	2.0	Shielded	Shielded	-
10	USB Cable	0.2	Shielded	Shielded	-
11	DC Cable	1.4	Unshielded	Unshielded	-
12	DC Cable	0.9	Unshielded	Unshielded	-
13	DC Cable	2.0	Unshielded	Unshielded	-

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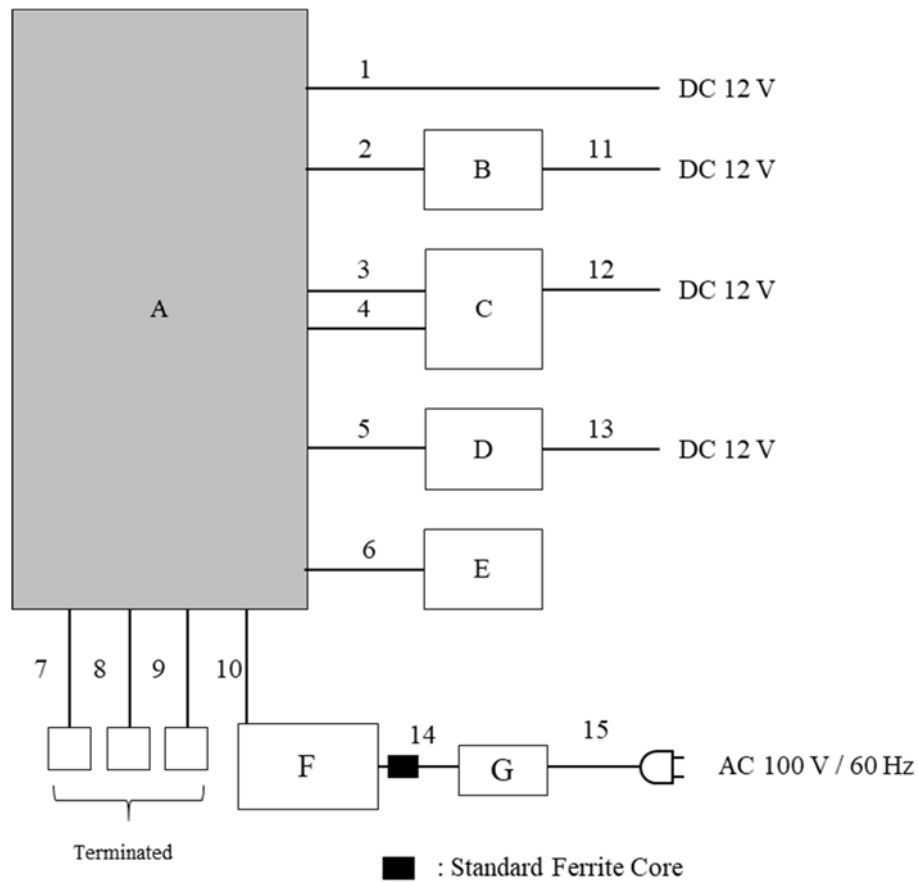
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For Antenna Terminal Conducted tests



* 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	Remarks
A	Control Box	DNNS087	00000298	DENSO CORPORATION	EUT
B	Touch Pad	39060-TJB-3030	2	CISTEON CORPORATION	-
C	Jig (cPhy)	cPhy	No.5	MICROCHIP	-
D	Display	-	RDX T2-89	Panasonic Automotive Systems	-
E	GPS Antenna	39835-THRA-A112-M1 26050003	31	Yokowo Co.,Ltd	-
F	Laptop PC	CF-N8HWCDPS	0BKSA08723	Panasonic	-
G	AC Adapter	CF-AA6372B	6372BM409X180 54B	Panasonic	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal and DC Cable	2.6	Unshielded	Unshielded	-
3	MOST Cable (Red)	0.8	Shielded	Shielded	-
4	MOST Cable (Green)	0.8	Shielded	Shielded	-
5	LVDS Cable	2.0	Shielded	Shielded	-
6	GNSS Antenna Cable	0.4	Shielded	Shielded	-
7	Camera Cable	2.0	Unshielded	Unshielded	-
8	USB Cable	2.0	Shielded	Shielded	-
9	USB Cable	2.0	Shielded	Shielded	-
10	USB Cable	2.8	Shielded	Shielded	-
11	DC Cable	2.0	Unshielded	Unshielded	-
12	DC Cable	0.9	Unshielded	Unshielded	-
13	DC Cable	2.0	Unshielded	Unshielded	-
14	DC Cable	1.0	Unshielded	Unshielded	-
15	AC Cable	0.8	Unshielded	Unshielded	-

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SECTION 6: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

The height of the measuring antenna varied between 1 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 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.

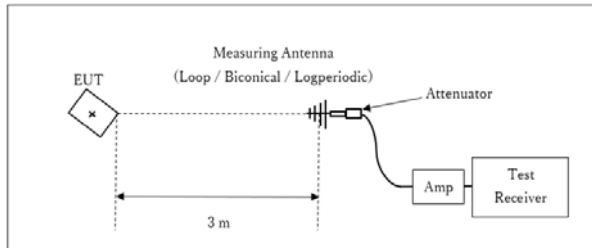
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

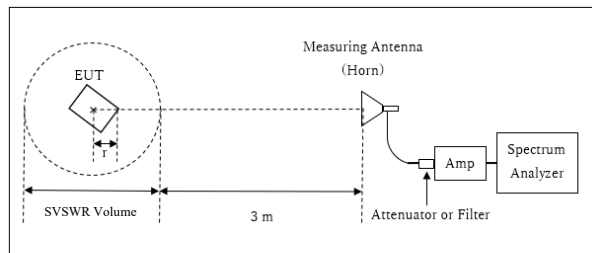
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log (3.9 \text{ m} / 3.0 \text{ m}) = 2.28 \text{ dB}$

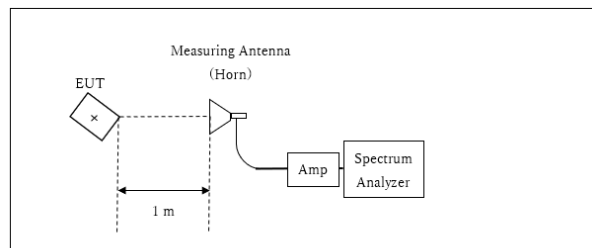
* Test Distance: $(3 + (\text{SVSWR Volume} / 2)) - r = 3.9 \text{ m}$

SVSWR Volume : 2.0 m

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

r = 0.1 m

10 GHz - 26.5 GHz



x : 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 test was made on EUT at the normal use position.

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) *4)	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 low enough as shown in the chart.

(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 9.1 kHz)T

*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohms. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to $45.5 - 51.5 = -6.0$ dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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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APPENDIX 1: Test data

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

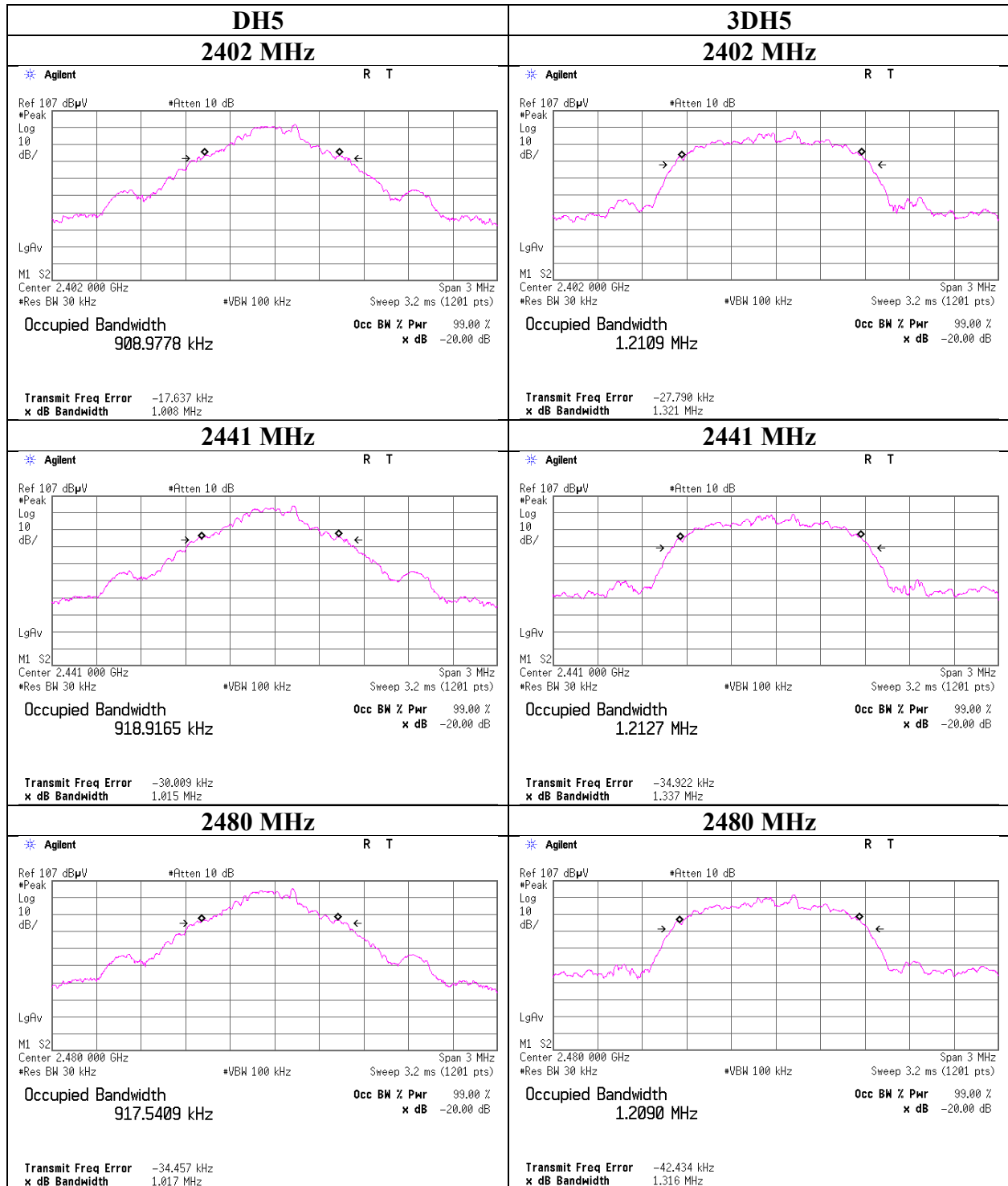
Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, Tx, Hopping On

Mode	Freq. [MHz]	20dB Bandwidth [MHz]	99% Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	1.008	908.978	1.000	≥ 0.672
DH5	2441.0	1.015	918.917	1.000	≥ 0.677
DH5	2480.0	1.017	917.541	1.000	≥ 0.678
DH5	Hopping On	-	78519.200	-	-
3DH5	2402.0	1.321	1210.900	1.000	≥ 0.881
3DH5	2441.0	1.337	1212.700	1.000	≥ 0.891
3DH5	2480.0	1.316	1209.000	1.000	≥ 0.877
3DH5	Hopping On	-	78630.800	-	-

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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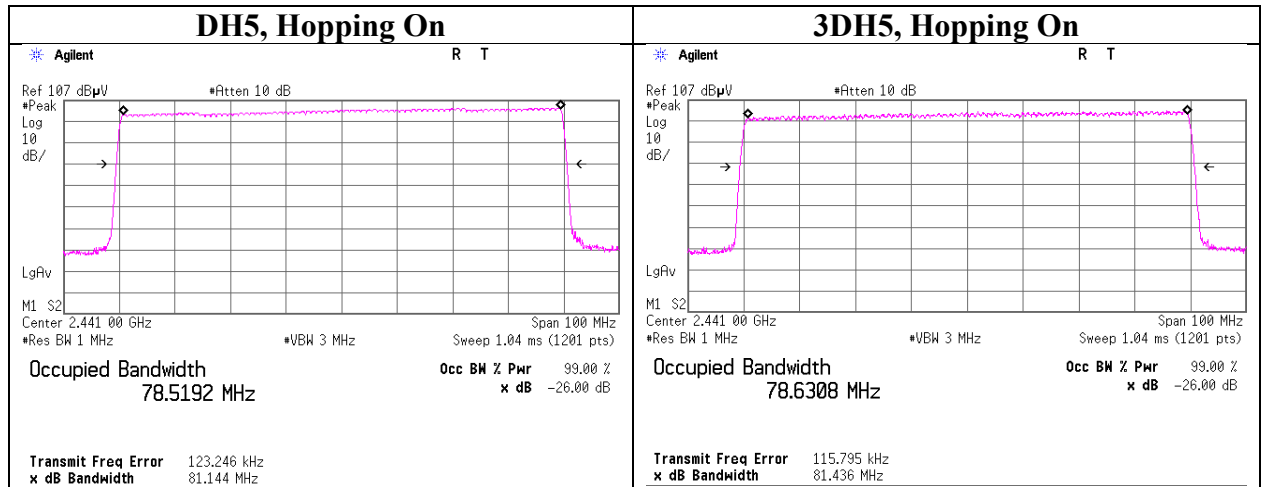
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20dB Bandwidth and 99% Occupied Bandwidth



UL Japan, Inc.

