



RADIO TEST REPORT

Test Report No. : 13274648H-A-R1

Applicant : DENSO CORPORATION
Type of EUT : Cockpit Control Unit
Model Number of EUT : DNNS114
FCC ID : HYQDNN114
Test regulation : FCC Part 15 Subpart C: 2019
*WLAN part
(Radiated Spurious Emission test only)
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.
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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.
9. This report is a revised version of 13274648H-A. 13274648H-A is replaced with this report.

Date of test: March 8 to 10, 2020

Representative test engineer:

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Engineer

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REVISION HISTORY

Original Test Report No.: 13274648H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13274648H-A	March 26, 2020	-	-
1	13274648H-A-R1	May 20, 2020	P.6	Addition of Clock frequency for Radio part.
1	13274648H-A-R1	May 20, 2020	P.7	Correction of reference test report No. from 13204004M-A to 13204004M-A-R1.
1	13274648H-A-R1	May 20, 2020	P.7	Correction of Worst Margin: from 1.6 dB to 1.5 dB
1	13274648H-A-R1	May 20, 2020	P.10	Correction of Power setting value from 11 dBm to 9 dBm
1	13274648H-A-R1	May 20, 2020	P.11, 12	Addition of Item A' and A''
1	13274648H-A-R1	May 20, 2020	P.12	Correction of name of Item B: from CID to Center Information Display (CID)
1	13274648H-A-R1	May 20, 2020	P.15, 17, 18	Correction of Duty factor: from 0.4 to 0.5
1	13274648H-A-R1	May 20, 2020	P.20, 22, 23	Correction of Duty factor: from 1.7 to 1.8

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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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SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1 Showa-cho, Kariya-shi, Aichi ken, 448-8661 Japan
Telephone Number	:	+81-566-20-3304
Facsimile Number	:	+81-566-25-4920
Contact Person	:	Naoto Makino

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 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	:	Cockpit Control Unit
Model Number	:	DNNS114
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 13.2 V
Receipt Date	:	March 6, 2020
Country of Mass-production	:	Japan
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: DNN114 (referred to as the EUT in this report) is a Cockpit Control Unit.

General Specification

The maximum clock frequencies used in the EUT (Radio part): 40 MHz

Radio Specification

[WLAN (IEEE802.11b/g/n-20)] *1)

	IEEE802.11b	IEEE802.11g/n (20 M band)
Radio Type	Transceiver	
Frequency of operation	2412 MHz - 2462 MHz	
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK)
Channel spacing	5 MHz	
Antenna type	ASSEMBLY WiFi Antenna	
Antenna Connector type	MHF PLUG	
Antenna Gain	-6.40 dBi (max.)	

[Bluetooth (BDR / EDR function)]

	Bluetooth Ver.4.2 with EDR function
Radio Type	Transceiver
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK)
Channel spacing	1 MHz
Antenna type	ASSEMBLY BT Antenna
Antenna Connector type	MHF PLUG
Antenna Gain	-4.52 dBi (max)

[Broadcast]

	AM	FM	RBDS	XM
Radio Type	Receiver			
Frequency of operation	522 kHz - 1629 kHz	87.5 MHz - 108.0 MHz	87.5 MHz - 108.0 MHz	2333.465 MHz - 2344.045 MHz
Antenna Connector type	GT13	GT13	GT13	GT13

*Wireless LAN and Bluetooth do not transmit simultaneously.

*1) This test report applies to Wireless LAN (2.4 GHz band).

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
Spurious Emission Restricted Band Edges	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02	FCC: Section15.247(d)	1.5 dB 9748.000 MHz, AV, Vert.	Complied# a)	Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			
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) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6. * The other tests other than Spurious Emission Restricted Band Edges were performed in the test report No. 13204004M-A-R1 issued by UL Japan, Inc.					
a)Refer to APPENDIX 1 (data of Radiated Spurious Emission)					
Symbols:					
Complied		The data of this test item has enough margin, more than the measurement uncertainty.			
Complied#		The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.			

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

FCC Part 15.31 (e)

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 vehicle.
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

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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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)

Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	5.5 Mbps, PN9
IEEE 802.11n MHz BW (11n-20)	MCS 4, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Test report No.: 13204004M-A issued by UL Japan, Inc.	
*Power of the EUT was set by the software as follows; Power settings: 9 dBm Software: MSoC Ver: F41CMM006-007 (Date: January 10, 2020, Storage location: EUT Memory)	
*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.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Spurious Emission (Radiated)	11b Tx	2412 MHz
		2437 MHz
		2462 MHz
	11n-20 Tx	2412 MHz
		2437 MHz
		2462 MHz

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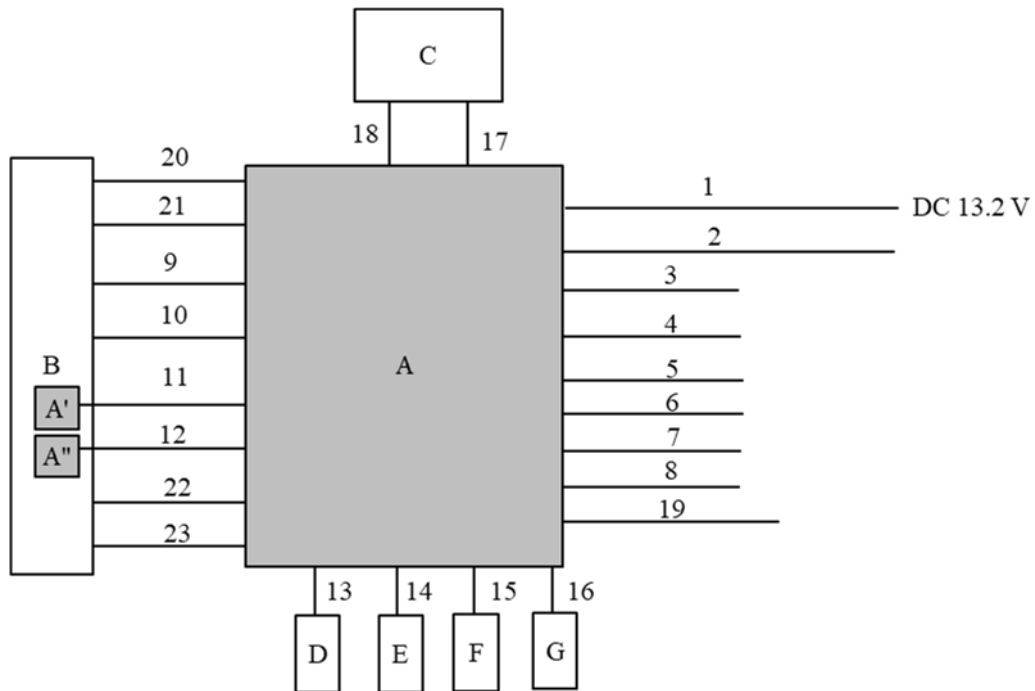
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4.2 Configuration and peripherals



