




RADIO TEST REPORT

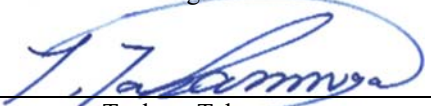
Test Report No. : 13809761H-A

Applicant : DENSO TEN Limited
Type of EUT : Car Navigation
Model Number of EUT : FT0091A
FCC ID : BABFT0091A
Test regulation : FCC Part 15 Subpart C: 2021
*WLAN part
*For permissive change
Test Result : Complied (Refer to SECTION 3)
(99 % Occupied Bandwidth and 6 dB Bandwidth, Radiated Spurious Emission and Conducted Spurious Emission tests only)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
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6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.

Date of test: May 11 to 18, 2021

Representative test engineer: 
Takafumi Noguchi
Engineer

Approved by: 
Tsubasa Takayama
Leader



CERTIFICATE 5107.02

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

UL Japan, Inc.
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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8999
Facsimile : +81 596 24 8124

REVISION HISTORY

Original Test Report No.: 13809761H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13809761H-A	July 12, 2021	-	-

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

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

Telephone : +81 596 24 8999

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SECTION 1: Customer information

Company Name : DENSO TEN Limited
Address : 2-28, Goshō-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 JAPAN
Telephone Number : +81-78-682-2159
Facsimile Number : +81-78-671-7160
Contact Person : Daisuke Fukii

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 : Car Navigation
Model Number : FT0091A
Serial Number : Refer to SECTION 4.2
Rating : DC 12 V
Receipt Date : April 30, 2021
Country of Mass-production : Mexico
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: FT0091A (referred to as the EUT in this report) is a Car Navigation.

Radio Type : Transceiver
Clock frequency(ies) : 26 MHz

	IEEE802.11b *1)	IEEE802.11g/n (20 M band) *1)	IEEE802.11a/n (20 M band)	IEEE802.11n (40 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM)	
Channel spacing	5MHz		20MHz	40MHz
Antenna type	Surface Mountable Dielectric Chip Antenna			
Antenna Connector type	-			
Antenna Gain	1.6 dBi (2.4 GHz Band), 0 dBi (5 GHz Band)			

	Bluetooth Ver.3.0 with EDR function
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK)
Channel spacing	BT: 1 MHz
Antenna type	Surface Mountable Dielectric Chip Antenna
Antenna Connector type	-
Antenna Gain	1.6 dBi

*1) This test report applies to WLAN (2.4 GHz Band only).

*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 May 3, 2021 and effective July 2, 2021

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

- * The revision does not affect the test result conducted before its effective date.
- * This test report is due to change of the crystal in the EUT.

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	*1)
6dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ----- ISED: -	FCC: Section 15.247(a)(2) ----- ISED: RSS-247 5.2(a)	See data.	Complied a)	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ----- ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(3) ----- ISED: RSS-247 5.4(d)		N/A	*2)
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ----- ISED: -	FCC: Section 15.247(e) ----- ISED: RSS-247 5.2(b)		N/A	*2)
Spurious Emission Restricted Band Edges	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	4.5 dB 639.994 MHz, QP, Hori.	Complied# b), c)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *3)
<p>Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.</p> <p>*1) The test was not performed since the EUT was DC device.</p> <p>*2) The purpose of this test is to verify that the degradation and performance meets the minimum adaptable requirements, therefore, only items related to the x'tal were tested. This test item is controlled by software there is no "degradation"</p> <p>*3) 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.</p> <p>a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth) b) Refer to APPENDIX 1 (data of Conducted Spurious Emission) c) Refer to APPENDIX 1 (data of Radiated Spurious Emission)</p> <p>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.</p>					

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

FCC Part 15.31 (e)

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

FCC Part 15.203 Antenna requirement

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

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

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	ISED: RSS-Gen 6.6	ISED: -	N/A	- a)	Conducted
a) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)					

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

3.4 Uncertainty

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

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k=2$.
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Antenna Terminal test

Test Item	Uncertainty (+/-)
20 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %
Maximum Peak Output Power / Average Output Power	1.4 dB
Carrier Frequency Separation	0.42 %
Dwell time / Burst rate	0.10 %
Conducted Spurious Emission	2.6 dB

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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*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967

ISED Lab Company Number: 2973C / CAB identifier: JP0002

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

Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-

* 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.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

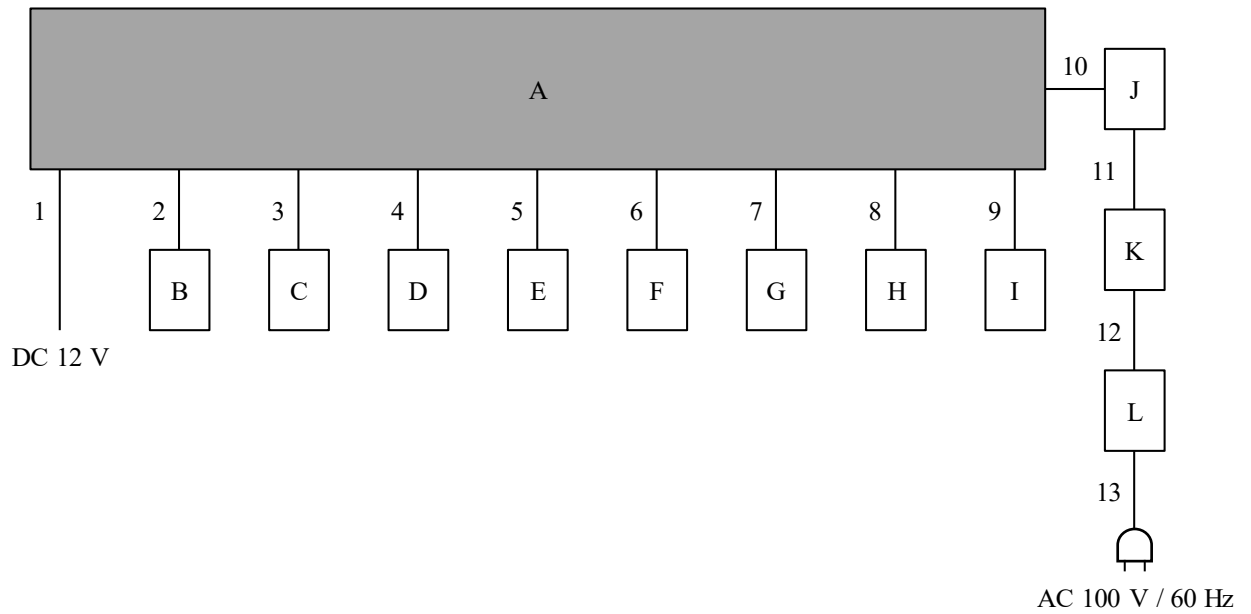
Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 7 (Short GI), PN9
* The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b: +13 dBm 11g/n-20: +11 dBm Software: Version 00.01F (Date: January 6, 2021, 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
Radiated Spurious Emission (Above 1 GHz)	11b Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
6dB Bandwidth 99% Occupied Bandwidth	11b Tx 11g Tx 11n-20 Tx	2412 MHz 2437 MHz 2462 MHz
Conducted Spurious Emission Radiated Spurious Emission (Below 1 GHz)	11n-20 Tx *1)	2412 MHz

*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.