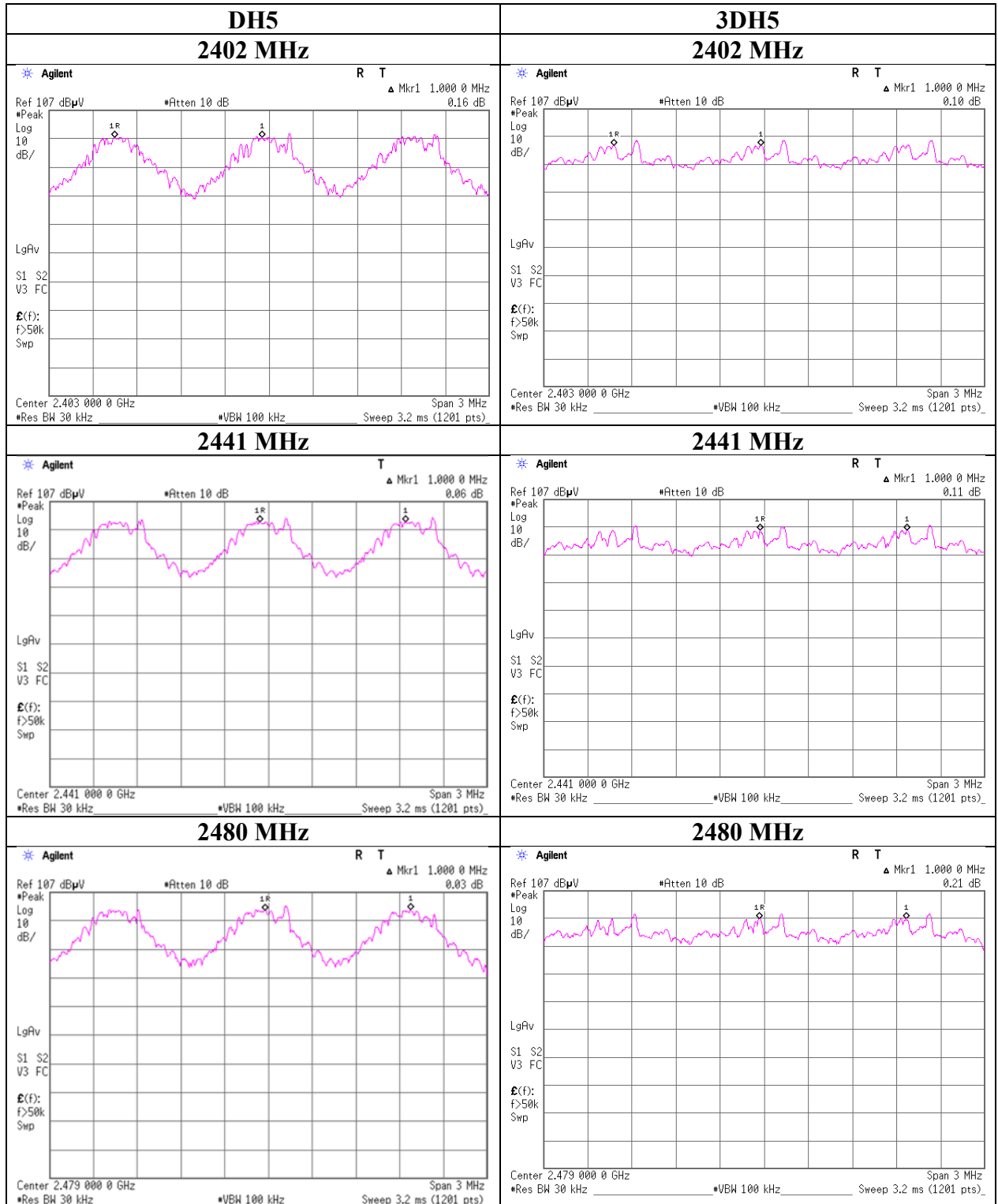
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Carrier Frequency Separation



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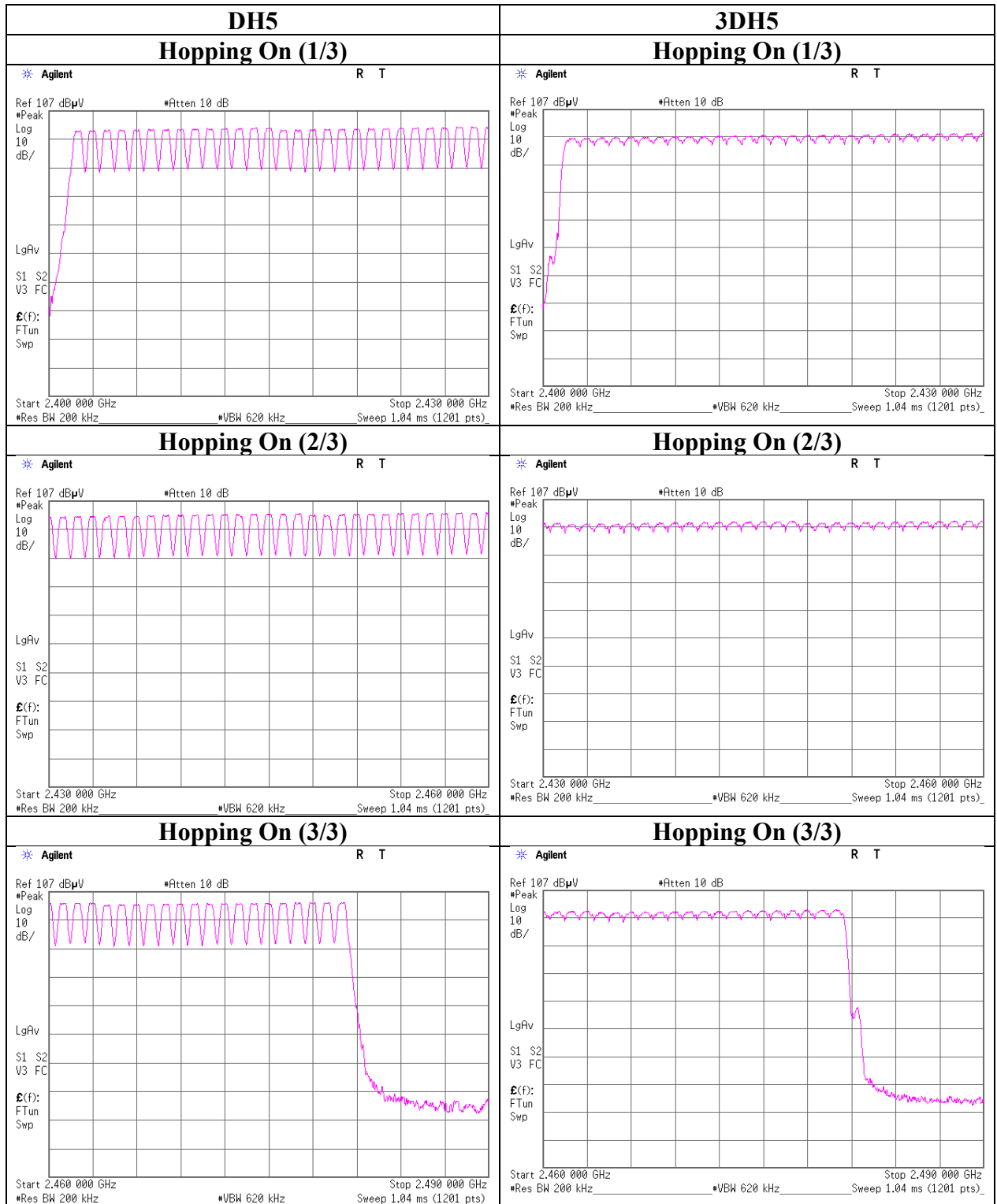
Number of Hopping Frequency

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
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.	13454495H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	August 20, 2020
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Yuta Moriya
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	49.4 times	/	5 sec.	x 31.6 sec. = 313 times	0.422	132	400
DH3	27.0 times	/	5 sec.	x 31.6 sec. = 171 times	1.685	288	400
DH5	18.4 times	/	5 sec.	x 31.6 sec. = 117 times	2.933	343	400
3DH1	50.2 times	/	5 sec.	x 31.6 sec. = 318 times	0.427	136	400
3DH3	25.8 times	/	5 sec.	x 31.6 sec. = 164 times	1.692	278	400
3DH5	19.4 times	/	5 sec.	x 31.6 sec. = 123 times	2.943	362	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.(except Inquiry)

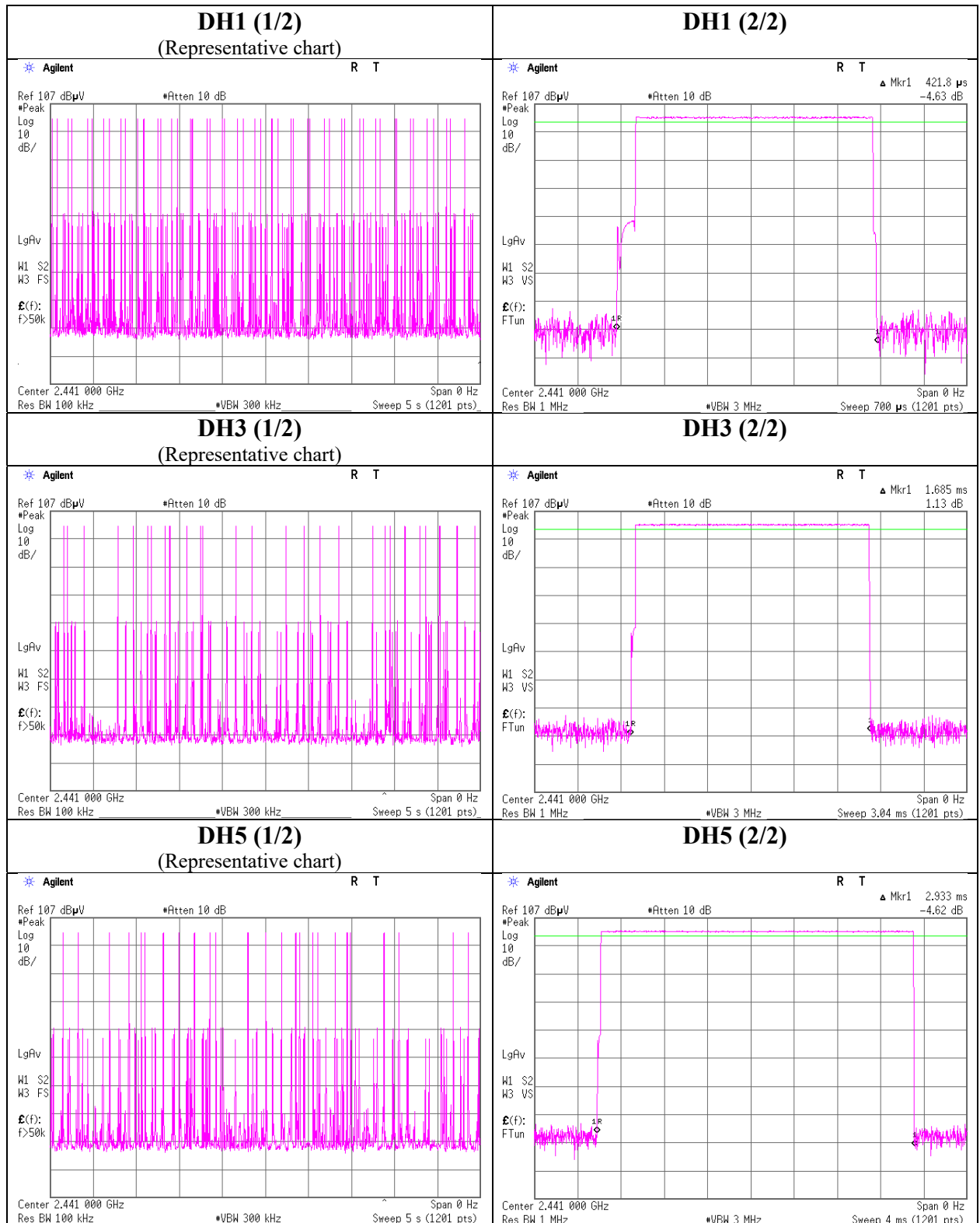
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	49	49	49	49	51	49.4
DH3	27	26	28	29	25	27.0
DH5	20	18	19	19	16	18.4
3DH1	51	49	52	50	49	50.2
3DH3	31	23	25	25	25	25.8
3DH5	18	20	22	19	18	19.4

Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

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

Dwell time



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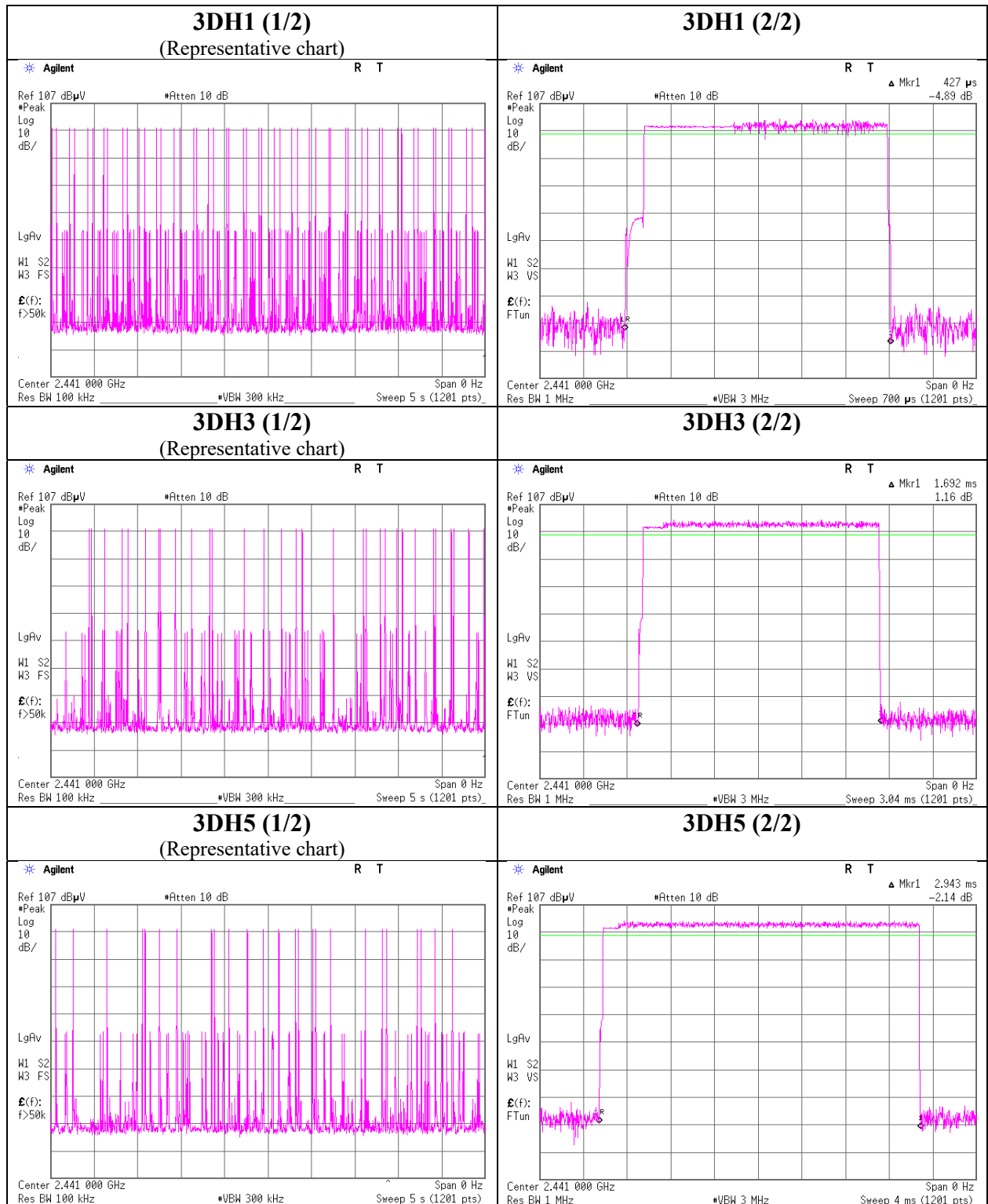
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Dwell time



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Maximum Peak Output Power

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 18, 2020
Temperature / Humidity 26 deg. C / 32 % RH
Engineer Yuta Moriya
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	
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]
DH5	2402.0	-6.65	2.07	9.73	5.15	3.27	20.96	125	15.81	-3.20	1.95	1.57	36.02	4000
DH5	2441.0	-4.57	2.16	9.73	7.32	5.40	20.96	125	13.64	-3.20	4.12	2.58	36.02	4000
DH5	2480.0	-3.61	2.19	9.73	8.31	6.78	20.96	125	12.65	-3.20	5.11	3.24	36.02	4000
2DH5	2402.0	-7.75	2.07	9.73	4.05	2.54	20.96	125	16.91	-3.20	0.85	1.22	36.02	4000
2DH5	2441.0	-5.63	2.16	9.73	6.26	4.23	20.96	125	14.70	-3.20	3.06	2.02	36.02	4000
2DH5	2480.0	-4.58	2.19	9.73	7.34	5.42	20.96	125	13.62	-3.20	4.14	2.59	36.02	4000
3DH5	2402.0	-7.43	2.07	9.73	4.37	2.74	20.96	125	16.59	-3.20	1.17	1.31	36.02	4000
3DH5	2441.0	-5.46	2.16	9.73	6.43	4.40	20.96	125	14.53	-3.20	3.23	2.10	36.02	4000
3DH5	2480.0	-4.40	2.19	9.73	7.52	5.65	20.96	125	13.44	-3.20	4.32	2.70	36.02	4000

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)

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 18, 2020
Temperature / Humidity 26 deg. C / 32 % RH
Engineer Yuta Moriya
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	-8.15	2.07	9.73	3.65	2.32	1.08	4.73	2.97
DH5	2441.0	-5.99	2.16	9.73	5.90	3.89	1.08	6.98	4.99
DH5	2480.0	-5.00	2.19	9.73	6.92	4.92	1.08	8.00	6.31
2DH5	2402.0	-11.64	2.07	9.73	0.16	1.04	1.07	1.23	1.33
2DH5	2441.0	-9.41	2.16	9.73	2.48	1.77	1.07	3.55	2.26
2DH5	2480.0	-8.26	2.19	9.73	3.66	2.32	1.07	4.73	2.97
3DH5	2402.0	-11.49	2.07	9.73	0.31	1.07	1.07	1.38	1.37
3DH5	2441.0	-9.42	2.16	9.73	2.47	1.77	1.07	3.54	2.26
3DH5	2480.0	-8.27	2.19	9.73	3.65	2.32	1.07	4.72	2.96

Sample Calculation:

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

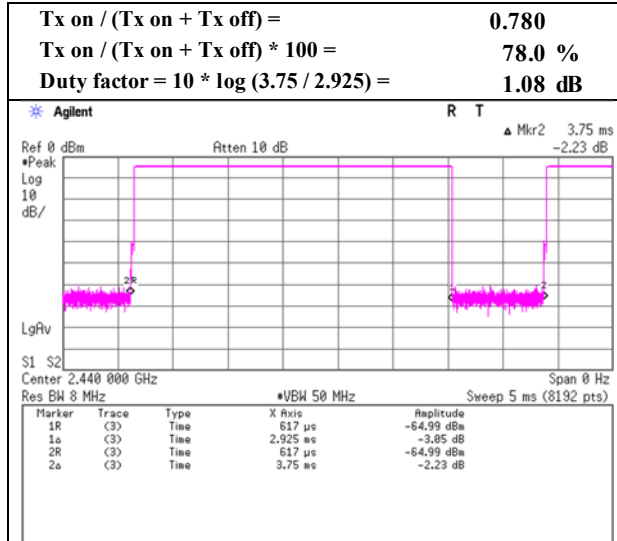
Result (Burst power average) = Time average + Duty factor

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

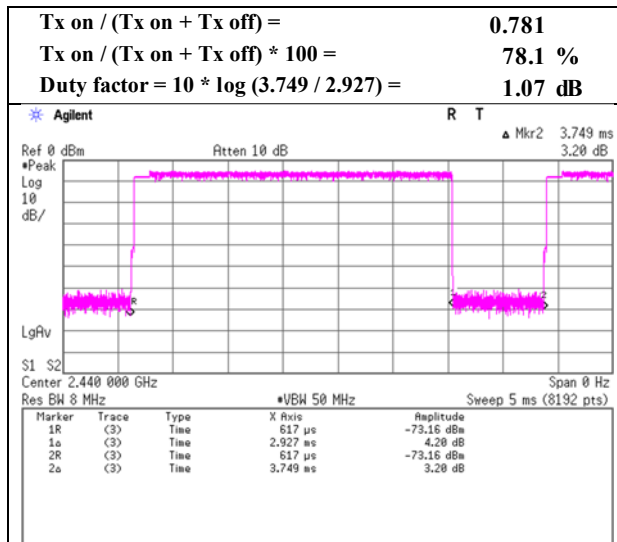
Burst Rate Confirmation

Report No.	13454495H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	August 18, 2020
Temperature / Humidity	26 deg. C / 32 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off

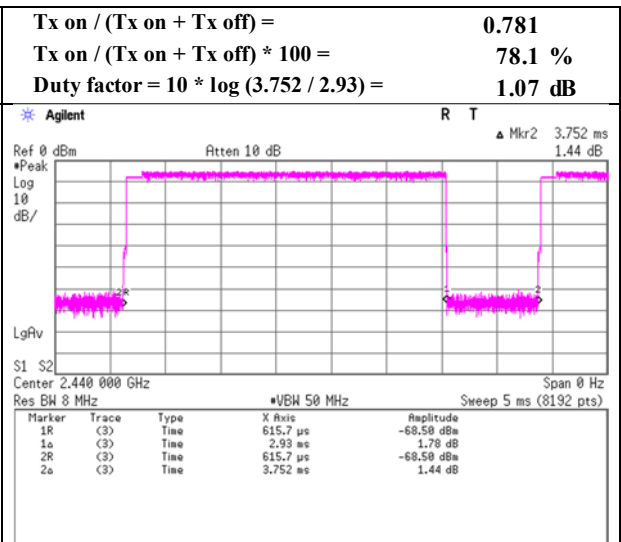
DH5



2DH5



3DH5



Radiated Spurious Emission

Report No. 13454495H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date August 18, 2020 August 18, 2020
(Day) (Night)
Temperature / Humidity 22 deg. C / 47 % RH 22 deg. C / 62 % RH
Engineer Yuichiro Yamazaki Junki Nagatomi
(1 GHz -10 GHz) (Above 10 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.	232.977	QP	51.0	11.4	9.3	31.8	-	39.9	46.0	6.1	
Hori.	356.363	QP	46.3	15.1	10.1	31.8	-	39.7	46.0	6.3	
Hori.	577.540	QP	41.7	18.6	11.3	32.0	-	39.7	46.0	6.3	
Hori.	589.834	QP	40.3	19.0	11.4	32.0	-	38.7	46.0	7.3	
Hori.	798.340	QP	38.4	20.8	12.4	31.6	-	40.0	46.0	6.0	
Hori.	906.780	QP	32.6	22.0	12.9	31.1	-	36.5	46.0	9.5	
Hori.	1071.251	PK	51.9	24.3	4.3	34.5	-	46.0	73.9	27.9	
Hori.	2390.000	PK	42.2	27.8	5.3	31.9	-	43.5	73.9	30.4	
Hori.	4804.000	PK	41.7	31.6	7.5	31.3	-	49.6	73.9	24.4	Floor noise
Hori.	7206.000	PK	42.1	36.5	8.8	32.4	-	55.0	73.9	18.9	Floor noise
Hori.	9608.000	PK	42.3	38.0	9.5	32.8	-	57.0	73.9	16.9	Floor noise
Hori.	1071.251	AV	46.7	24.3	4.3	34.5	-	40.8	53.9	13.1	
Hori.	2390.000	AV	33.7	27.8	5.3	31.9	1.1	36.1	53.9	17.8	*1)
Hori.	4804.000	AV	30.6	31.6	7.5	31.3	-	38.5	53.9	15.4	Floor noise
Hori.	7206.000	AV	32.5	36.5	8.8	32.4	-	45.4	53.9	8.5	Floor noise
Hori.	9608.000	AV	32.0	38.0	9.5	32.8	-	46.8	53.9	7.1	Floor noise
Vert.	231.672	QP	45.5	11.4	9.2	31.8	-	34.3	46.0	11.7	
Vert.	356.359	QP	39.1	15.1	10.1	31.8	-	32.5	46.0	13.5	
Vert.	577.084	QP	41.3	18.6	11.3	32.0	-	39.3	46.0	6.7	
Vert.	589.835	QP	41.3	19.0	11.4	32.0	-	39.7	46.0	6.3	
Vert.	604.080	QP	36.6	19.4	11.5	32.0	-	35.5	46.0	10.5	
Vert.	824.281	QP	34.4	21.0	12.5	31.5	-	36.5	46.0	9.5	
Vert.	1071.251	PK	54.7	24.3	4.3	34.5	-	48.9	73.9	25.0	
Vert.	2390.000	PK	43.6	27.8	5.3	31.9	-	44.8	73.9	29.1	
Vert.	4804.000	PK	41.8	31.6	7.5	31.3	-	49.7	73.9	24.2	Floor noise
Vert.	7206.000	PK	42.1	36.5	8.8	32.4	-	55.0	73.9	18.9	Floor noise
Vert.	9608.000	PK	42.6	38.0	9.5	32.8	-	57.4	73.9	16.5	Floor noise
Vert.	1071.251	AV	50.4	24.3	4.3	34.5	-	44.5	53.9	9.4	
Vert.	2390.000	AV	34.1	27.8	5.3	31.9	1.1	36.4	53.9	17.5	*1)
Vert.	4804.000	AV	31.1	31.6	7.5	31.3	-	39.0	53.9	14.9	Floor noise
Vert.	7206.000	AV	32.9	36.5	8.8	32.4	-	45.8	53.9	8.1	Floor noise
Vert.	9608.000	AV	32.4	38.0	9.5	32.8	-	47.2	53.9	6.7	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 20log (3.9 m / 3.0 m) = 2.28 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	99.8	27.8	5.3	31.9	101.1	-	-	Carrier
Hori.	2400.000	PK	39.7	27.8	5.3	31.9	41.0	81.1	40.1	
Vert.	2402.000	PK	101.7	27.8	5.3	31.9	103.0	-	-	Carrier
Vert.	2400.000	PK	42.2	27.8	5.3	31.9	43.5	83.0	39.5	

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

Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

UL Japan, Inc.