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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Cockpit Control Unit (CCU)	DNNS114	K3-US-K3-Mid-S-008	DENSO	EUT
A'	WiFi Antenna	2314128-2	*1)	TE Connectivity Ltd.	EUT
A''	ASSEMBLY Bluetooth Antenna	2462810-0140	*1)	TE Connectivity Ltd.	EUT
B	Center Information Display (CID)	DNNS105	K3-MS2_Mid-LHD027	DENSO	-
C	Meter	457300-7520	85002CC110	DENSO	-
D	Speaker(8 ohm)	K50	-	VISATON	-
E	Speaker(8 ohm)	K50	-	VISATON	-
F	Speaker(8 ohm)	K50	-	VISATON	-
G	Speaker(8 ohm)	K50	-	VISATON	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.5	Unshielded	Unshielded	-
2	Frame Ground Cable	1.6	Unshielded	Unshielded	-
3	AM/FM Cable	2.0	Shielded	Shielded	-
4	XM Cable	1.1	Shielded	Shielded	-
5	CAN Cable	1.8	Unshielded	Unshielded	-
6	MIC Cable	1.8	Unshielded	Unshielded	-
7	Signal Cable	1.5	Shielded	Shielded	-
8	Signal Cable	1.5	Shielded	Shielded	-
9	DC Cable	0.2	Unshielded	Unshielded	-
10	LVDS Cable	0.2	Shielded	Shielded	-
11	WiFi Cable	0.2	Shielded	Shielded	-
12	BT Cable	0.2	Shielded	Shielded	-
13	Speaker Cable	2.0	Unshielded	Unshielded	-
14	Speaker Cable	2.0	Unshielded	Unshielded	-
15	Speaker Cable	2.0	Unshielded	Unshielded	-
16	Speaker Cable	2.0	Unshielded	Unshielded	-
17	Meter Cable	3.0	Shielded	Shielded	-
18	DC Cable	1.7	Unshielded	Unshielded	-
19	USB Cable	1.5	Shielded	Shielded	-
20	FG Cable	0.2	Unshielded	Unshielded	-
21	FG Cable	0.2	Unshielded	Unshielded	-
22	FG Cable	0.2	Unshielded	Unshielded	-
23	FG Cable	0.2	Unshielded	Unshielded	-

*1) This item is controlled with B: Center Information Display

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SECTION 5: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[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 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	11.12.2.5.1 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces 11.12.2.5.2 The duty cycle was less than 98% for detected noise, a duty factor was added to the 11.12.2.5.1 results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

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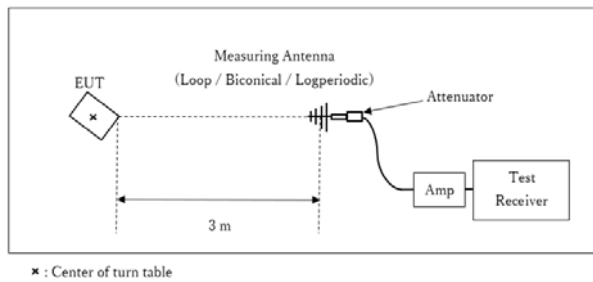
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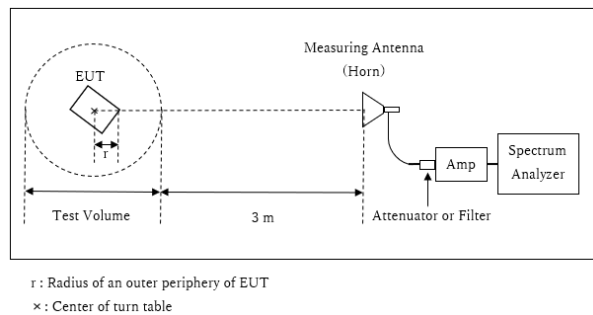
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 10 GHz



Distance Factor: $20 \times \log (3.8 \text{ m} / 3.0 \text{ m}) = 2.06 \text{ dB}$

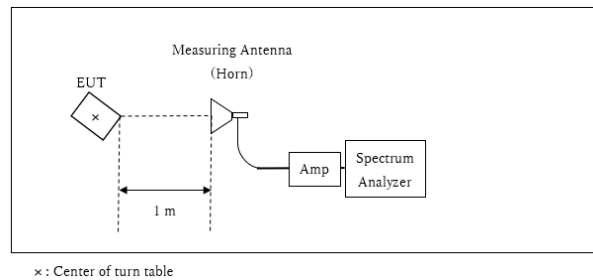
* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.8 \text{ m}$