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	Car Navigation	FT0091A	MSC00018	DENSO TEN	EUT *1)
			MSC00044	Limited	EUT *2)
B	Antenna	16ADA	No.1	HONDA Genuine product	-
C	Radio dummy	39835-T5A-E010-M1	24D50094	-	-
D	Camera	8983980530	0000015	HONDA Genuine product	-
E	MIC ASSY	W01B-5012-D240	03U1520000026	TRANSTRON INC.	-
F	Dummy load	-	-	DENSO TEN Limited	-
G	Switch	-	-	DENSO TEN Limited	-
H	USB memory	USM4GR B	-	sony	-
I	USB memory	USM4GR B	-	sony	-
J	Jig board	-	-	DENSO TEN Limited	-
K	Laptop PC	PR63PBAA337AD7X	6F053983H	TOSHIBA	*2)
L	AC Adapter	PA51770-1ACA	FX1200E91PCC	TOSHIBA	*2)

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.5	Unshielded	Unshielded	*2)
		2.0			*1)
2	Antenna Cable	3.6	Shielded	Shielded	-
3	Antenna Cable	0.5	Shielded	Shielded	-
4	Signal Cable	0.6	Unshielded	Unshielded	-
5	Signal Cable	0.5	Unshielded	Unshielded	-
6	Signal Cable	0.5	Unshielded	Unshielded	-
7	Signal Cable	1.0	Unshielded	Unshielded	-
8	USB Cable	1.0	Shielded	Shielded	-
9	USB Cable	1.0	Shielded	Shielded	-
10	Signal Cable	0.1	Unshielded	Unshielded	-
11	USB Cable	0.7	Shielded	Shielded	*2)
12	DC Cable	1.7	Unshielded	Unshielded	*2)
13	AC Cable	0.8	Unshielded	Unshielded	*2)

*1) Used only for Radiated Spurious Emission

*2) Used for Antenna Terminal Conducted Tests

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

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, 1.5 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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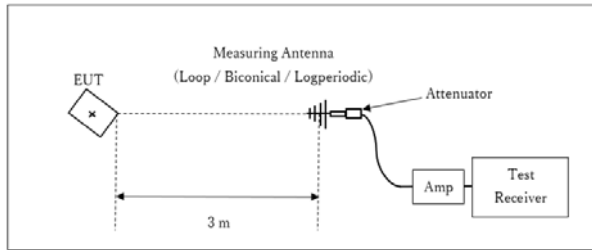
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Figure 2: Test Setup

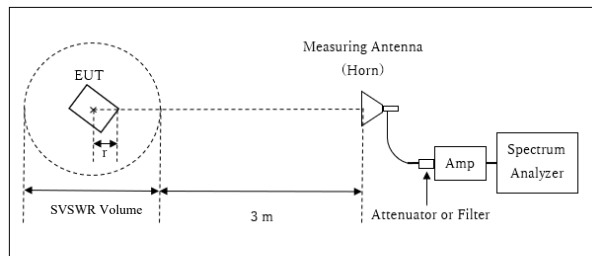
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



r : Radius of an outer periphery of EUT

× : Center of turn table

Distance Factor: $20 \times \log(3.65 \text{ m} / 3.0 \text{ m}) = 1.7 \text{ dB}$

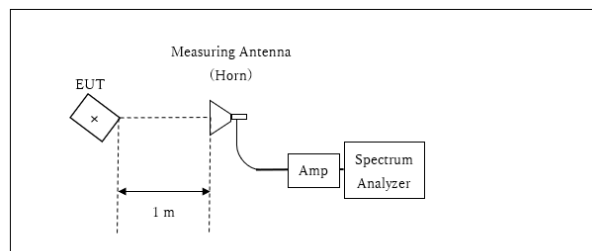
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.65 \text{ m}$

SVSWR Volume : 1.5 m

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

r = 0.1 m

10 GHz – 26.5 GHz



× : Center of turn table

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

*Test Distance: 1 m

The 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 6: 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
6dB Bandwidth	20 MHz	100 kHz	300 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
Conducted Spurious Emission *2) *3)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	9.1 kHz	27 kHz				

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

*2) 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).

*3) 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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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 1: Test data

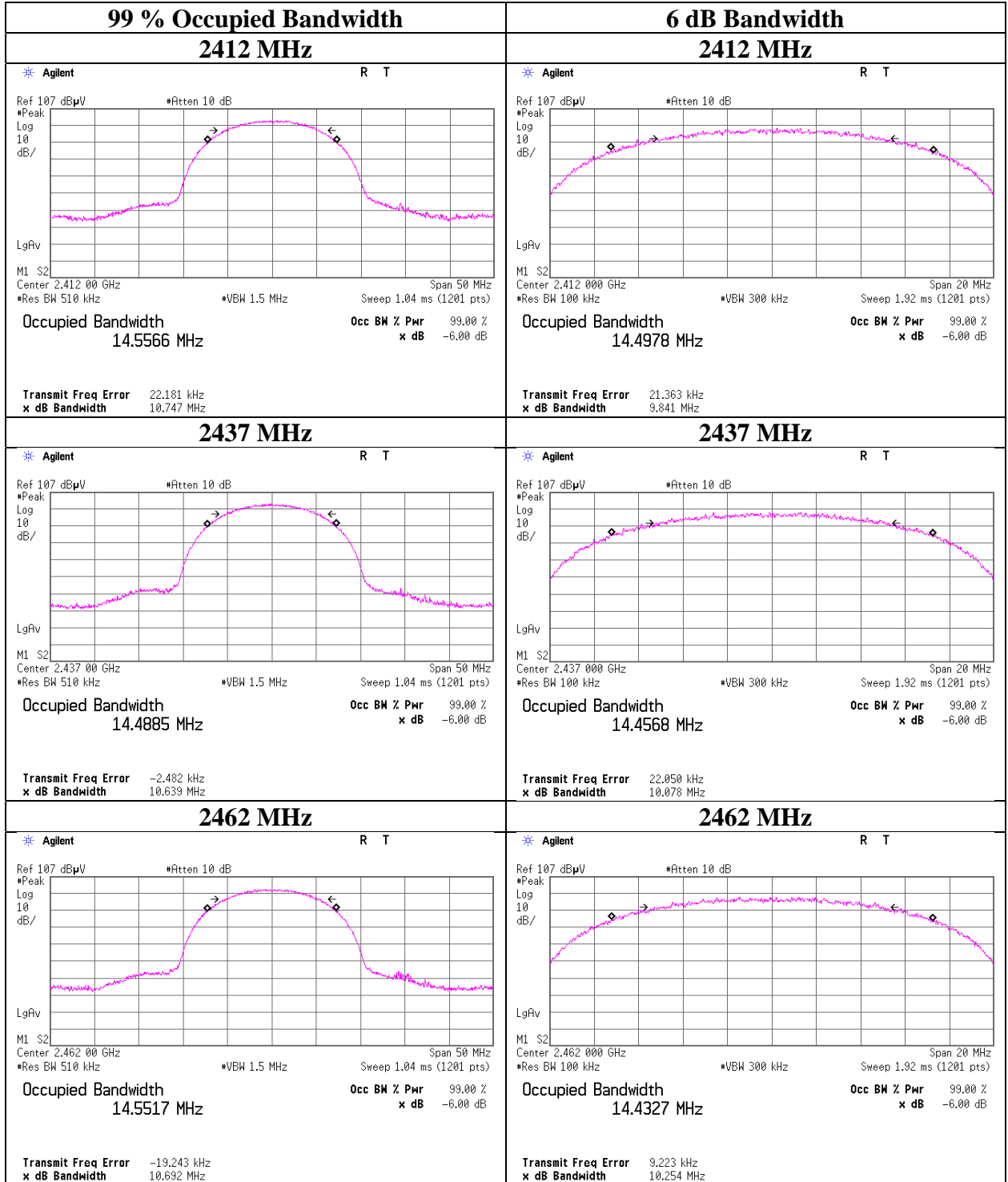
99 % Occupied Bandwidth and 6 dB Bandwidth

Report No. 13809761H
Test place Ise EMC Lab. No.8 Measurement Room
Date May 18, 2021
Temperature / Humidity 25.5 deg. C / 50 % RH
Engineer Akihiko Maeda
Mode Tx

Mode	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
11b	2412	14556.6	9.841	> 0.5000
	2437	14488.5	10.078	> 0.5000
	2462	14551.7	10.254	> 0.5000
11g	2412	17052.7	16.018	> 0.5000
	2437	16989.4	15.118	> 0.5000
	2462	16969.8	15.104	> 0.5000
11n-20	2412	18248.8	15.501	> 0.5000
	2437	18024.1	15.110	> 0.5000
	2462	18038.9	15.114	> 0.5000

99 % Occupied Bandwidth and 6 dB Bandwidth

11b



UL Japan, Inc.