Ise EMC Lab.

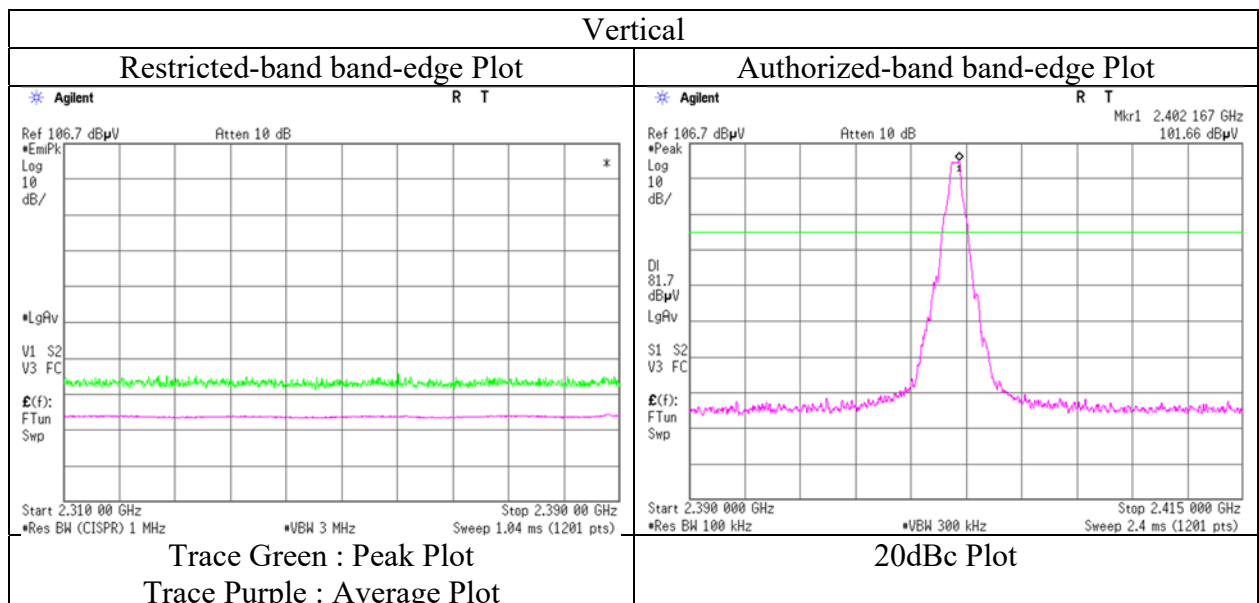
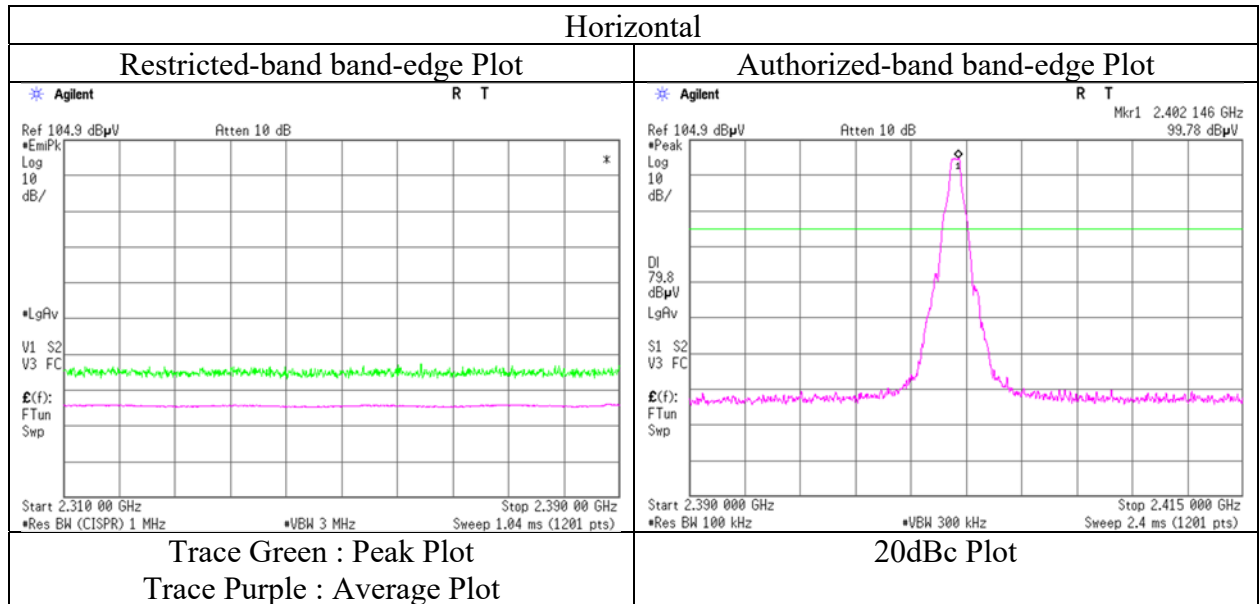
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13454495H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	August 18, 2020
Temperature / Humidity	22 deg. C / 47 % RH
Engineer	Yuichiro Yamazaki
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.

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.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (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.	233.275	QP	50.2	11.4	9.3	31.8	-	39.1	46.0	6.9	
Hori.	356.613	QP	48.1	15.1	10.1	31.8	-	41.5	46.0	4.5	
Hori.	576.908	QP	43.8	18.6	11.3	32.0	-	41.8	46.0	4.2	
Hori.	589.719	QP	40.3	19.0	11.4	32.0	-	38.7	46.0	7.3	
Hori.	797.948	QP	33.9	20.8	12.4	31.6	-	35.5	46.0	10.5	
Hori.	905.918	QP	32.7	22.0	12.9	31.1	-	36.6	46.0	9.4	
Hori.	1071.251	PK	52.0	24.3	4.3	34.5	-	46.1	73.9	27.8	
Hori.	4882.000	PK	41.5	31.6	7.5	31.2	-	49.3	73.9	24.6	Floor noise
Hori.	7323.000	PK	42.1	36.6	8.8	32.5	-	55.0	73.9	18.9	Floor noise
Hori.	9764.000	PK	43.0	38.5	9.6	32.9	-	58.1	73.9	15.8	Floor noise
Hori.	1071.251	AV	47.0	24.3	4.3	34.5	-	41.2	53.9	12.7	
Hori.	4882.000	AV	31.3	31.6	7.5	31.2	-	39.2	53.9	14.7	Floor noise
Hori.	7323.000	AV	32.9	36.6	8.8	32.5	-	45.8	53.9	8.1	Floor noise
Hori.	9764.000	AV	32.1	38.5	9.6	32.9	-	47.2	53.9	6.7	Floor noise
Vert.	233.275	QP	45.2	11.4	9.3	31.8	-	34.1	46.0	11.9	
Vert.	576.908	QP	42.9	18.6	11.3	32.0	-	40.9	46.0	5.1	
Vert.	589.719	QP	40.1	19.0	11.4	32.0	-	38.5	46.0	7.5	
Vert.	610.140	QP	37.1	19.5	11.5	32.0	-	36.2	46.0	9.8	
Vert.	797.948	QP	34.8	20.8	12.4	31.6	-	36.4	46.0	9.6	
Vert.	905.918	QP	34.5	22.0	12.9	31.1	-	38.4	46.0	7.6	
Vert.	1071.251	PK	55.1	24.3	4.3	34.5	-	49.2	73.9	24.7	
Vert.	4882.000	PK	41.3	31.6	7.5	31.2	-	49.2	73.9	24.8	Floor noise
Vert.	7323.000	PK	42.4	36.6	8.8	32.5	-	55.3	73.9	18.6	Floor noise
Vert.	9764.000	PK	42.9	38.5	9.6	32.9	-	58.0	73.9	15.9	Floor noise
Vert.	1071.251	AV	51.4	24.3	4.3	34.5	-	45.5	53.9	8.4	
Vert.	4882.000	AV	31.5	31.6	7.5	31.2	-	39.3	53.9	14.6	Floor noise
Vert.	7323.000	AV	33.5	36.6	8.8	32.5	-	46.5	53.9	7.4	Floor noise
Vert.	9764.000	AV	32.3	38.5	9.6	32.9	-	47.5	53.9	6.4	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 (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (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.	233.107	QP	49.7	11.4	9.3	31.8	-	38.6	46.0	7.4	
Hori.	356.347	QP	48.3	15.1	10.1	31.8	-	41.7	46.0	4.3	
Hori.	576.830	QP	41.8	18.6	11.3	32.0	-	39.7	46.0	6.3	
Hori.	589.831	QP	40.3	19.0	11.4	32.0	-	38.7	46.0	7.3	
Hori.	610.485	QP	38.8	19.5	11.5	32.0	-	37.9	46.0	8.1	
Hori.	905.839	QP	34.4	22.0	12.9	31.1	-	38.3	46.0	7.7	
Hori.	1071.251	PK	52.9	24.3	4.3	34.5	-	47.0	73.9	26.9	
Hori.	2483.500	PK	46.3	27.7	5.4	31.8	-	47.6	73.9	26.3	
Hori.	4960.000	PK	41.3	31.6	7.5	31.2	-	49.2	73.9	24.7	Floor noise
Hori.	7440.000	PK	42.8	36.7	8.8	32.5	-	55.7	73.9	18.2	Floor noise
Hori.	9920.000	PK	42.5	38.6	9.6	33.0	-	57.8	73.9	16.1	Floor noise
Hori.	1071.251	AV	47.3	24.3	4.3	34.5	-	41.4	53.9	12.5	
Hori.	2483.500	AV	35.5	27.7	5.4	31.8	1.1	37.8	53.9	16.1	*1)
Hori.	4960.000	AV	32.1	31.6	7.5	31.2	-	40.0	53.9	13.9	Floor noise
Hori.	7440.000	AV	33.4	36.7	8.8	32.5	-	46.4	53.9	7.5	Floor noise
Hori.	9920.000	AV	32.4	38.6	9.6	33.0	-	47.7	53.9	6.2	Floor noise
Vert.	233.107	QP	45.6	11.4	9.3	31.8	-	34.5	46.0	11.5	
Vert.	356.347	QP	39.9	15.1	10.1	31.8	-	33.3	46.0	12.7	
Vert.	576.830	QP	41.9	18.6	11.3	32.0	-	39.9	46.0	6.1	
Vert.	589.831	QP	41.1	19.0	11.4	32.0	-	39.5	46.0	6.5	
Vert.	610.485	QP	37.2	19.5	11.5	32.0	-	36.3	46.0	9.7	
Vert.	905.839	QP	35.7	22.0	12.9	31.1	-	39.6	46.0	6.4	
Vert.	1071.251	PK	54.5	24.3	4.3	34.5	-	48.7	73.9	25.2	
Vert.	2483.500	PK	47.5	27.7	5.4	31.8	-	48.8	73.9	25.1	
Vert.	4960.000	PK	41.1	31.6	7.5	31.2	-	49.0	73.9	24.9	Floor noise
Vert.	7440.000	PK	42.5	36.7	8.8	32.5	-	55.5	73.9	18.4	Floor noise
Vert.	9920.000	PK	42.8	38.6	9.6	33.0	-	58.1	73.9	15.8	Floor noise
Vert.	1071.251	AV	49.1	24.3	4.3	34.5	-	43.3	53.9	10.6	
Vert.	2483.500	AV	36.6	27.7	5.4	31.8	1.1	38.9	53.9	15.0	*1)
Vert.	4960.000	AV	32.2	31.6	7.5	31.2	-	40.1	53.9	13.8	Floor noise
Vert.	7440.000	AV	33.4	36.7	8.8	32.5	-	46.3	53.9	7.6	Floor noise
Vert.	9920.000	AV	32.5	38.6	9.6	33.0	-	47.7	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(3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log(1.0 m / 3.0 m) = -9.5 dB

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

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Ise EMC Lab.