Test Volume : 2.0 m

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

r = 0.2 m

10 GHz - 26.5 GHz



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

*Test Distance: 1 m

The 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

APPENDIX 1: Test data

Radiated Spurious Emission

Report No. 13274648H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date March 8, 2020 Night March 9, 2020
Temperature / Humidity 22 deg. C / 41 % RH 21 deg. C / 39 % RH
Engineer Akihiko Maeda Takeshi Hiyaji
(1 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11b 2412 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.	2390.000	PK	39.6	27.9	5.5	31.9	-	41.1	73.9	32.8	
Hori.	3650.017	PK	46.5	29.2	6.3	31.5	-	50.5	73.9	23.4	
Hori.	4824.000	PK	42.7	31.7	7.6	31.3	-	50.7	73.9	23.2	
Hori.	7236.000	PK	40.1	36.3	9.1	32.4	-	53.1	73.9	20.9	Floor noise
Hori.	9648.000	PK	40.0	38.0	10.0	32.8	-	55.2	73.9	18.7	Floor noise
Hori.	2390.000	AV	33.8	27.9	5.5	31.9	0.5	35.7	53.9	18.2	*1)
Hori.	3650.017	AV	42.9	29.2	6.3	31.5	-	46.8	53.9	7.1	
Hori.	4824.000	AV	33.6	31.7	7.6	31.3	0.5	42.1	53.9	11.8	
Hori.	7236.000	AV	32.4	36.3	9.1	32.4	-	45.4	53.9	8.6	Floor noise
Hori.	9648.000	AV	31.2	38.0	10.0	32.8	-	46.4	53.9	7.5	Floor noise
Vert.	2390.000	PK	40.3	27.9	5.5	31.9	-	41.7	73.9	32.2	
Vert.	3650.017	PK	46.5	29.2	6.3	31.5	-	50.5	73.9	23.4	
Vert.	4824.000	PK	43.5	31.7	7.6	31.3	-	51.5	73.9	22.4	
Vert.	7236.000	PK	40.2	36.3	9.1	32.4	-	53.2	73.9	20.7	Floor noise
Vert.	9648.000	PK	39.2	38.0	10.0	32.8	-	54.4	73.9	19.5	Floor noise
Vert.	2390.000	AV	34.1	27.9	5.5	31.9	0.5	36.0	53.9	17.9	*1)
Vert.	3650.017	AV	42.6	29.2	6.3	31.5	-	46.5	53.9	7.4	
Vert.	4824.000	AV	34.9	31.7	7.6	31.3	0.5	43.4	53.9	10.5	
Vert.	7236.000	AV	32.4	36.3	9.1	32.4	-	45.4	53.9	8.5	Floor noise
Vert.	9648.000	AV	31.5	38.0	10.0	32.8	-	46.7	53.9	7.2	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 $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori	2412.000	PK	89.4	27.9	5.5	31.9	90.9	-	-	Carrier
Hori	2400.000	PK	39.8	27.9	5.5	31.9	41.3	70.9	29.5	
Vert	2412.000	PK	91.5	27.9	5.5	31.9	93.0	-	-	Carrier
Vert	2400.000	PK	41.6	27.9	5.5	31.9	43.0	73.0	30.0	

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

Distance factor: 1 GHz - 10 GHz $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

UL Japan, Inc.

Ise EMC Lab.

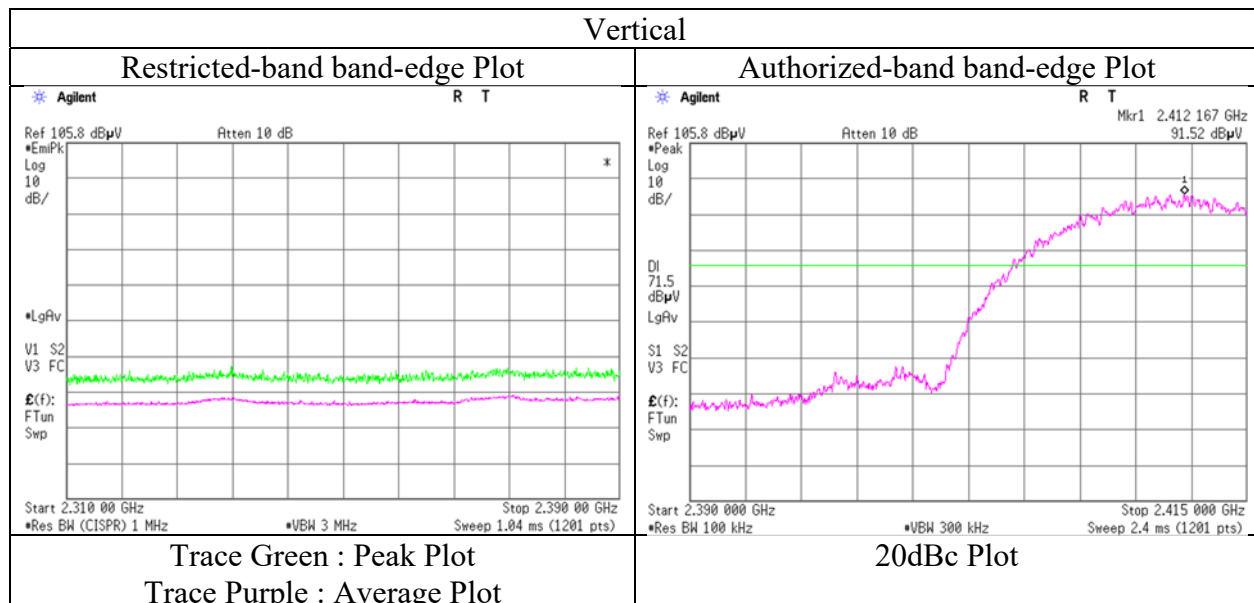
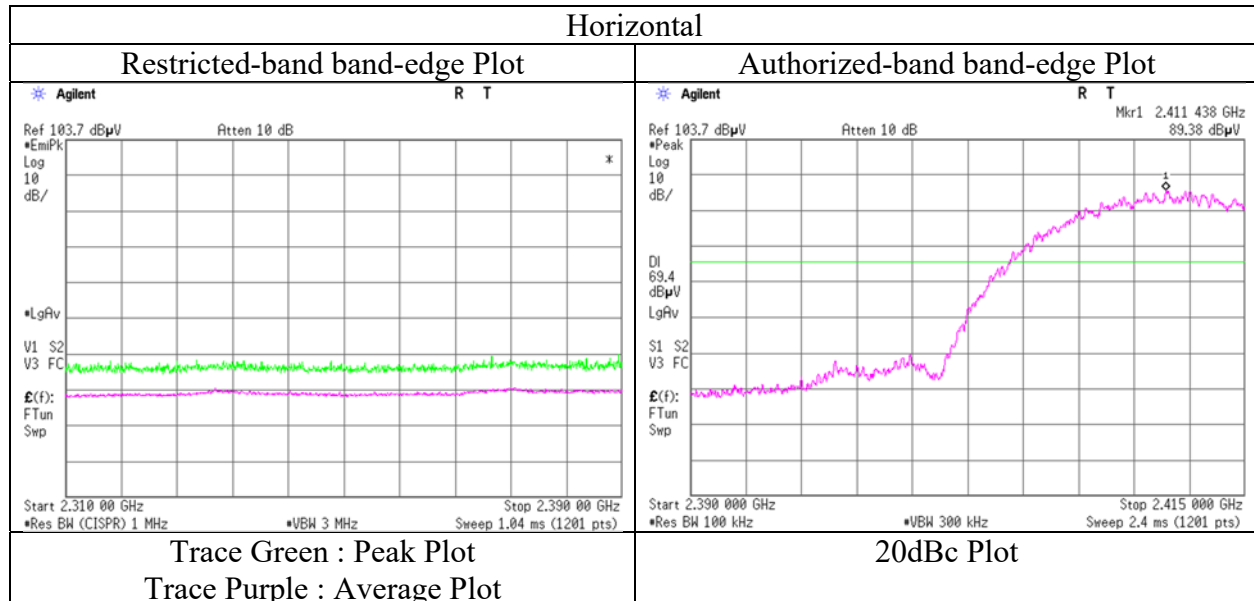
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274648H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	March 8, 2020 Night
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11b 2412 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.