Ise EMC Lab.

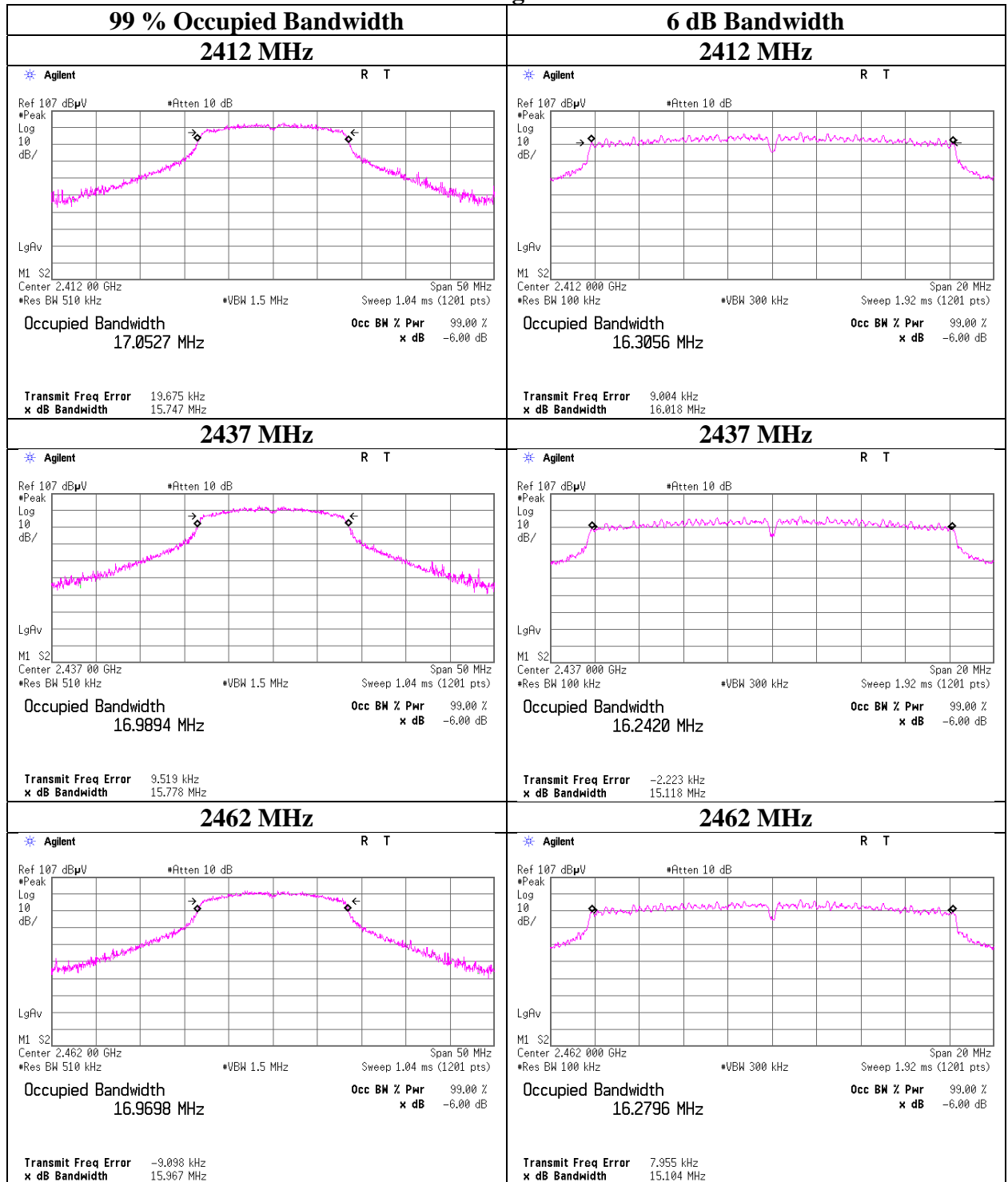
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth and 6 dB Bandwidth

11g



UL Japan, Inc.

Ise EMC Lab.

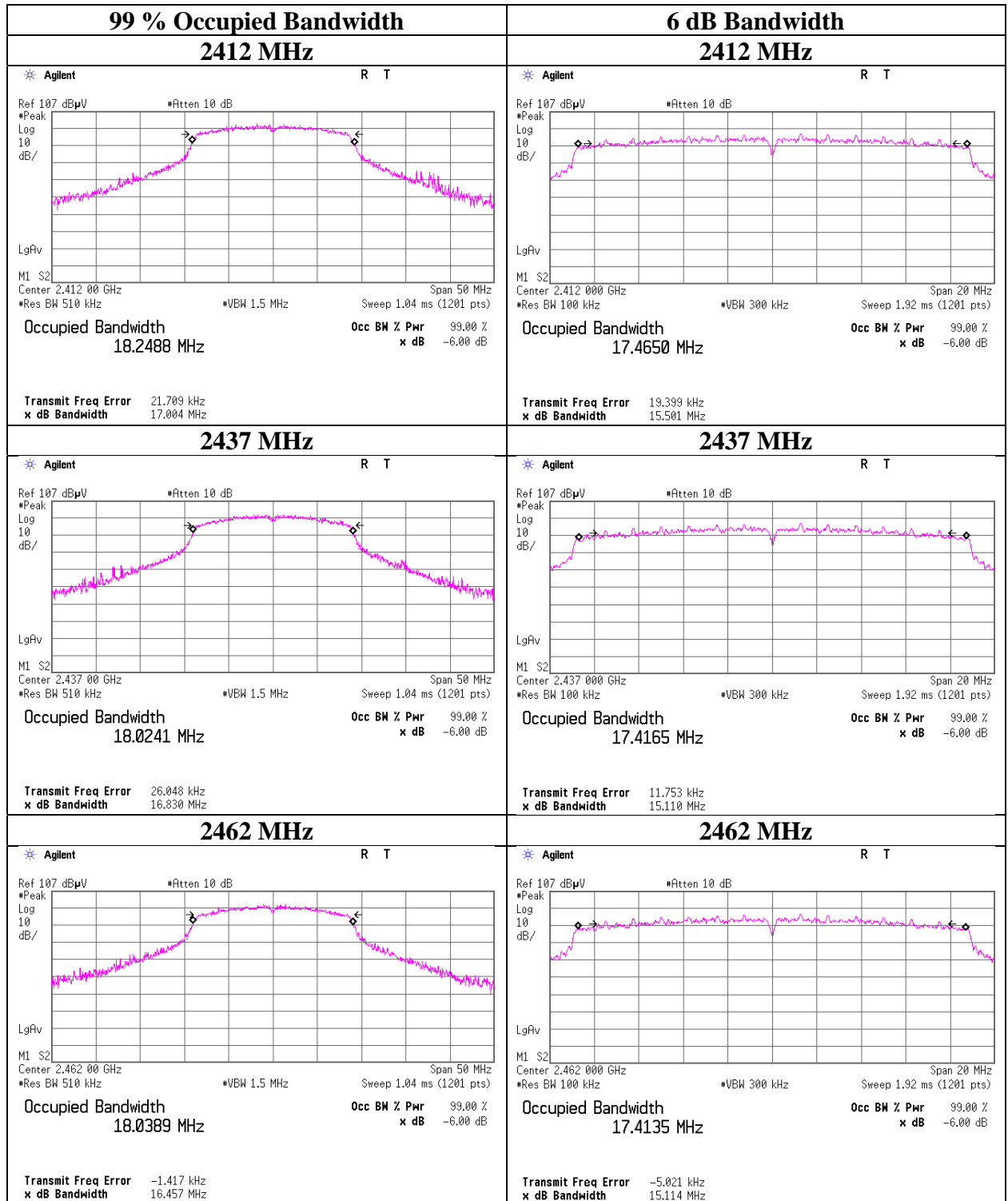
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20