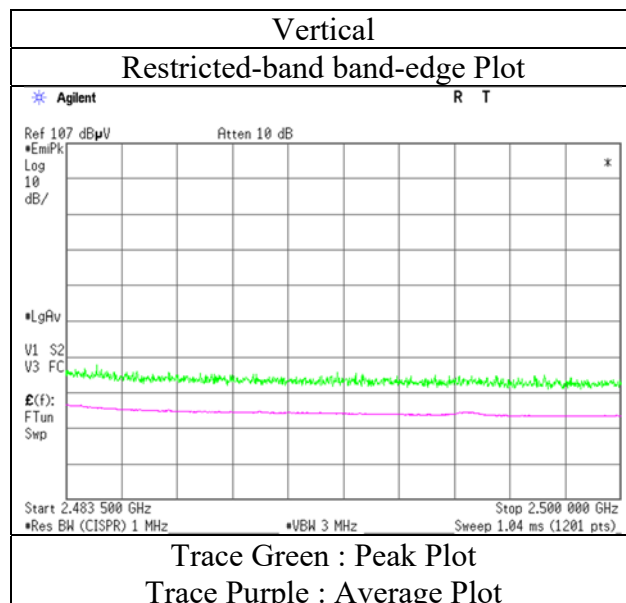
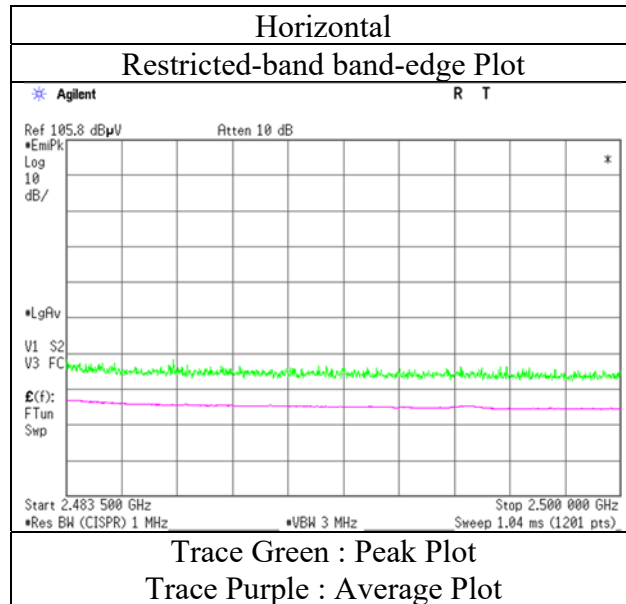
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13454495H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	August 18, 2020
Temperature / Humidity	22 deg. C / 47 % RH
Engineer	Yuichiro Yamazaki
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.

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Radiated Spurious Emission

Report No.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (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.	231.639	QP	47.2	11.4	9.2	31.8	-	36.0	46.0	10.0	
Hori.	356.359	QP	47.5	15.1	10.1	31.8	-	40.9	46.0	5.1	
Hori.	576.927	QP	44.0	18.6	11.3	32.0	-	42.0	46.0	4.0	
Hori.	620.143	QP	32.2	19.5	11.6	32.0	-	31.2	46.0	14.8	
Hori.	797.922	QP	38.2	20.8	12.4	31.6	-	39.8	46.0	6.2	
Hori.	906.407	QP	34.0	22.0	12.9	31.1	-	37.9	46.0	8.1	
Hori.	1071.251	PK	50.5	24.3	4.3	34.5	-	44.7	73.9	29.2	
Hori.	2390.000	PK	43.3	27.8	5.3	31.9	-	44.6	73.9	29.3	
Hori.	4804.000	PK	41.4	31.6	7.5	31.3	-	49.2	73.9	24.7	Floor noise
Hori.	7206.000	PK	42.8	36.5	8.8	32.4	-	55.7	73.9	18.2	Floor noise
Hori.	9608.000	PK	42.6	38.0	9.5	32.8	-	57.3	73.9	16.6	Floor noise
Hori.	1071.251	AV	44.2	24.3	4.3	34.5	-	38.4	53.9	15.5	
Hori.	2390.000	AV	34.8	27.8	5.3	31.9	1.1	37.2	53.9	16.7	*1)
Hori.	4804.000	AV	31.3	31.6	7.5	31.3	-	39.2	53.9	14.7	Floor noise
Hori.	7206.000	AV	33.5	36.5	8.8	32.4	-	46.4	53.9	7.5	Floor noise
Hori.	9608.000	AV	32.9	38.0	9.5	32.8	-	47.6	53.9	6.3	Floor noise
Vert.	231.639	QP	46.1	11.4	9.2	31.8	-	34.9	46.0	11.1	
Vert.	356.359	QP	39.0	15.1	10.1	31.8	-	32.4	46.0	13.6	
Vert.	576.927	QP	42.0	18.6	11.3	32.0	-	40.0	46.0	6.0	
Vert.	620.143	QP	33.4	19.5	11.6	32.0	-	32.4	46.0	13.6	
Vert.	797.922	QP	36.8	20.8	12.4	31.6	-	38.4	46.0	7.6	
Vert.	906.407	QP	35.6	22.0	12.9	31.1	-	39.5	46.0	6.5	
Vert.	1071.251	PK	54.5	24.3	4.3	34.5	-	48.6	73.9	25.3	
Vert.	2390.000	PK	43.3	27.8	5.3	31.9	-	44.6	73.9	29.3	
Vert.	4804.000	PK	41.7	31.6	7.5	31.3	-	49.5	73.9	24.4	Floor noise
Vert.	7206.000	PK	42.5	36.5	8.8	32.4	-	55.4	73.9	18.5	Floor noise
Vert.	9608.000	PK	42.7	38.0	9.5	32.8	-	57.4	73.9	16.5	Floor noise
Vert.	1071.251	AV	50.2	24.3	4.3	34.5	-	44.4	53.9	9.5	
Vert.	2390.000	AV	34.8	27.8	5.3	31.9	1.1	37.1	53.9	16.8	*1)
Vert.	4804.000	AV	30.9	31.6	7.5	31.3	-	38.8	53.9	15.1	Floor noise
Vert.	7206.000	AV	33.4	36.5	8.8	32.4	-	46.3	53.9	7.6	Floor noise
Vert.	9608.000	AV	32.9	38.0	9.5	32.8	-	47.7	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 (3.9 m / 3.0 m) = 2.28 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	96.6	27.8	5.3	31.9	97.9	-	-	Carrier
Hori.	2400.000	PK	38.8	27.8	5.3	31.9	40.1	77.9	37.8	
Vert.	2402.000	PK	98.9	27.8	5.3	31.9	100.2	-	-	Carrier
Vert.	2400.000	PK	39.9	27.8	5.3	31.9	41.2	80.2	39.0	

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

Distance factor: 1 GHz - 10 GHz 20log (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5dB

UL Japan, Inc.

Ise EMC Lab.

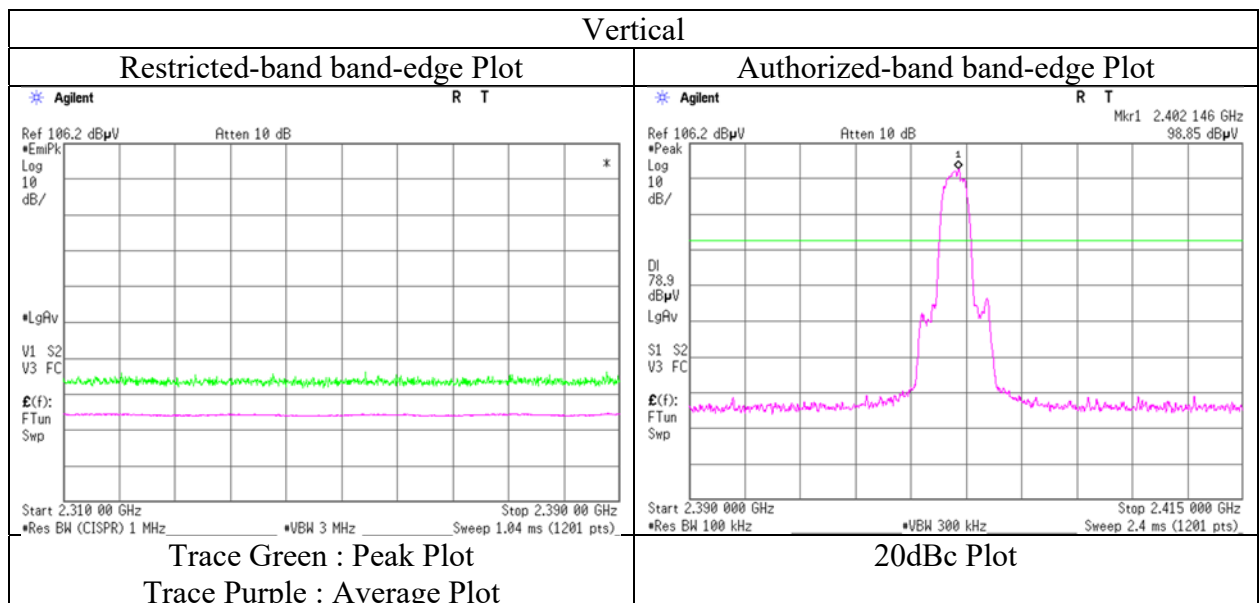
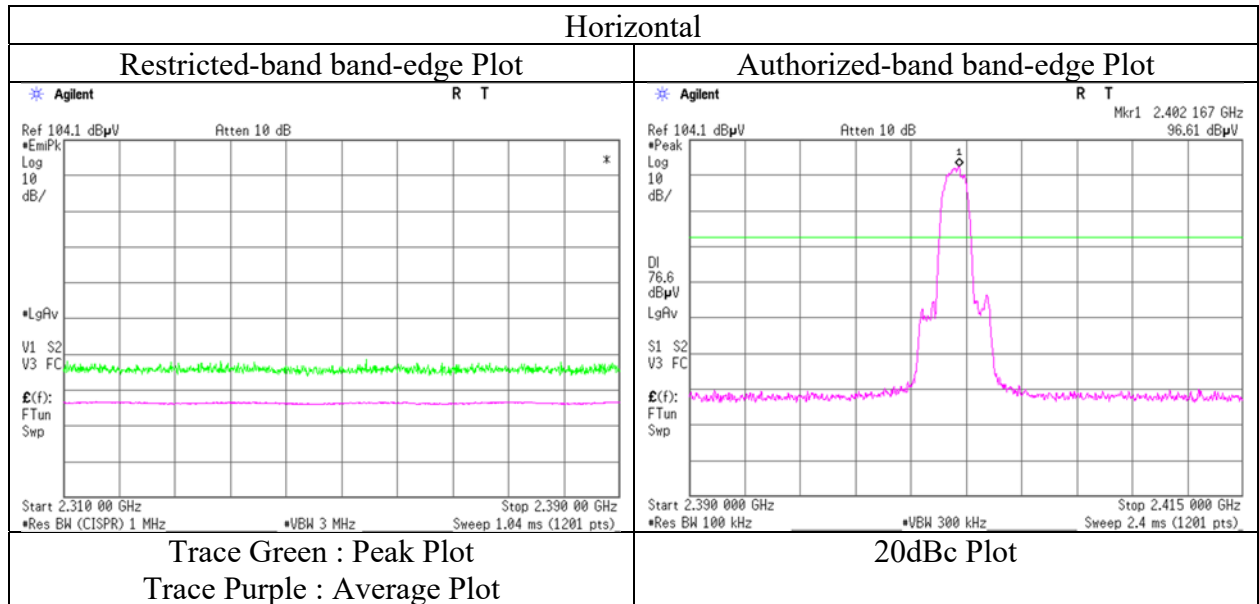
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Telephone : +81 596 24 8999

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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13454495H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	August 18, 2020
Temperature / Humidity	22 deg. C / 47 % RH
Engineer	Yuichiro Yamazaki
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.