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Radiated Spurious Emission

Report No.	13274648H	
Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.4
Date	March 8, 2020 Night	March 9, 2020
Temperature / Humidity	22 deg. C / 41 % RH	21 deg. C / 39 % RH
Engineer	Akihiko Maeda	Takeshi Hiyaji
	(1 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx 11b 2437 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.	3650.017	PK	46.5	29.2	6.3	31.5	-	50.4	73.9	23.5	
Hori.	4874.000	PK	41.1	31.6	7.6	31.2	-	49.1	73.9	24.8	
Hori.	7311.000	PK	42.1	36.4	9.1	32.5	-	55.2	73.9	18.7	Floor noise
Hori.	9748.000	PK	40.1	38.3	10.0	32.9	-	55.5	73.9	18.4	Floor noise
Hori.	3650.017	AV	42.4	29.2	6.3	31.5	-	46.3	53.9	7.6	
Hori.	4874.000	AV	32.6	31.6	7.6	31.2	0.5	41.1	53.9	12.8	
Hori.	7311.000	AV	32.6	36.4	9.1	32.5	-	45.6	53.9	8.3	Floor noise
Hori.	9748.000	AV	31.1	38.3	10.0	32.9	-	46.5	53.9	7.4	Floor noise
Vert.	3650.017	PK	48.0	29.2	6.3	31.5	-	52.0	73.9	21.9	
Vert.	4874.000	PK	42.2	31.6	7.6	31.2	-	50.2	73.9	23.7	
Vert.	7311.000	PK	41.8	36.4	9.1	32.5	-	54.8	73.9	19.1	Floor noise
Vert.	9748.000	PK	40.6	38.3	10.0	32.9	-	56.0	73.9	17.9	Floor noise
Vert.	3650.017	AV	44.4	29.2	6.3	31.5	-	48.4	53.9	5.5	
Vert.	4874.000	AV	34.0	31.6	7.6	31.2	0.5	42.5	53.9	11.4	
Vert.	7311.000	AV	32.7	36.4	9.1	32.5	-	45.7	53.9	8.2	Floor noise
Vert.	9748.000	AV	31.3	38.3	10.0	32.9	-	46.7	53.9	7.2	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 $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 13274648H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date March 8, 2020 Night March 9, 2020
Temperature / Humidity 22 deg. C / 41 % RH 21 deg. C / 39 % RH
Engineer Akihiko Maeda Takeshi Hiyaji
(1 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11b 2462 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.	2483.500	PK	40.8	27.7	5.5	31.8	-	42.2	73.9	31.7	
Hori.	3650.017	PK	47.3	29.2	6.3	31.5	-	51.3	73.9	22.6	
Hori.	4924.000	PK	42.0	31.6	7.7	31.2	-	50.0	73.9	23.9	
Hori.	7386.000	PK	41.5	36.5	9.1	32.5	-	54.6	73.9	19.3	
Hori.	9848.000	PK	40.5	38.5	10.1	32.9	-	56.2	73.9	17.7	
Hori.	2483.500	AV	34.7	27.7	5.5	31.8	0.5	36.6	53.9	17.3	*1)
Hori.	3650.017	AV	43.8	29.2	6.3	31.5	-	47.8	53.9	6.1	
Hori.	4924.000	AV	33.2	31.6	7.7	31.2	0.5	41.7	53.9	12.2	
Hori.	7386.000	AV	32.2	36.5	9.1	32.5	0.5	45.8	53.9	8.1	
Hori.	9848.000	AV	31.3	38.5	10.1	32.9	0.5	47.4	53.9	6.5	
Vert.	2483.500	PK	39.4	27.7	5.5	31.8	-	40.9	73.9	33.0	
Vert.	3650.017	PK	47.9	29.2	6.3	31.5	-	51.8	73.9	22.1	
Vert.	4924.000	PK	41.6	31.6	7.7	31.2	-	49.6	73.9	24.3	
Vert.	7386.000	PK	41.5	36.5	9.1	32.5	-	54.7	73.9	19.2	
Vert.	9848.000	PK	40.4	38.5	10.1	32.9	-	56.1	73.9	17.8	
Vert.	2483.500	AV	33.6	27.7	5.5	31.8	0.5	35.5	53.9	18.4	*1)
Vert.	3650.017	AV	44.5	29.2	6.3	31.5	-	48.5	53.9	5.5	
Vert.	4924.000	AV	33.2	31.6	7.7	31.2	0.5	41.7	53.9	12.2	
Vert.	7386.000	AV	32.4	36.5	9.1	32.5	0.5	46.0	53.9	7.9	
Vert.	9848.000	AV	31.3	38.5	10.1	32.9	0.5	47.4	53.9	6.5	