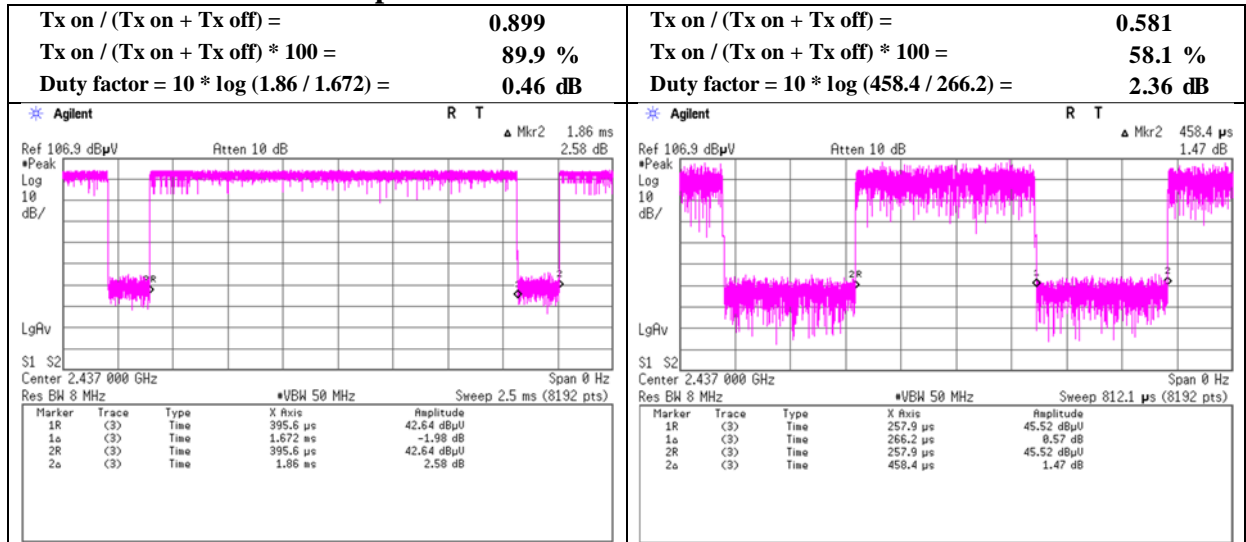


Burst rate confirmation

Report No. 13809761H
 Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date May 11, 2021
 Temperature / Humidity 21 deg. C / 45 % RH
 Engineer Takafumi Noguchi
 Mode Tx

11b 11 Mbps

11n-20 MCS 7



* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Radiated Spurious Emission

Report No. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH
Engineer Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz)
Mode Tx 11b 2412MHz

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	47.0	27.5	4.8	35.1	-	44.3	73.9	29.6	
Hori.	4824.000	PK	45.2	31.7	7.0	34.4	-	49.5	73.9	24.4	
Hori.	7236.000	PK	41.6	36.1	8.5	34.4	-	51.8	73.9	22.1	Floor noise
Hori.	9648.000	PK	43.2	38.7	9.0	35.0	-	56.0	73.9	18.0	Floor noise
Hori.	2390.000	AV	38.0	27.5	4.8	35.1	0.5	35.8	53.9	18.1	*1)
Hori.	4824.000	AV	37.4	31.7	7.0	34.4	0.5	42.2	53.9	11.8	
Hori.	7236.000	AV	34.3	36.1	8.5	34.4	-	44.5	53.9	9.4	Floor noise
Hori.	9648.000	AV	34.9	38.7	9.0	35.0	-	47.6	53.9	6.3	Floor noise
Vert.	2390.000	PK	46.9	27.5	4.8	35.1	-	44.1	73.9	29.8	
Vert.	4824.000	PK	45.1	31.7	7.0	34.4	-	49.4	73.9	24.6	
Vert.	7236.000	PK	42.3	36.1	8.5	34.4	-	52.5	73.9	21.4	Floor noise
Vert.	9648.000	PK	43.0	38.7	9.0	35.0	-	55.7	73.9	18.2	Floor noise
Vert.	2390.000	AV	36.9	27.5	4.8	35.1	0.5	34.6	53.9	19.3	*1)
Vert.	4824.000	AV	35.2	31.7	7.0	34.4	0.5	40.0	53.9	13.9	
Vert.	7236.000	AV	33.0	36.1	8.5	34.4	-	43.2	53.9	10.7	Floor noise
Vert.	9648.000	AV	34.9	38.7	9.0	35.0	-	47.6	53.9	6.3	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
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)