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.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (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.	233.282	QP	49.9	11.4	9.3	31.8	-	38.8	46.0	7.2	
Hori.	356.345	QP	47.3	15.1	10.1	31.8	-	40.7	46.0	5.3	
Hori.	576.572	QP	40.7	18.6	11.3	32.0	-	38.7	46.0	7.3	
Hori.	618.953	QP	41.9	19.5	11.6	32.0	-	40.9	46.0	5.1	
Hori.	798.223	QP	35.8	20.8	12.4	31.6	-	37.4	46.0	8.6	
Hori.	906.254	QP	34.1	22.0	12.9	31.1	-	38.0	46.0	8.1	
Hori.	1071.251	PK	51.5	24.3	4.3	34.5	-	45.7	73.9	28.2	
Hori.	4882.000	PK	41.7	31.6	7.5	31.2	-	49.5	73.9	24.4	Floor noise
Hori.	7323.000	PK	42.8	36.6	8.8	32.5	-	55.7	73.9	18.2	Floor noise
Hori.	9764.000	PK	43.1	38.5	9.6	32.9	-	58.2	73.9	15.7	Floor noise
Hori.	1071.251	AV	46.7	24.3	4.3	34.5	-	40.8	53.9	13.1	
Hori.	4882.000	AV	32.0	31.6	7.5	31.2	-	39.9	53.9	14.0	Floor noise
Hori.	7323.000	AV	33.7	36.6	8.8	32.5	-	46.6	53.9	7.3	Floor noise
Hori.	9764.000	AV	32.6	38.5	9.6	32.9	-	47.7	53.9	6.2	Floor noise
Vert.	233.282	QP	43.2	11.4	9.3	31.8	-	32.1	46.0	13.9	
Vert.	356.345	QP	38.9	15.1	10.1	31.8	-	32.3	46.0	13.7	
Vert.	576.572	QP	40.2	18.6	11.3	32.0	-	38.2	46.0	7.8	
Vert.	618.953	QP	39.2	19.5	11.6	32.0	-	38.2	46.0	7.8	
Vert.	798.223	QP	33.1	20.8	12.4	31.6	-	34.7	46.0	11.3	
Vert.	906.254	QP	31.9	22.0	12.9	31.1	-	35.8	46.0	10.3	
Vert.	1071.251	PK	54.6	24.3	4.3	34.5	-	48.8	73.9	25.1	
Vert.	4882.000	PK	41.2	31.6	7.5	31.2	-	49.0	73.9	24.9	Floor noise
Vert.	7323.000	PK	42.8	36.6	8.8	32.5	-	55.7	73.9	18.2	Floor noise
Vert.	9764.000	PK	42.7	38.5	9.6	32.9	-	57.8	73.9	16.1	Floor noise
Vert.	1071.251	AV	49.7	24.3	4.3	34.5	-	43.9	53.9	10.0	
Vert.	4882.000	AV	31.9	31.6	7.5	31.2	-	39.7	53.9	14.2	Floor noise
Vert.	7323.000	AV	33.6	36.6	8.8	32.5	-	46.5	53.9	7.4	Floor noise
Vert.	9764.000	AV	32.5	38.5	9.6	32.9	-	47.6	53.9	6.3	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 (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Report No.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (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.	233.153	QP	51.4	11.4	9.3	31.8	-	40.3	46.0	5.7	
Hori.	356.360	QP	45.9	15.1	10.1	31.8	-	39.3	46.0	6.7	
Hori.	577.523	QP	38.4	18.6	11.3	32.0	-	36.4	46.0	9.6	
Hori.	610.250	QP	39.3	19.5	11.5	32.0	-	38.4	46.0	7.6	
Hori.	797.673	QP	36.5	20.8	12.4	31.6	-	38.1	46.0	7.9	
Hori.	906.259	QP	33.3	22.0	12.9	31.1	-	37.2	46.0	8.9	
Hori.	1071.251	PK	52.4	24.3	4.3	34.5	-	46.5	73.9	27.4	
Hori.	2483.500	PK	45.1	27.7	5.4	31.8	-	46.4	73.9	27.5	
Hori.	4960.000	PK	41.5	31.6	7.5	31.2	-	49.4	73.9	24.5	Floor noise
Hori.	7440.000	PK	42.6	36.7	8.8	32.5	-	55.6	73.9	18.3	Floor noise
Hori.	9920.000	PK	43.0	38.6	9.6	33.0	-	58.2	73.9	15.7	Floor noise
Hori.	1071.251	AV	46.8	24.3	4.3	34.5	-	41.0	53.9	12.9	
Hori.	2483.500	AV	34.0	27.7	5.4	31.8	1.1	36.3	53.9	17.6	*1)
Hori.	4960.000	AV	31.2	31.6	7.5	31.2	-	39.1	53.9	14.8	Floor noise
Hori.	7440.000	AV	32.8	36.7	8.8	32.5	-	45.7	53.9	8.2	Floor noise
Hori.	9920.000	AV	32.4	38.6	9.6	33.0	-	47.6	53.9	6.3	Floor noise
Vert.	233.153	QP	47.3	11.4	9.3	31.8	-	36.2	46.0	9.8	
Vert.	356.360	QP	38.7	15.1	10.1	31.8	-	32.1	46.0	13.9	
Vert.	577.523	QP	34.3	18.6	11.3	32.0	-	32.3	46.0	13.7	
Vert.	610.250	QP	37.9	19.5	11.5	32.0	-	37.0	46.0	9.1	
Vert.	797.673	QP	35.7	20.8	12.4	31.6	-	37.3	46.0	8.7	
Vert.	906.259	QP	33.3	22.0	12.9	31.1	-	37.2	46.0	8.9	
Vert.	1071.251	PK	54.6	24.3	4.3	34.5	-	48.7	73.9	25.2	
Vert.	2483.500	PK	47.3	27.7	5.4	31.8	-	48.6	73.9	25.4	
Vert.	4960.000	PK	41.3	31.6	7.5	31.2	-	49.2	73.9	24.7	Floor noise
Vert.	7440.000	PK	42.7	36.7	8.8	32.5	-	55.6	73.9	18.3	Floor noise
Vert.	9920.000	PK	42.8	38.6	9.6	33.0	-	58.1	73.9	15.8	Floor noise
Vert.	1071.251	AV	48.9	24.3	4.3	34.5	-	43.1	53.9	10.8	
Vert.	2483.500	AV	35.5	27.7	5.4	31.8	1.1	37.8	53.9	16.1	*1)
Vert.	4960.000	AV	32.0	31.6	7.5	31.2	-	39.9	53.9	14.0	Floor noise
Vert.	7440.000	AV	33.4	36.7	8.8	32.5	-	46.4	53.9	7.5	Floor noise
Vert.	9920.000	AV	32.4	38.6	9.6	33.0	-	47.7	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 (3.9 m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

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

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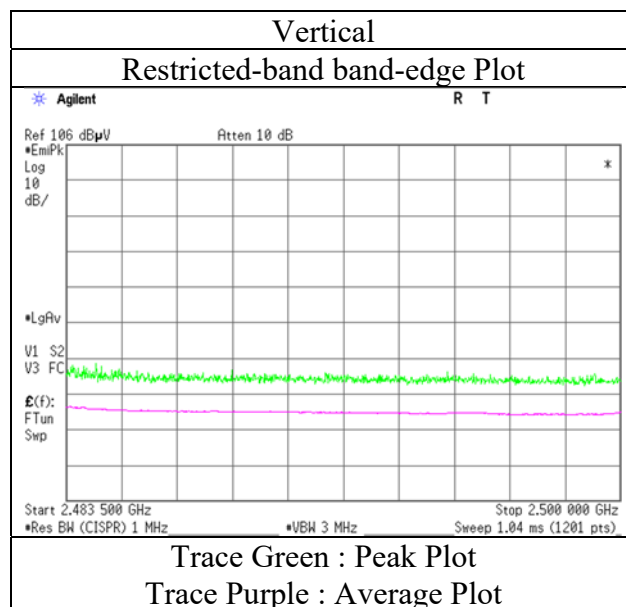
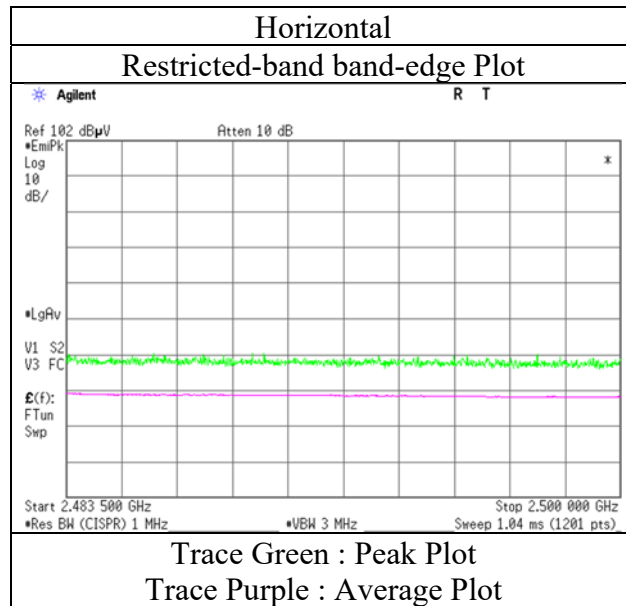
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Facsimile : +81 596 24 8124

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13454495H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	August 18, 2020
Temperature / Humidity	22 deg. C / 47 % RH
Engineer	Yuichiro Yamazaki
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.

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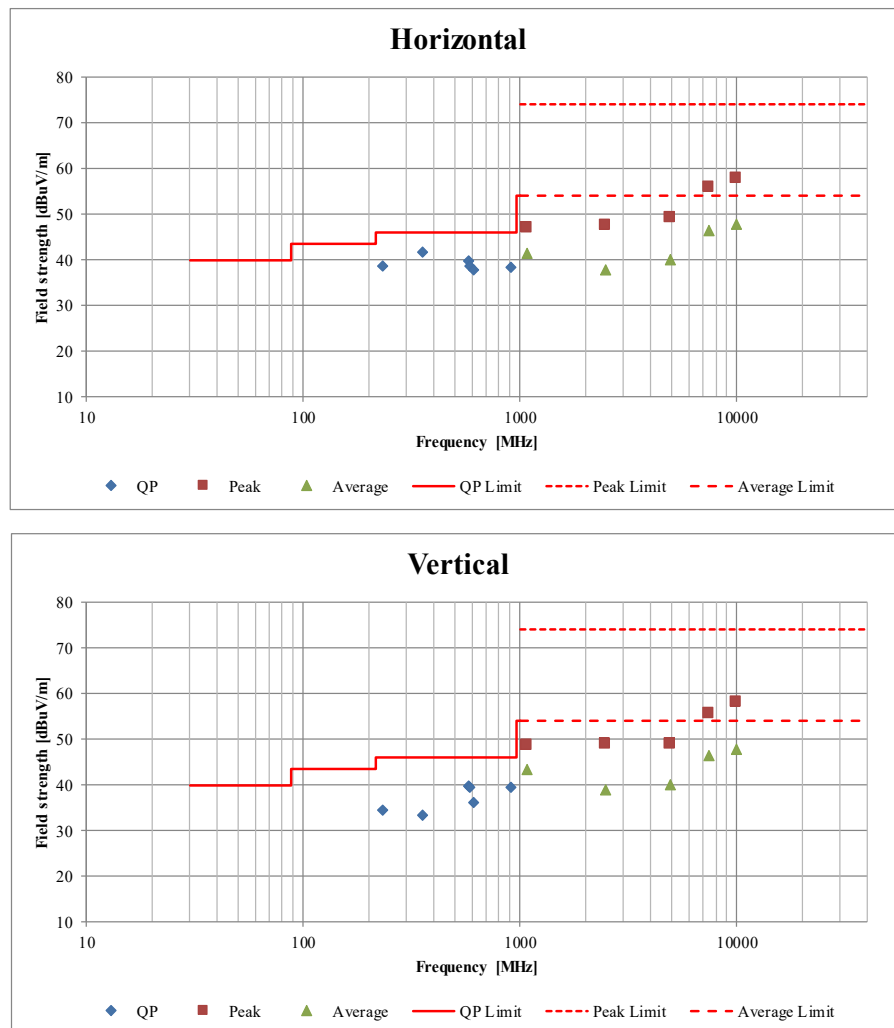
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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Radiated Spurious Emission (Plot data, Worst case)

Report No.	13454495H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	August 18, 2020 (Day)	August 18, 2020 (Night)	August 19, 2020
Temperature / Humidity	22 deg. C / 47 % RH	22 deg. C / 62 % RH	23 deg. C / 63 % RH
Engineer	Yuichiro Yamazaki (1 GHz -10 GHz)	Junki Nagatomi (Above 10 GHz)	Yuichiro Yamazaki (Below 1 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz		