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

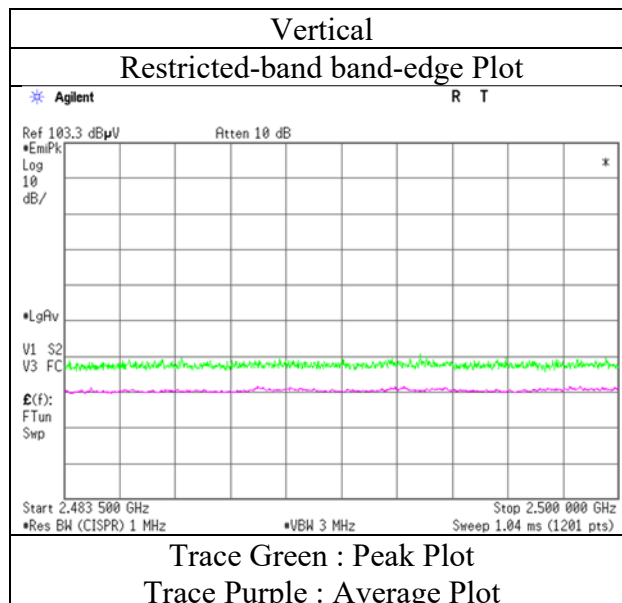
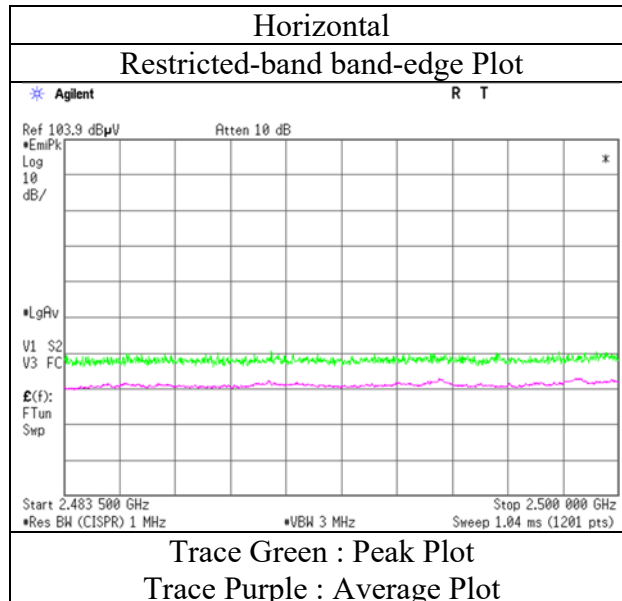
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
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)

Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274648H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	March 8, 2020 Night
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Akihiko Maeda
	(1 GHz - 10 GHz)
Mode	Tx 11b 2462 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.	13274648H		
Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.4	No.4	No.4
Date	March 8, 2020	March 8, 2020 Night	March 9, 2020
Temperature / Humidity	23 deg. C / 35 % RH	22 deg. C / 41 % RH	21 deg. C / 39 % RH
Engineer	Hiroyuki Furutaka	Akihiko Maeda	Takeshi Hiyaji
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)
Mode	Tx 11n-20 2412 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.	2390.000	PK	52.0	27.9	5.5	31.9	-	53.5	73.9	20.4	
Hori.	3650.017	PK	47.7	29.2	6.3	31.5	-	51.7	73.9	22.2	
Hori.	4824.000	PK	39.5	31.7	7.6	31.3	-	47.5	73.9	26.4	Floor noise
Hori.	7236.000	PK	40.7	36.3	9.1	32.4	-	53.6	73.9	20.3	Floor noise
Hori.	9648.000	PK	40.6	38.0	10.0	32.8	-	55.8	73.9	18.1	Floor noise
Hori.	2390.000	AV	38.4	27.9	5.5	31.9	1.8	41.7	53.9	12.2	*1)
Hori.	3650.017	AV	45.5	29.2	6.3	31.5	-	49.5	53.9	4.4	
Hori.	4824.000	AV	31.8	31.7	7.6	31.3	-	39.8	53.9	14.1	Floor noise
Hori.	7236.000	AV	32.5	36.3	9.1	32.4	-	45.4	53.9	8.5	Floor noise
Hori.	9648.000	AV	32.5	38.0	10.0	32.8	-	47.7	53.9	6.2	Floor noise
Vert.	2390.000	PK	51.1	27.9	5.5	31.9	-	52.6	73.9	21.3	
Vert.	3650.017	PK	44.3	29.2	6.3	31.5	-	48.3	73.9	25.6	
Vert.	4824.000	PK	41.3	31.7	7.6	31.3	-	49.3	73.9	24.6	Floor noise
Vert.	7236.000	PK	41.0	36.3	9.1	32.4	-	53.9	73.9	20.0	Floor noise
Vert.	9648.000	PK	41.1	38.0	10.0	32.8	-	56.3	73.9	17.6	Floor noise
Vert.	2390.000	AV	38.3	27.9	5.5	31.9	1.8	41.6	53.9	12.3	*1)
Vert.	3650.017	AV	41.1	29.2	6.3	31.5	-	45.1	53.9	8.8	
Vert.	4824.000	AV	32.1	31.7	7.6	31.3	-	40.1	53.9	13.8	Floor noise
Vert.	7236.000	AV	32.5	36.3	9.1	32.4	-	45.4	53.9	8.5	Floor noise
Vert.	9648.000	AV	32.6	38.0	10.0	32.8	-	47.8	53.9	6.1	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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

20dBc Data Sheet

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.4	27.9	5.5	31.9	87.9	-	-	Carrier
Hori.	2400.000	PK	57.7	27.9	5.5	31.9	59.2	67.9	8.7	
Vert.	2412.000	PK	87.2	27.9	5.5	31.9	88.7	-	-	Carrier
Vert.	2400.000	PK	58.1	27.9	5.5	31.9	59.5	68.7	9.1	

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

Distance factor: 1 GHz - 10 GHz $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

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Ise EMC Lab.