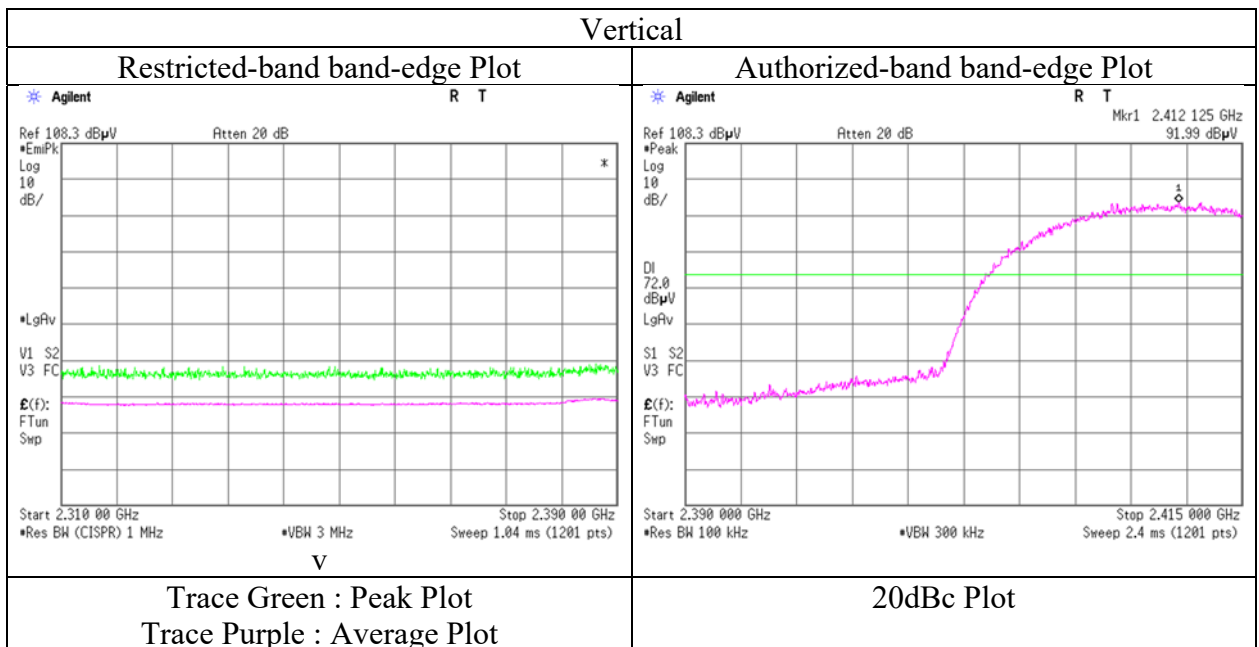
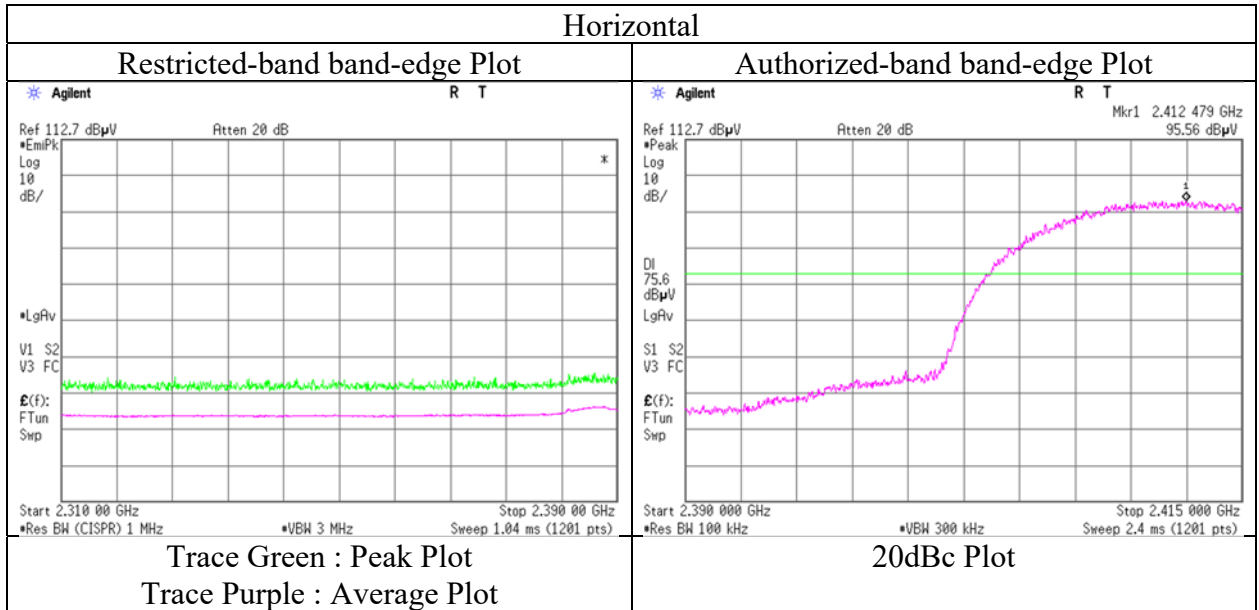
20dBc Data Sheet

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	95.6	27.5	4.8	35.1	92.8	-	-	Carrier
Hori.	2400.000	PK	47.9	27.5	4.8	35.1	45.1	72.8	27.7	
Vert.	2412.000	PK	92.0	27.5	4.8	35.1	89.2	-	-	Carrier
Vert.	2400.000	PK	45.3	27.5	4.8	35.1	42.5	69.2	26.7	

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

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021
Temperature / Humidity 21 deg. C / 45 % RH
Engineer Takafumi Noguchi
(1GHz - 10 GHz)
Mode Tx 11b 2412MHz



* 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. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH
Engineer Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz)
Mode Tx 11b 2437MHz

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.	4874.000	PK	43.4	31.5	7.0	34.4	-	47.5	73.9	26.4	
Hori.	7311.000	PK	41.8	36.2	8.5	34.4	-	52.1	73.9	21.8	Floor noise
Hori.	9748.000	PK	42.7	39.0	9.0	35.0	-	55.7	73.9	18.2	Floor noise
Hori.	4874.000	AV	37.0	31.5	7.0	34.4	0.5	41.5	53.9	12.4	
Hori.	7311.000	AV	34.3	36.2	8.5	34.4	-	44.6	53.9	9.3	Floor noise
Hori.	9748.000	AV	34.9	39.0	9.0	35.0	-	47.9	53.9	6.0	Floor noise
Vert.	4874.000	PK	44.6	31.5	7.0	34.4	-	48.7	73.9	25.2	
Vert.	7311.000	PK	42.6	36.2	8.5	34.4	-	52.9	73.9	21.0	Floor noise
Vert.	9748.000	PK	43.4	39.0	9.0	35.0	-	56.4	73.9	17.5	Floor noise
Vert.	4874.000	AV	37.8	31.5	7.0	34.4	0.5	42.4	53.9	11.5	
Vert.	7311.000	AV	34.8	36.2	8.5	34.4	-	45.1	53.9	8.8	Floor noise
Vert.	9748.000	AV	34.8	39.0	9.0	35.0	-	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 $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH
Engineer Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz)
Mode Tx 11b 2462MHz

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	46.4	27.3	4.9	35.0	-	43.6	73.9	30.3	
Hori.	4924.000	PK	43.4	31.4	7.0	34.4	-	47.4	73.9	26.5	
Hori.	7386.000	PK	41.9	36.2	8.5	34.4	-	52.2	73.9	21.7	Floor noise
Hori.	9848.000	PK	42.5	38.9	9.0	35.0	-	55.3	73.9	18.6	Floor noise
Hori.	2483.500	AV	37.8	27.3	4.9	35.0	0.5	35.4	53.9	18.5	*1)
Hori.	4924.000	AV	36.5	31.4	7.0	34.4	0.5	41.0	53.9	12.9	
Hori.	7386.000	AV	34.3	36.2	8.5	34.4	-	44.6	53.9	9.3	Floor noise
Hori.	9848.000	AV	35.0	38.9	9.0	35.0	-	47.8	53.9	6.1	Floor noise
Vert.	2483.500	PK	48.9	27.3	4.9	35.0	-	46.1	73.9	27.8	
Vert.	4924.000	PK	43.0	31.4	7.0	34.4	-	47.0	73.9	26.9	
Vert.	7386.000	PK	42.5	36.2	8.5	34.4	-	52.8	73.9	21.1	Floor noise
Vert.	9848.000	PK	43.1	38.9	9.0	35.0	-	56.0	73.9	17.9	Floor noise
Vert.	2483.500	AV	37.1	27.3	4.9	35.0	0.5	34.8	53.9	19.1	*1)
Vert.	4924.000	AV	35.6	31.4	7.0	34.4	0.5	40.1	53.9	13.8	
Vert.	7386.000	AV	34.2	36.2	8.5	34.4	-	44.5	53.9	9.4	Floor noise
Vert.	9848.000	AV	34.8	38.9	9.0	35.0	-	47.6	53.9	6.3	Floor noise