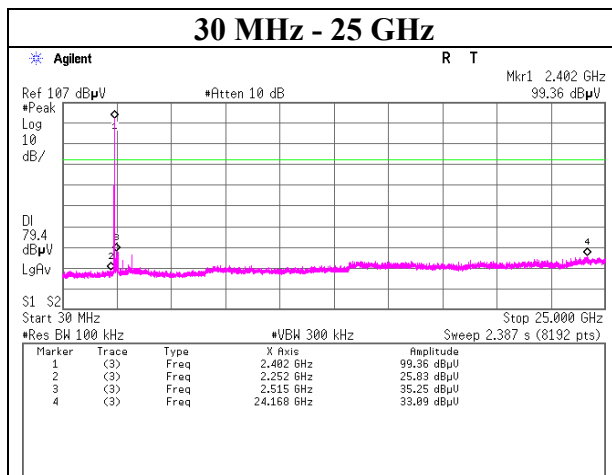
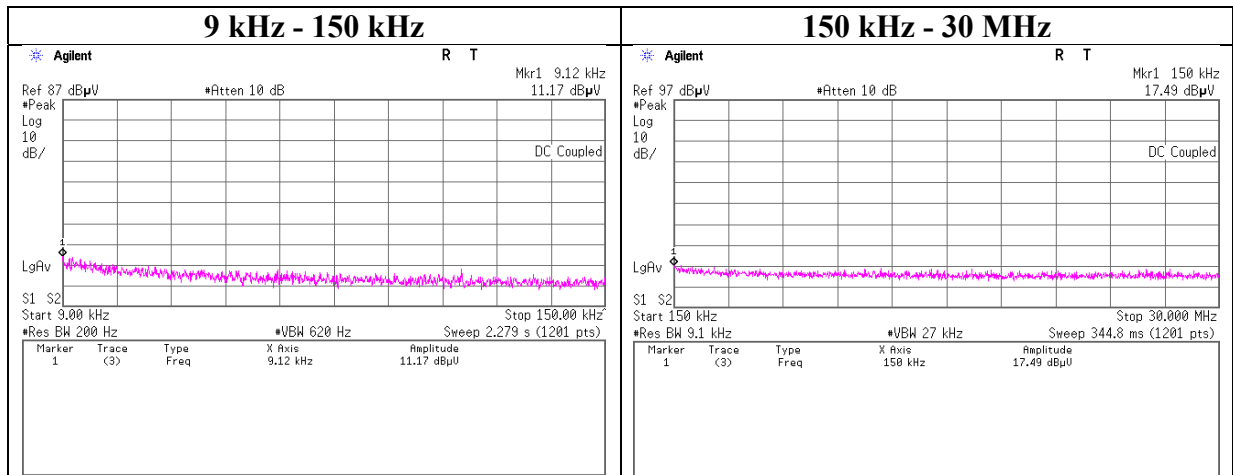


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5

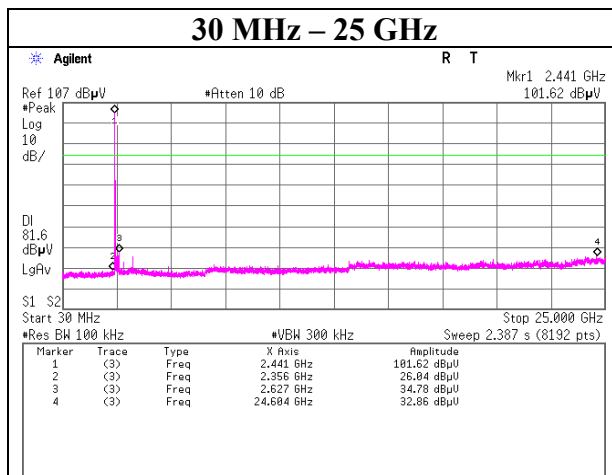
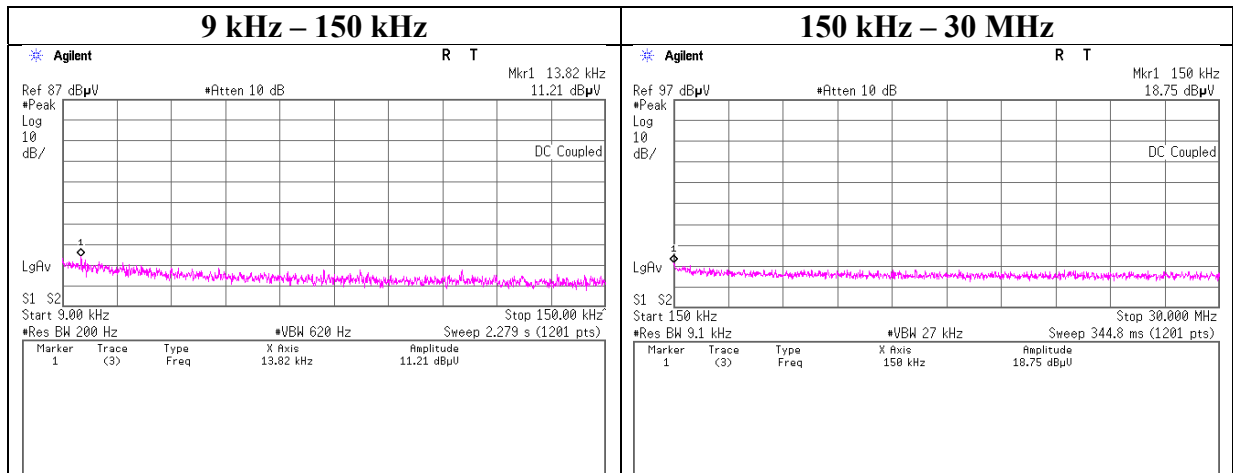
2402 MHz



Conducted Spurious Emission

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5

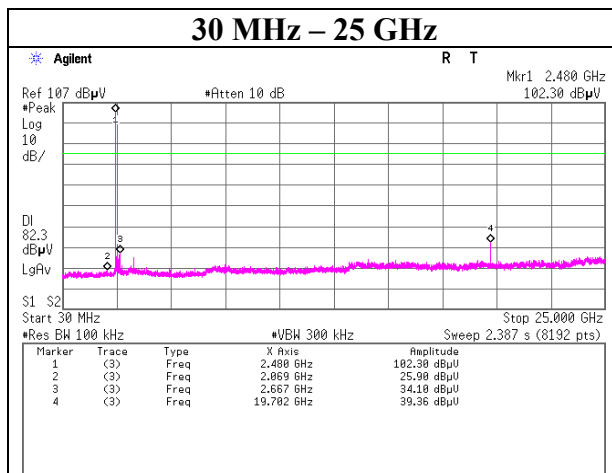
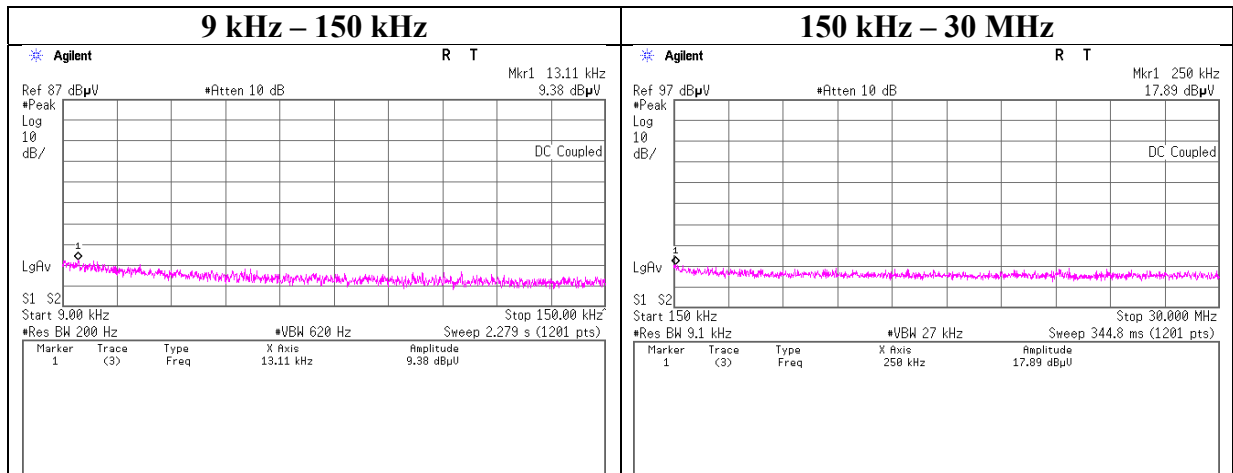
2441 MHz



Conducted Spurious Emission

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, DH5

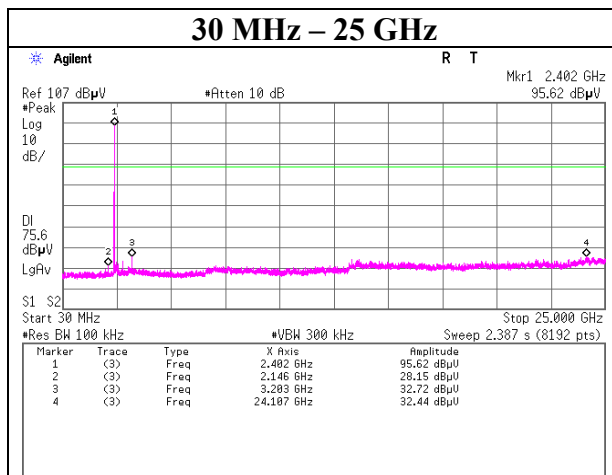
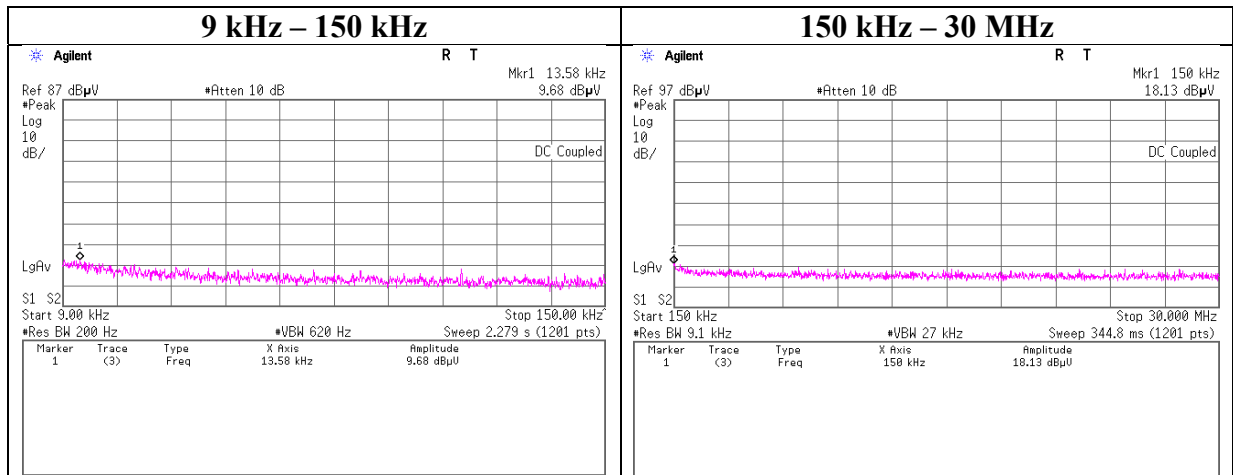
2480 MHz



Conducted Spurious Emission

Report No.	13454495H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	August 20, 2020
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

2402 MHz



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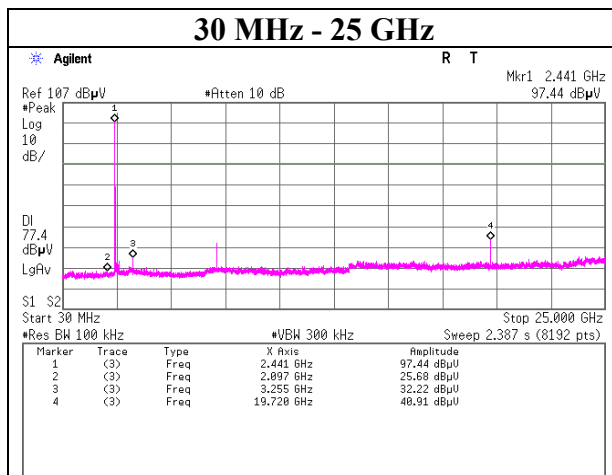
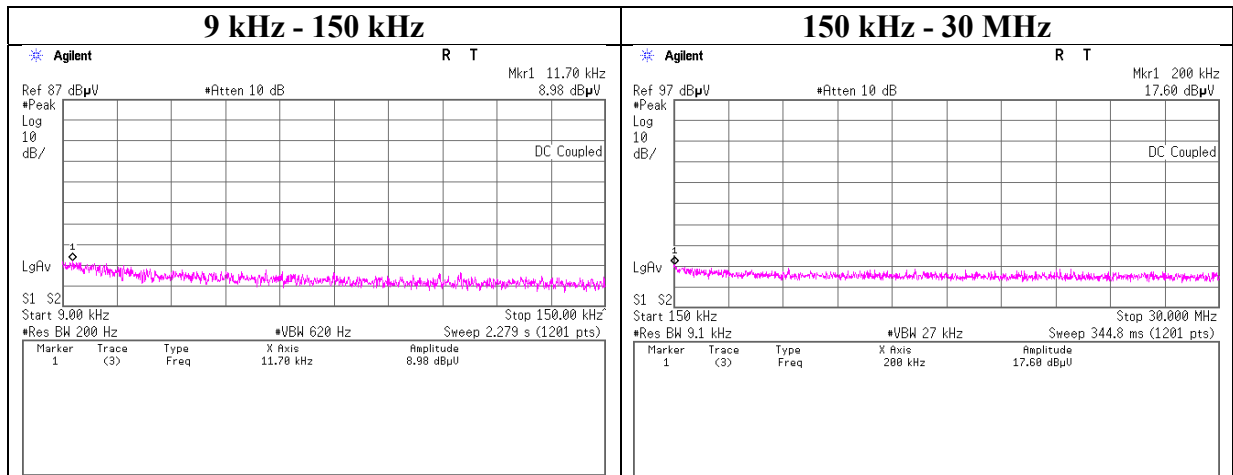
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No.	13454495H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	August 20, 2020
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Yuta Moriya
Mode	Tx, Hopping Off, 3DH5

2441 MHz



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Ise EMC Lab.