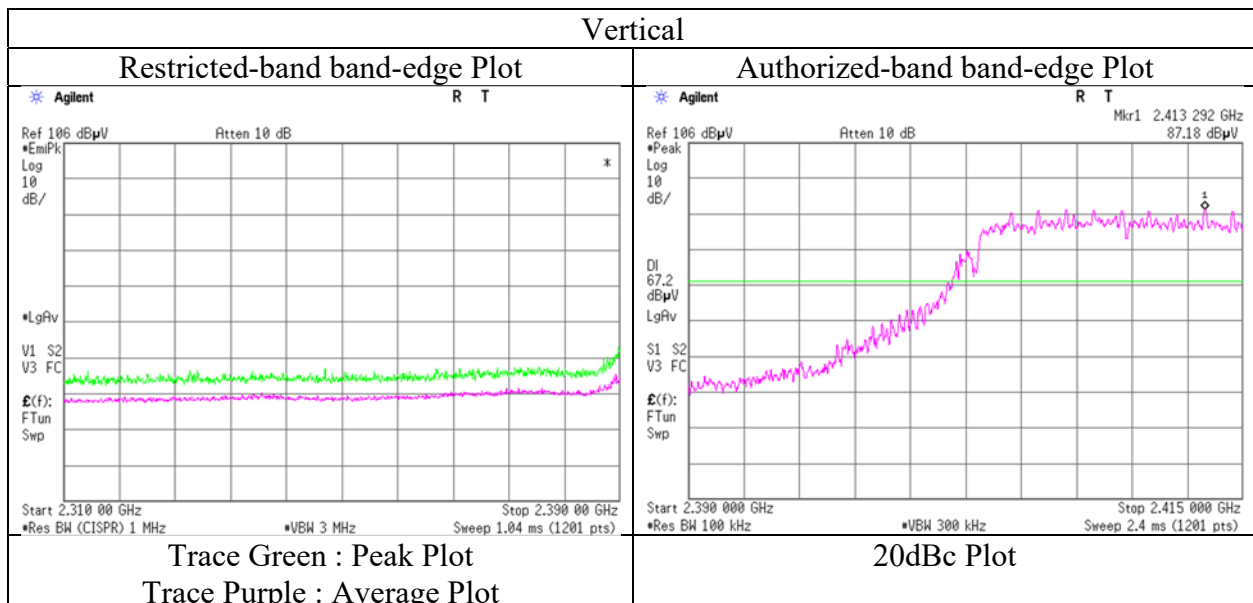
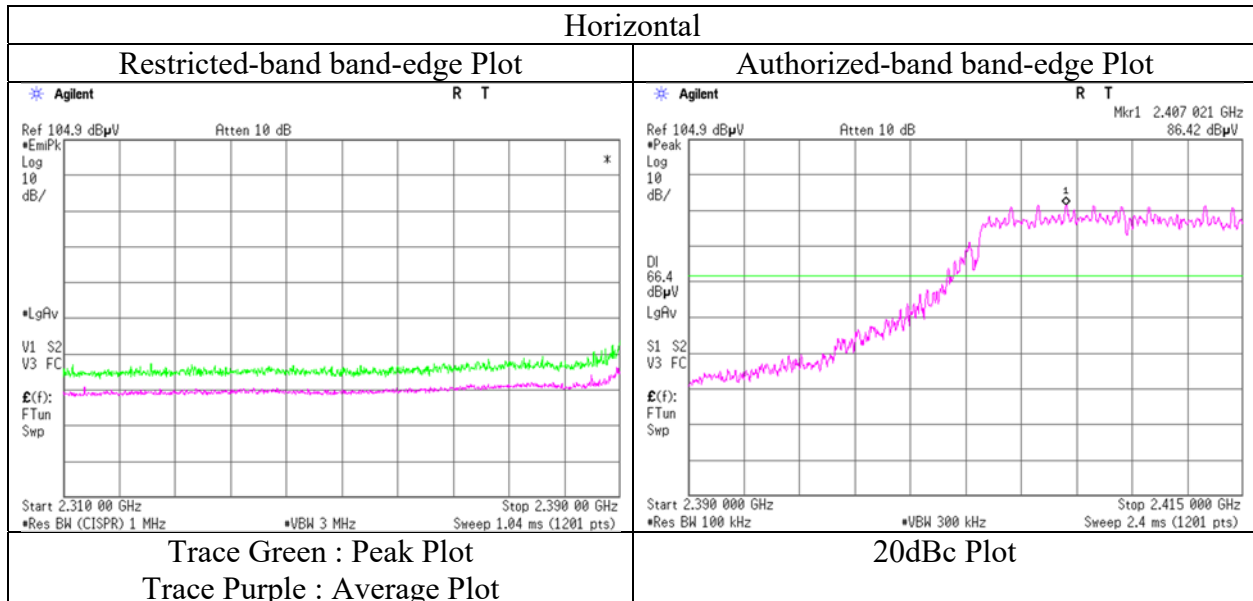
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274648H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	March 8, 2020
Temperature / Humidity	23 deg. C / 35 % RH
Engineer	Hiroyuki Furutaka
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2412 MHz



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

Radiated Spurious Emission

Report No. 13274648H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date March 8, 2020 Night March 9, 2020
Temperature / Humidity 22 deg. C / 41 % RH 21 deg. C / 39 % RH
Engineer Akihiko Maeda Takeshi Hiyaji
(1 GHz - 18 GHz) (18 GHz - 26.5 GHz)
Mode Tx 11n-20 2437 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.	3650.017	PK	47.0	29.2	6.3	31.5	-	50.9	73.9	23.0	
Hori.	4874.000	PK	39.5	31.6	7.6	31.2	-	47.5	73.9	26.4	Floor noise
Hori.	7311.000	PK	40.0	36.4	9.1	32.5	-	53.1	73.9	20.8	Floor noise
Hori.	9748.000	PK	41.7	38.3	10.0	32.9	-	57.1	73.9	16.8	
Hori.	3650.017	AV	42.9	29.2	6.3	31.5	-	46.9	53.9	7.0	
Hori.	4874.000	AV	31.0	31.6	7.6	31.2	-	39.0	53.9	14.9	Floor noise
Hori.	7311.000	AV	33.1	36.4	9.1	32.5	-	46.1	53.9	7.8	Floor noise
Hori.	9748.000	AV	34.1	38.3	10.0	32.9	1.8	51.3	53.9	2.6	
Vert.	3650.017	PK	47.4	29.2	6.3	31.5	-	51.3	73.9	22.6	
Vert.	4874.000	PK	41.0	31.6	7.6	31.2	-	49.1	73.9	24.8	Floor noise
Vert.	7311.000	PK	41.2	36.4	9.1	32.5	-	54.3	73.9	19.6	Floor noise
Vert.	9748.000	PK	42.3	38.3	10.0	32.9	-	57.6	73.9	16.3	
Vert.	3650.017	AV	44.4	29.2	6.3	31.5	-	48.4	53.9	5.5	
Vert.	4874.000	AV	31.5	31.6	7.6	31.2	-	39.6	53.9	14.3	Floor noise
Vert.	7311.000	AV	32.8	36.4	9.1	32.5	-	45.9	53.9	8.1	Floor noise
Vert.	9748.000	AV	35.2	38.3	10.0	32.9	1.8	52.4	53.9	1.5	