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

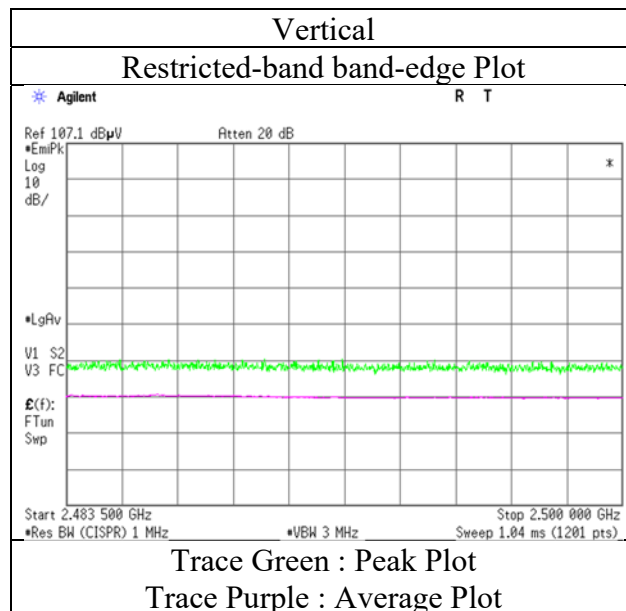
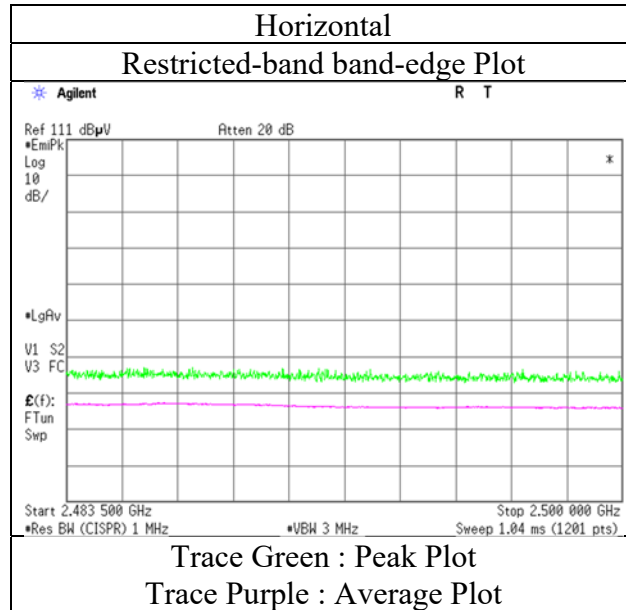
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
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. 13809761H
 Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date May 11, 2021
 Temperature / Humidity 21 deg. C / 45 % RH
 Engineer Takafumi Noguchi
 (1GHz - 10 GHz)
 Mode Tx 11b 2462MHz



* 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. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021 May 15, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH 21 deg. C / 44 % RH
Engineer Takafumi Noguchi Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz) (Below 1 GHz)
Mode Tx 11n-20 2412MHz

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.	172.067	QP	30.2	15.6	8.0	28.2	-	25.6	43.5	17.9	
Hori.	187.970	QP	34.8	15.9	8.1	28.1	-	30.7	43.5	12.8	
Hori.	236.000	QP	38.4	11.4	8.4	27.9	-	30.4	46.0	15.7	
Hori.	243.998	QP	36.4	11.7	8.5	27.9	-	28.7	46.0	17.3	
Hori.	336.772	QP	31.0	14.7	9.1	28.0	-	26.8	46.0	19.2	
Hori.	483.960	QP	30.3	17.5	9.8	29.1	-	28.4	46.0	17.6	
Hori.	639.994	QP	41.1	19.3	10.4	29.3	-	41.5	46.0	4.5	
Hori.	650.226	QP	33.5	19.3	10.4	29.3	-	33.9	46.0	12.1	
Hori.	873.611	QP	33.2	21.8	11.2	29.0	-	37.3	46.0	8.7	
Hori.	2390.000	PK	64.4	27.5	4.8	35.1	-	61.6	73.9	12.3	
Hori.	4824.000	PK	44.5	31.7	7.0	34.4	-	48.7	73.9	25.2	
Hori.	7236.000	PK	42.4	36.1	8.5	34.4	-	52.6	73.9	21.3	Floor noise
Hori.	9648.000	PK	43.0	38.7	9.0	35.0	-	55.7	73.9	18.2	Floor noise
Hori.	2390.000	AV	47.7	27.5	4.8	35.1	2.4	47.3	53.9	6.6	*1)
Hori.	4824.000	AV	37.5	31.7	7.0	34.4	2.4	44.1	53.9	9.8	
Hori.	7236.000	AV	34.3	36.1	8.5	34.4	-	44.5	53.9	9.4	Floor noise
Hori.	9648.000	AV	35.2	38.7	9.0	35.0	-	47.9	53.9	6.0	Floor noise
Vert.	172.067	QP	26.5	15.6	8.0	28.2	-	21.9	43.5	21.6	
Vert.	187.970	QP	23.5	15.9	8.1	28.1	-	19.4	43.5	24.1	
Vert.	236.000	QP	28.4	11.4	8.4	27.9	-	20.3	46.0	25.7	
Vert.	243.998	QP	29.4	11.7	8.5	27.9	-	21.7	46.0	24.3	
Vert.	336.772	QP	32.1	14.7	9.1	28.0	-	27.9	46.0	18.1	
Vert.	483.960	QP	38.6	17.5	9.8	29.1	-	36.7	46.0	9.3	
Vert.	639.994	QP	39.3	19.3	10.4	29.3	-	39.7	46.0	6.3	
Vert.	650.226	QP	33.9	19.3	10.4	29.3	-	34.3	46.0	11.7	
Vert.	873.611	QP	31.7	21.8	11.2	29.0	-	35.8	46.0	10.2	
Vert.	2390.000	PK	60.3	27.5	4.8	35.1	-	57.6	73.9	16.3	
Vert.	4824.000	PK	41.7	31.7	7.0	34.4	-	46.0	73.9	27.9	
Vert.	7236.000	PK	42.7	36.1	8.5	34.4	-	52.9	73.9	21.0	Floor noise
Vert.	9648.000	PK	42.4	38.7	9.0	35.0	-	55.1	73.9	18.8	Floor noise
Vert.	2390.000	AV	43.9	27.5	4.8	35.1	2.4	43.5	53.9	10.4	*1)
Vert.	4824.000	AV	35.3	31.7	7.0	34.4	2.4	42.0	53.9	12.0	
Vert.	7236.000	AV	34.2	36.1	8.5	34.4	-	44.4	53.9	9.5	Floor noise
Vert.	9648.000	AV	35.0	38.7	9.0	35.0	-	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 $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
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	94.6	27.5	4.8	35.1	91.9	-	-	Carrier
Hori.	2400.000	PK	65.1	27.5	4.8	35.1	62.4	71.9	9.5	
Vert.	2412.000	PK	89.4	27.5	4.8	35.1	86.7	-	-	Carrier
Vert.	2400.000	PK	59.4	27.5	4.8	35.1	56.6	66.7	10.0	

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

UL Japan, Inc.

Ise EMC Lab.