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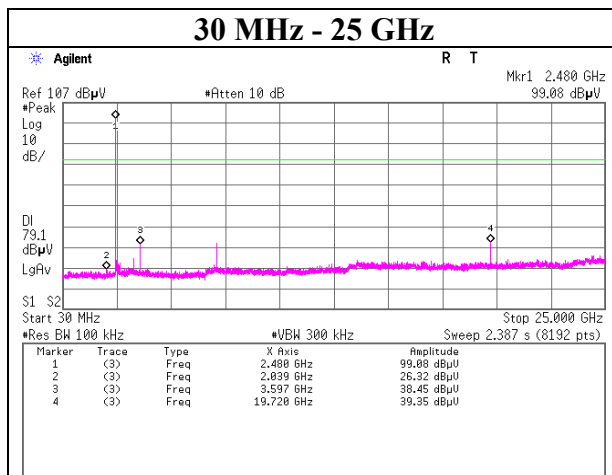
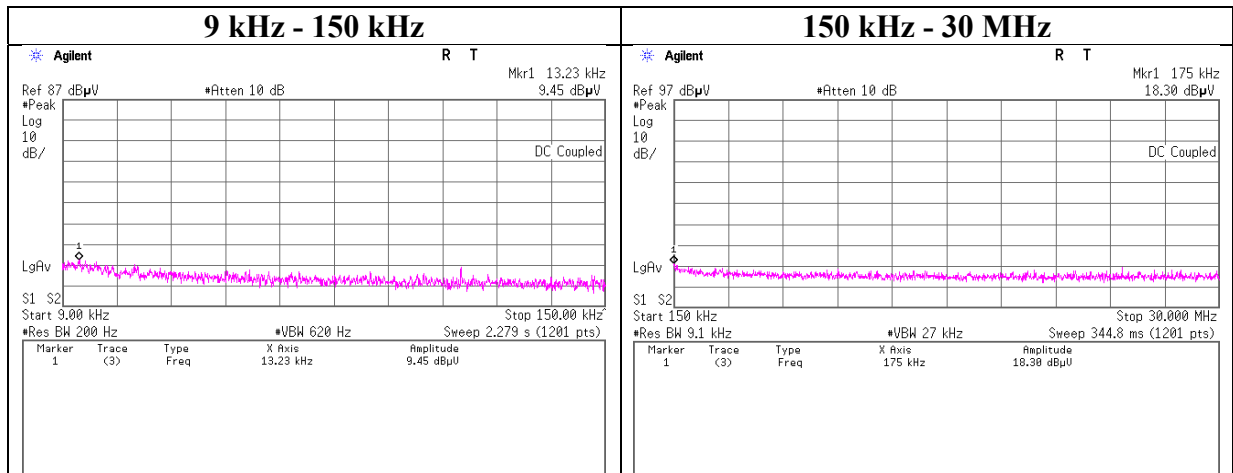
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Conducted Spurious Emission

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx, Hopping Off, 3DH5

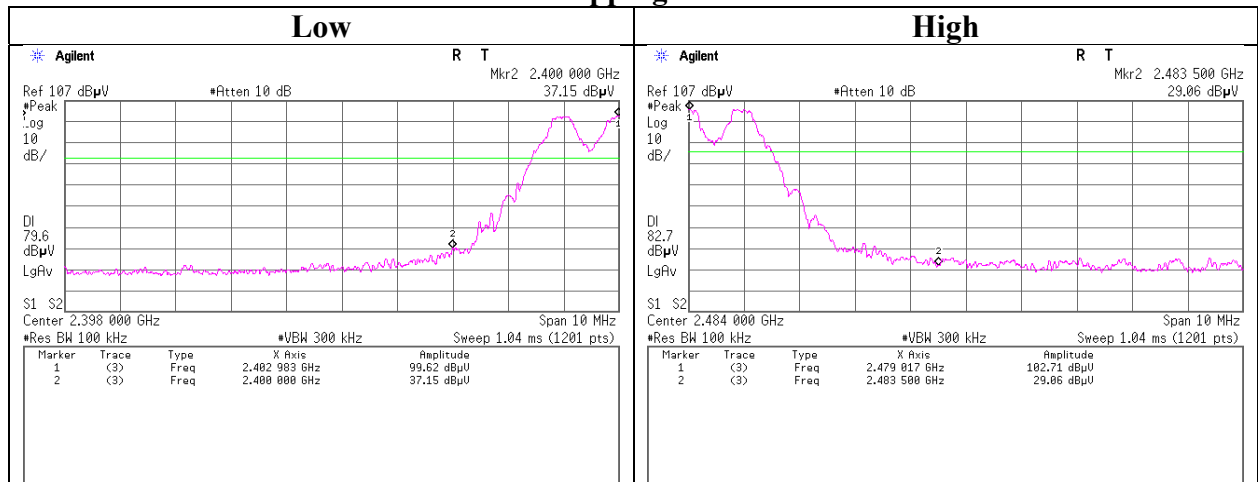
2480 MHz



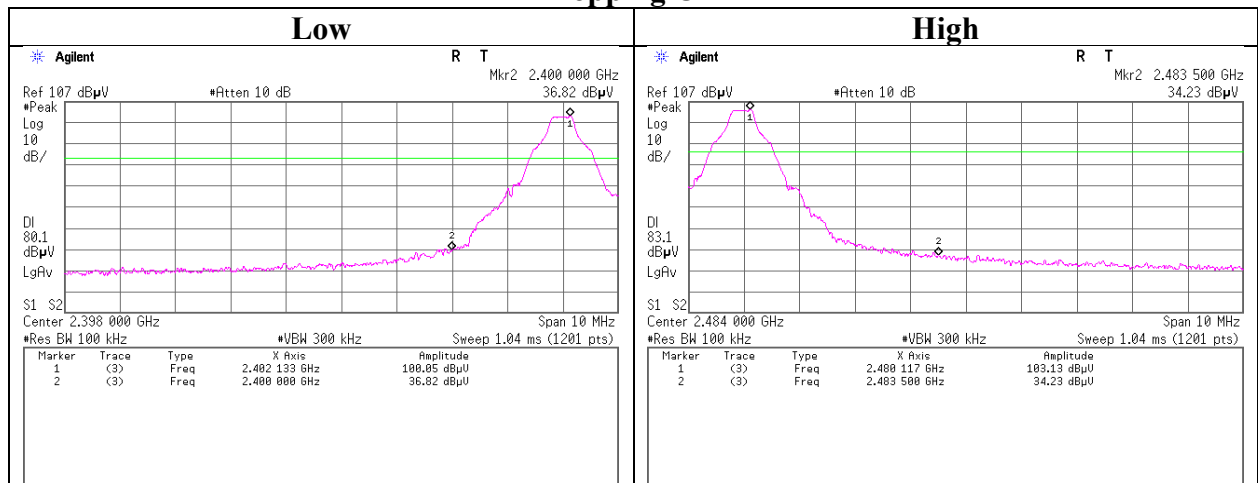
Conducted Emission Band Edge compliance

Report No. 13454495H
Test place Ise EMC Lab. No.6 Measurement Room
Date August 20, 2020
Temperature / Humidity 24 deg. C / 55 % RH
Engineer Yuta Moriya
Mode Tx DH5

Hopping On



Hopping Off



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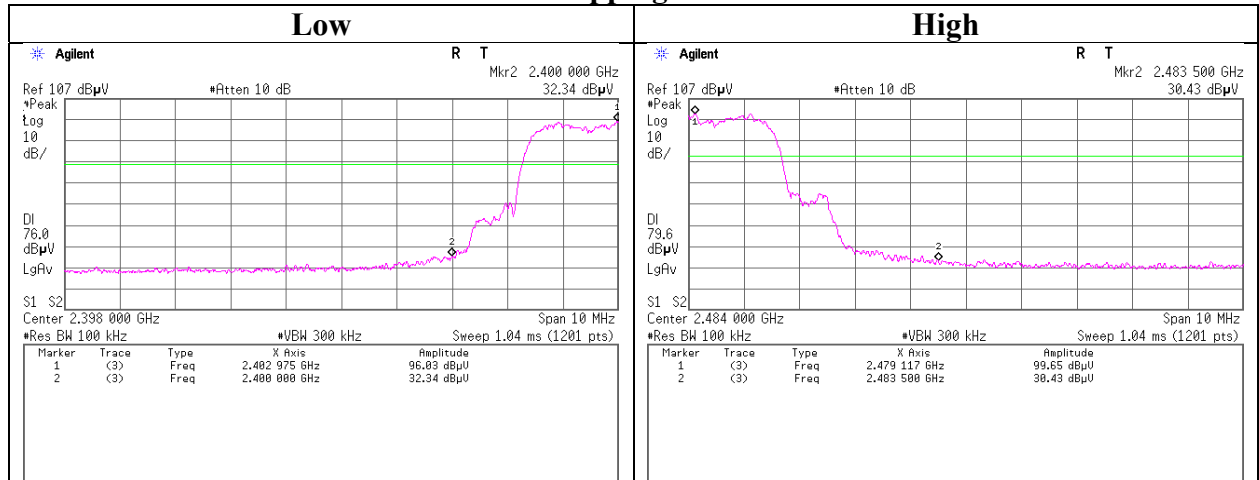
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

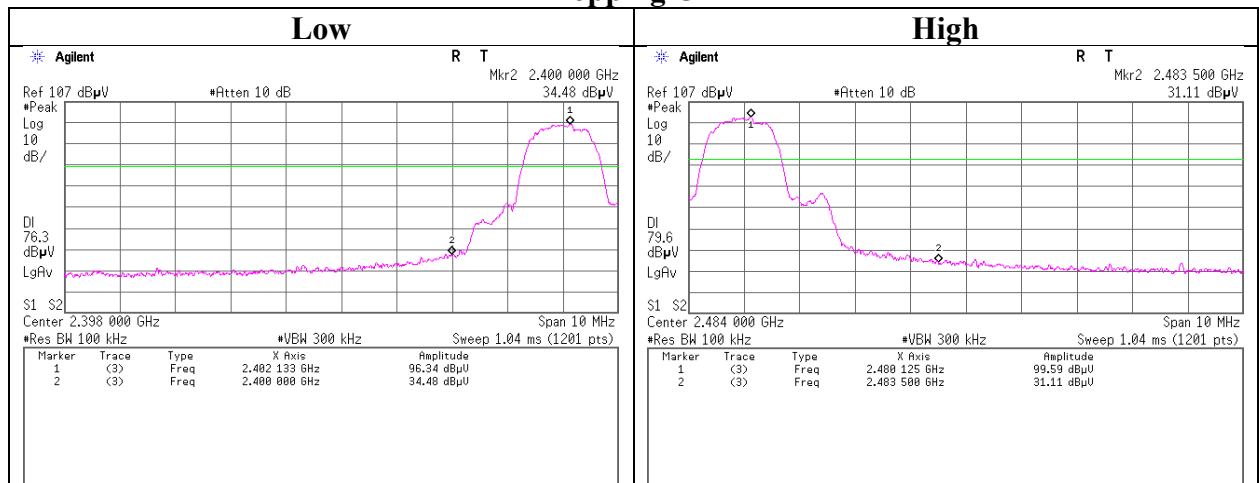
Conducted Emission Band Edge compliance

Report No.	13454495H
Test place	Ise EMC Lab. No.6 Measurement Room
Date	August 20, 2020
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Yuta Moriya
Mode	Tx 3DH5

Hopping On



Hopping Off



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APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MSA-15	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	10/09/2019	12
AT	MPM-12	141809	Power Meter	ANRITSU	ML2495A	825002	05/07/2020	12
AT	MPSE-17	141830	Power sensor	ANRITSU	MA2411B	738285	05/07/2020	12
AT	MAT-88	141312	Attenuator	Weinschel Associates	WA56-10	56100304	05/27/2020	12
AT	MOS-14	141561	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1401	01/07/2020	12
RE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/25/2020	24
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/07/2020	12
RE	MMM-10	141545	DIGITAL HiTESTER	Hioki	3805	51201148	01/06/2020	12
RE	MJM-26	142227	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-M EMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-04-SVSWR	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/04/2019	24
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	557	05/22/2020	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	650	10/16/2019	12
RE	MCC-246	199563	Microwave Cable	HUBER+SUNER	SF126E/11PC35/11PC35/1000M,5000M	537061/126E / 537072/126E	06/11/2020	12
RE	MHF-26	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/11/2019	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/04/2020	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	1302	08/24/2019	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-192	08/24/2019	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2020	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	03/24/2020	12
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/05/2020	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	2020/03/10	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess - Elektronik	BBHA9170	BBHA9170307	2020/07/16	12

*Hyphens for Last Calibration 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.

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

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

Test item:

RE: Radiated Emission test

AT: Antenna Terminal Conducted test

UL Japan, Inc.

Ise EMC Lab.

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