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 $20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No.	13274648H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.4	No.4	No.4	No.3
Date	March 8, 2020	March 8, 2020 Night	March 9, 2020	March 10, 2020
Temperature / Humidity	23 deg. C / 35 % RH	22 deg. C / 41 % RH	21 deg. C / 39 % RH	21 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka	Akihiko Maeda	Takeshi Hiyaji	Junya Okuno
	(1 GHz - 10 GHz)	(10 GHz - 18 GHz)	(18 GHz - 26.5 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2462 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.	192.000	QP	42.2	16.5	9.0	32.0	-	35.7	43.5	7.8	
Hori.	200.000	QP	44.2	11.4	9.1	32.0	-	32.7	43.5	10.8	
Hori.	280.000	QP	49.5	13.3	9.8	32.0	-	40.6	46.0	5.4	
Hori.	288.000	QP	45.6	13.4	9.9	32.0	-	36.9	46.0	9.1	
Hori.	328.000	QP	42.6	14.4	10.2	32.0	-	35.2	46.0	10.8	
Hori.	336.000	QP	48.6	14.7	10.2	32.0	-	41.6	46.0	4.4	
Hori.	448.000	QP	43.5	16.5	11.0	32.0	-	39.0	46.0	7.0	
Hori.	2483.500	PK	48.3	27.7	5.5	31.8	-	49.7	73.9	24.2	
Hori.	3650.017	PK	45.5	29.2	6.3	31.5	-	49.5	73.9	24.4	
Hori.	4924.000	PK	39.5	31.6	7.7	31.2	-	47.5	73.9	26.4	Floor noise
Hori.	7386.000	PK	41.3	36.5	9.1	32.5	-	54.4	73.9	19.5	Floor noise
Hori.	9848.000	PK	41.2	38.5	10.1	32.9	-	56.8	73.9	17.1	Floor noise
Hori.	2483.500	AV	36.9	27.7	5.5	31.8	1.8	40.1	53.9	13.8	*1)
Hori.	3650.017	AV	42.0	29.2	6.3	31.5	-	46.0	53.9	7.9	
Hori.	4924.000	AV	31.6	31.6	7.7	31.2	-	39.6	53.9	14.3	Floor noise
Hori.	7386.000	AV	32.5	36.5	9.1	32.5	-	45.6	53.9	8.3	Floor noise
Hori.	9848.000	AV	31.6	38.5	10.1	32.9	-	47.2	53.9	6.7	Floor noise
Vert.	192.000	QP	44.9	16.5	9.0	32.0	-	38.4	43.5	5.1	
Vert.	200.000	QP	51.9	11.4	9.1	32.0	-	40.4	43.5	3.1	
Vert.	208.000	QP	52.0	11.2	9.2	32.0	-	40.4	43.5	3.1	
Vert.	216.000	QP	52.1	11.1	9.3	32.0	-	40.4	43.5	3.1	
Vert.	280.000	QP	49.0	13.3	9.8	32.0	-	40.1	46.0	5.9	
Vert.	288.000	QP	47.7	13.4	9.9	32.0	-	39.0	46.0	7.0	
Vert.	328.000	QP	47.0	14.4	10.2	32.0	-	39.6	46.0	6.4	
Vert.	336.000	QP	46.5	14.7	10.2	32.0	-	39.5	46.0	6.5	
Vert.	2483.500	PK	45.3	27.7	5.5	31.8	-	46.7	73.9	27.2	
Vert.	3650.017	PK	46.5	29.2	6.3	31.5	-	50.5	73.9	23.4	
Vert.	4924.000	PK	42.5	31.6	7.7	31.2	-	50.5	73.9	23.4	Floor noise
Vert.	7386.000	PK	41.0	36.5	9.1	32.5	-	54.1	73.9	19.8	Floor noise
Vert.	9848.000	PK	41.7	38.5	10.1	32.9	-	57.3	73.9	16.6	Floor noise
Vert.	2483.500	AV	35.0	27.7	5.5	31.8	1.8	38.2	53.9	15.7	*1)
Vert.	3650.017	AV	43.2	29.2	6.3	31.5	-	47.2	53.9	6.7	
Vert.	4924.000	AV	31.7	31.6	7.7	31.2	-	39.7	53.9	14.2	Floor noise
Vert.	7386.000	AV	33.0	36.5	9.1	32.5	-	46.1	53.9	7.8	Floor noise
Vert.	9848.000	AV	31.8	38.5	10.1	32.9	-	47.4	53.9	6.5	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 (3.8 m / 3.0 m) = 2.06 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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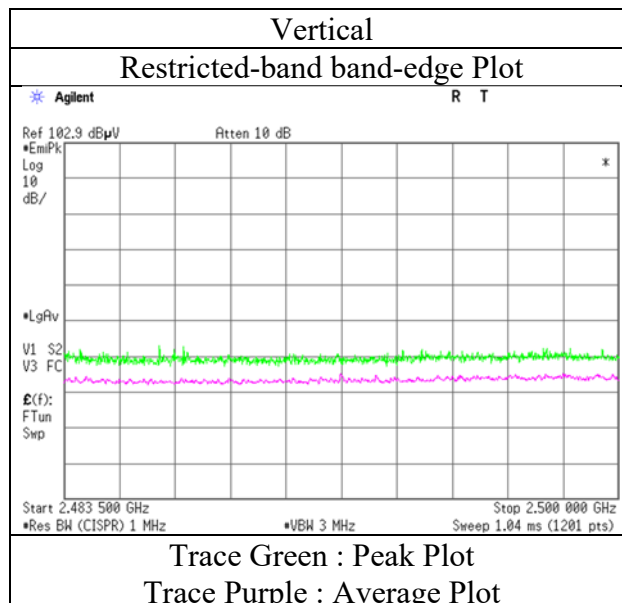
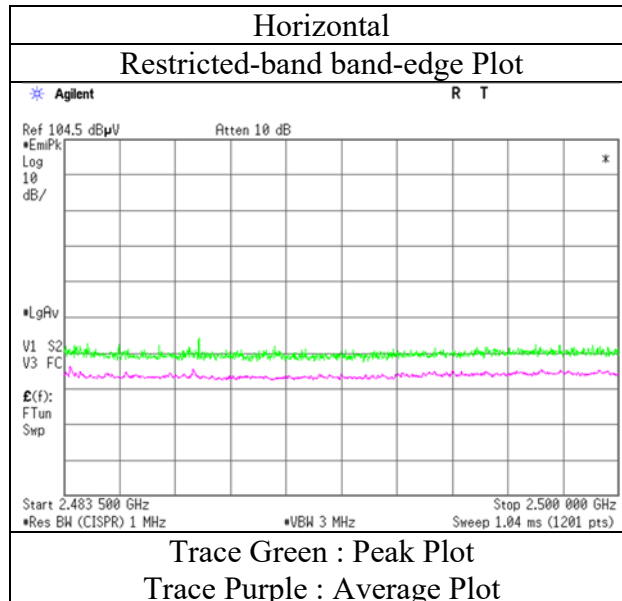
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Radiated Spurious Emission (Reference Plot for band-edge)