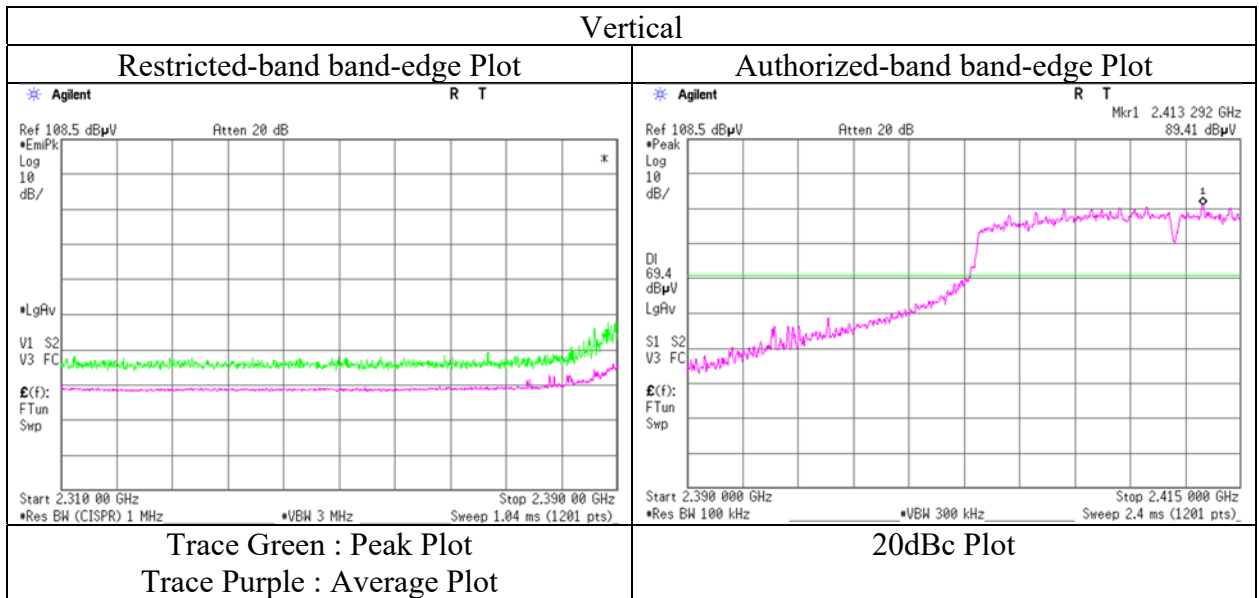
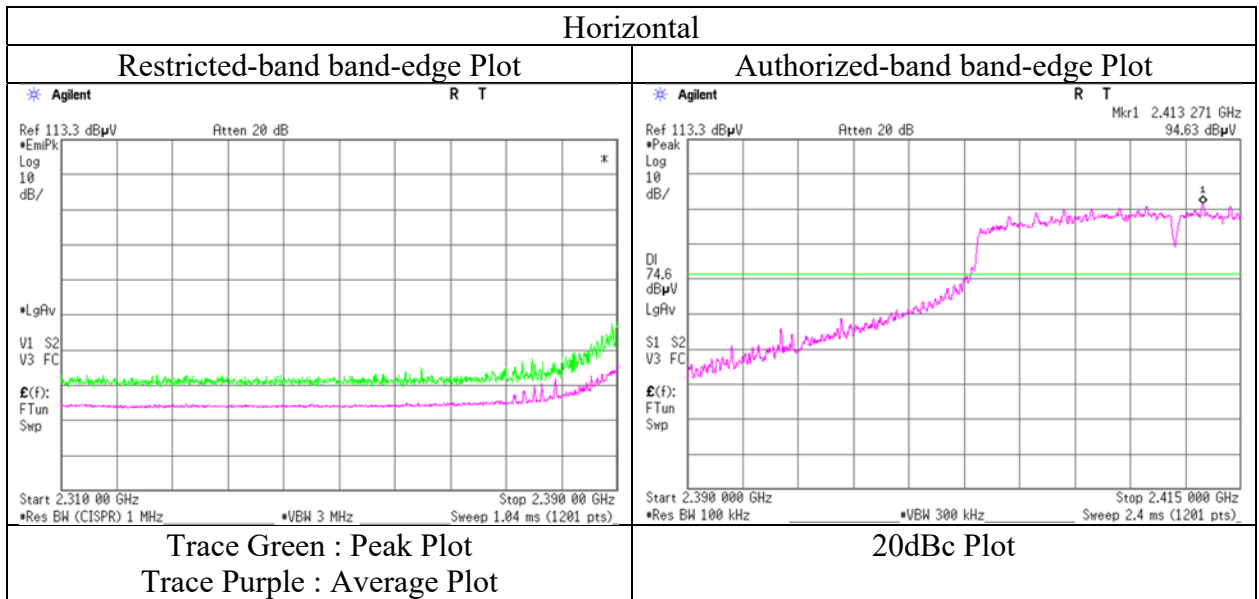
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021
Temperature / Humidity 21 deg. C / 45 % RH
Engineer Takafumi Noguchi
(1GHz - 10 GHz)
Mode Tx 11n-20 2412MHz



* 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. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH
Engineer Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz)
Mode Tx 11n-20 2437MHz

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.	4874.000	PK	42.5	31.5	7.0	34.4	-	46.6	73.9	27.3	
Hori.	7311.000	PK	42.1	36.2	8.5	34.4	-	52.4	73.9	21.5	Floor noise
Hori.	9748.000	PK	43.0	39.0	9.0	35.0	-	56.0	73.9	17.9	Floor noise
Hori.	4874.000	AV	37.0	31.5	7.0	34.4	2.4	43.4	53.9	10.5	
Hori.	7311.000	AV	34.4	36.2	8.5	34.4	-	44.6	53.9	9.3	Floor noise
Hori.	9748.000	AV	34.8	39.0	9.0	35.0	-	47.8	53.9	6.1	Floor noise
Vert.	4874.000	PK	43.9	31.5	7.0	34.4	-	48.0	73.9	25.9	
Vert.	7311.000	PK	42.1	36.2	8.5	34.4	-	52.4	73.9	21.5	Floor noise
Vert.	9748.000	PK	42.8	39.0	9.0	35.0	-	55.8	73.9	18.1	Floor noise
Vert.	4874.000	AV	35.6	31.5	7.0	34.4	2.4	42.1	53.9	11.9	
Vert.	7311.000	AV	34.4	36.2	8.5	34.4	-	44.7	53.9	9.2	Floor noise
Vert.	9748.000	AV	34.7	39.0	9.0	35.0	-	47.7	53.9	6.3	Floor noise

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

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

Distance factor: 1 GHz - 10 GHz $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
10 GHz - 26.5 GHz $20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission

Report No. 13809761H
Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
Date May 11, 2021 May 13, 2021
Temperature / Humidity 21 deg. C / 45 % RH 21 deg. C / 42 % RH
Engineer Takafumi Noguchi Takafumi Noguchi
(1GHz - 10 GHz) (Above 10 GHz)
Mode Tx 11n-20 2462MHz

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	62.7	27.3	4.9	35.0	-	59.9	73.9	14.0	
Hori.	4924.000	PK	42.2	31.4	7.0	34.4	-	46.2	73.9	27.7	
Hori.	7386.000	PK	42.7	36.2	8.5	34.4	-	53.0	73.9	20.9	Floor noise
Hori.	9848.000	PK	43.4	38.9	9.0	35.0	-	56.2	73.9	17.7	Floor noise
Hori.	2483.500	AV	45.4	27.3	4.9	35.0	2.4	44.9	53.9	9.0	*1)
Hori.	4924.000	AV	36.0	31.4	7.0	34.4	2.4	42.4	53.9	11.5	
Hori.	7386.000	AV	34.4	36.2	8.5	34.4	-	44.7	53.9	9.2	Floor noise
Hori.	9848.000	AV	34.9	38.9	9.0	35.0	-	47.7	53.9	6.2	Floor noise
Vert.	2483.500	PK	60.9	27.3	4.9	35.0	-	58.1	73.9	15.8	
Vert.	4924.000	PK	42.4	31.4	7.0	34.4	-	46.4	73.9	27.5	
Vert.	7386.000	PK	42.7	36.2	8.5	34.4	-	53.0	73.9	20.9	Floor noise
Vert.	9848.000	PK	43.5	38.9	9.0	35.0	-	56.3	73.9	17.6	Floor noise
Vert.	2483.500	AV	45.1	27.3	4.9	35.0	2.4	44.6	53.9	9.3	*1)
Vert.	4924.000	AV	36.1	31.4	7.0	34.4	2.4	42.5	53.9	11.4	
Vert.	7386.000	AV	34.3	36.2	8.5	34.4	-	44.6	53.9	9.3	Floor noise
Vert.	9848.000	AV	34.9	38.9	9.0	35.0	-	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