Report No.	13274648H
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	March 8, 2020
Temperature / Humidity	23 deg. C / 35 % RH
Engineer	Hiroyuki Furutaka
	(1 GHz - 10 GHz)
Mode	Tx 11n-20 2462 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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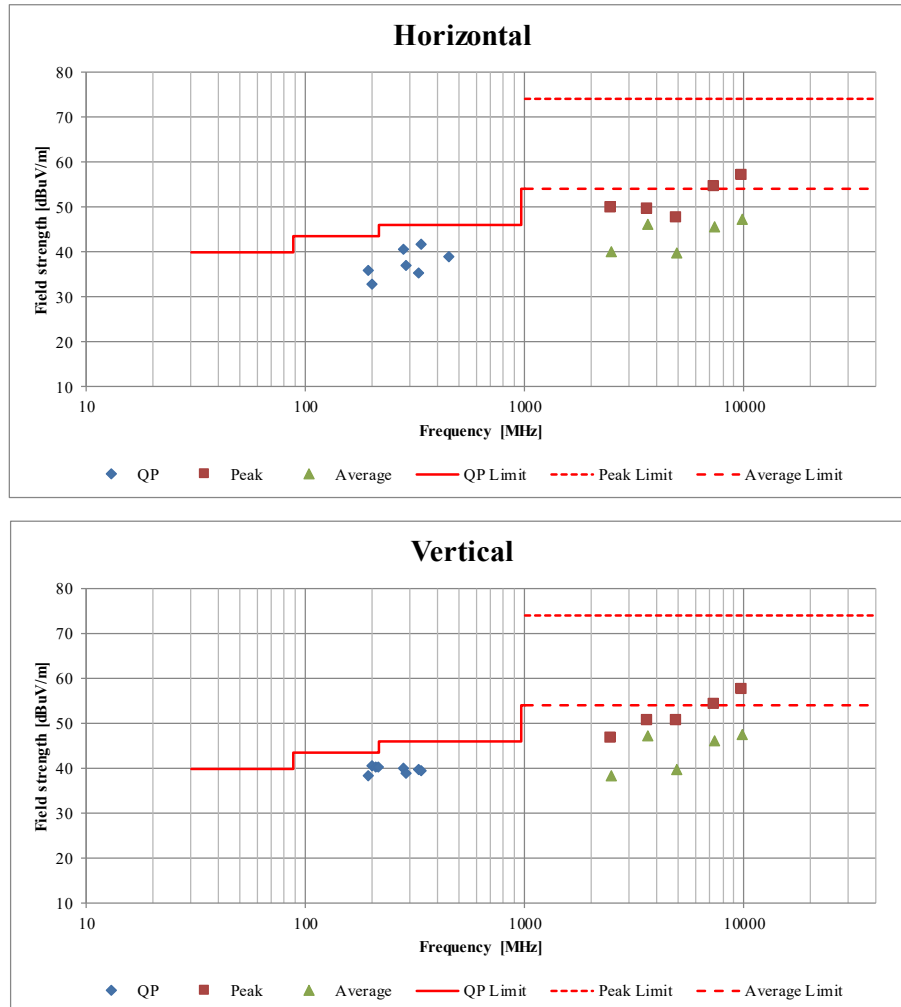
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Radiated Spurious Emission (Plot data, Worst case)

Report No.	13274648H			
Test place	Ise EMC Lab.			
Semi Anechoic Chamber	No.4	No.4	No.4	No.3
Date	March 8, 2020	March 8, 2020 Night	March 9, 2020	March 10, 2020
Temperature / Humidity	23 deg. C / 35 % RH	22 deg. C / 41 % RH	21 deg. C / 39 % RH	21 deg. C / 50 % RH
Engineer	Hiroyuki Furutaka (1 GHz - 10 GHz)	Akihiko Maeda (10 GHz - 18 GHz)	Takeshi Hiyaji (18 GHz - 26.5 GHz)	Junya Okuno (Below 1 GHz)
Mode	Tx 11n-20 2462 MHz			



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

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/28/2018	24
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM	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-MEMI-02	178648	EMI measurement program	TSJ	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	BBHA9120D	9120D-557	09/26/2019	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	650	10/16/2019	12
RE	MCC-141	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	06/17/2019	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck	BBHA9170	BBHA9170307	10/08/2019	12
RE	MHF-26	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/11/2019	12
RE	MSA-15	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	10/09/2019	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	06/18/2019	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2020	12
RE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/02/2019	12
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/05/2020	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck	VHA9103+ BBA9106	1302	08/24/2019	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	9111B-192	08/24/2019	12
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	06/26/2018	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM	CTH-201	1301	01/07/2020	12
RE	MMM-08	141532	DIGITAL HiTESTER	HIOKI	3805	51201197	01/06/2020	12
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	06/11/2019	12
RE	MBA-03	141424	Biconical Antenna	Schwarzbeck	VHA9103+ BBA9106	1915	08/24/2019	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/02/2019	12
RE	MLA-22	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck	VUSLP9111B	9111B-191	08/24/2019	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/10/2020	12
RE	TR-08	146754	Test Receiver	Rohde & Schwarz	ESCI	100299	10/08/2019	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/13/2019	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

UL Japan, Inc.

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