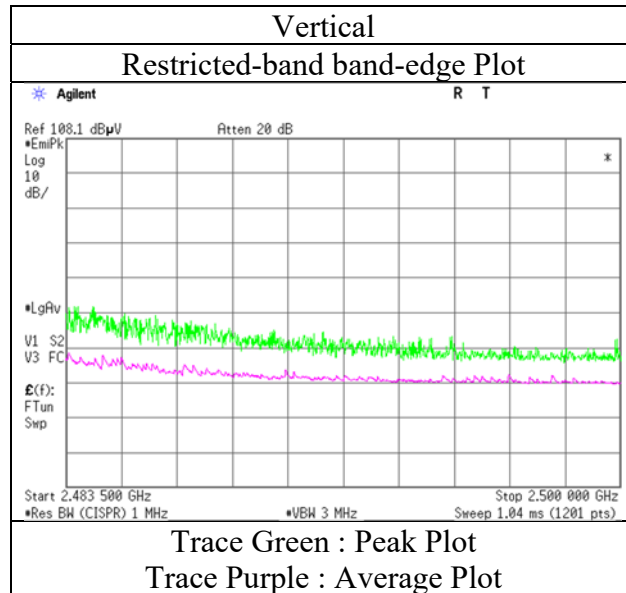
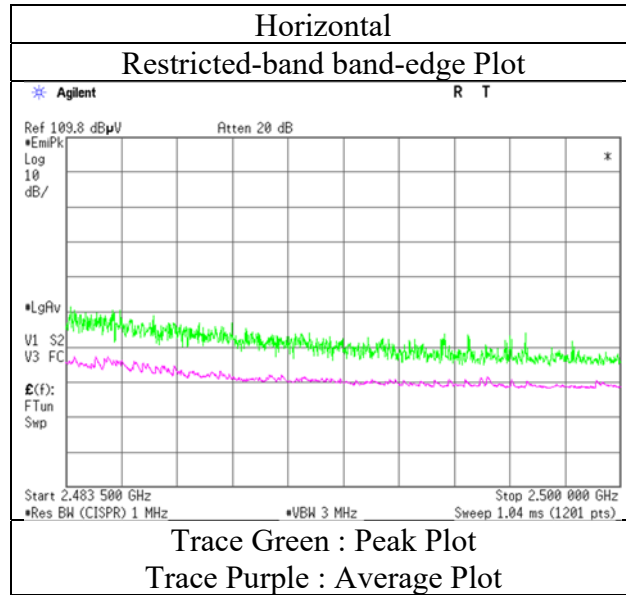
*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

Distance factor: 1 GHz - 10 GHz $20\log(3.65\text{ m} / 3.0\text{ m}) = 1.71\text{ dB}$
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)

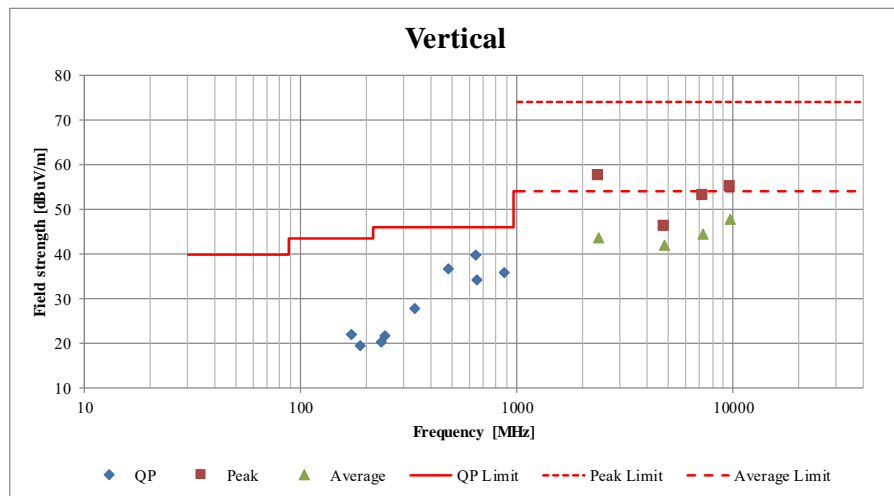
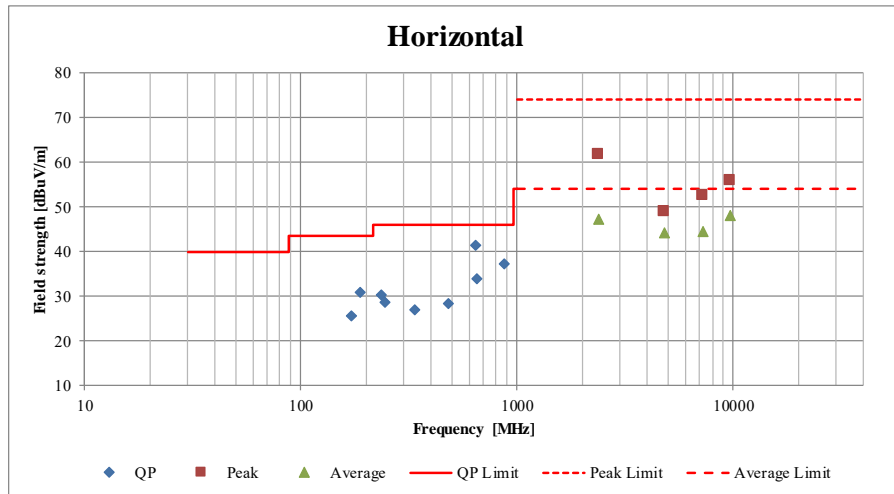
Report No. 13809761H
 Test place Ise EMC Lab. No.2 Semi Anechoic Chamber
 Date May 11, 2021
 Temperature / Humidity 21 deg. C / 45 % RH
 Engineer Takafumi Noguchi
 (1GHz - 10 GHz)
 Mode Tx 11n-20 2412 MHz



* 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
(Plot data, Worst case)

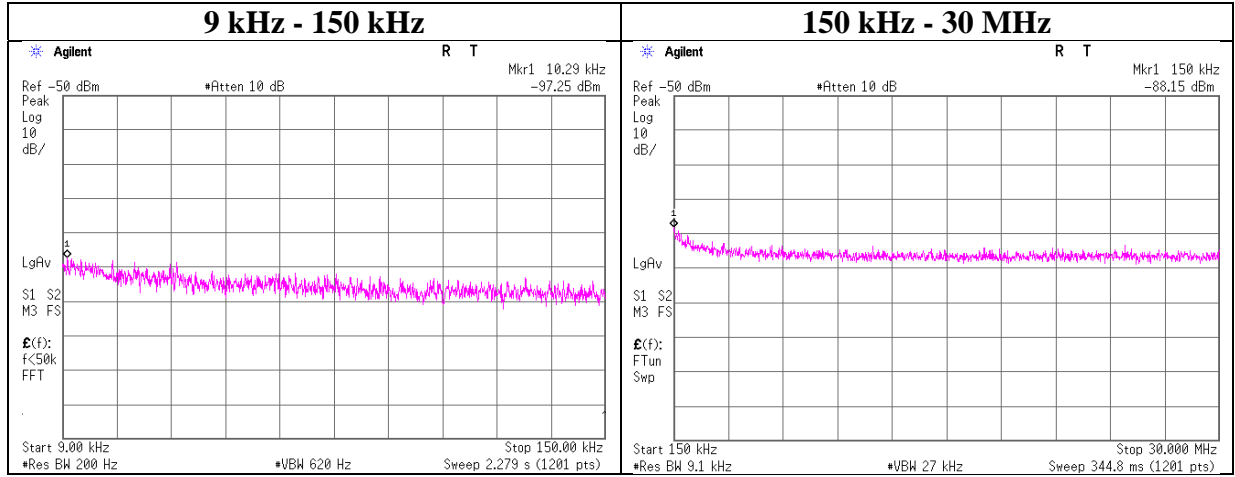
Report No.	13809761H		
Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber		
Date	May 11, 2021	May 13, 2021	May 15, 2021
Temperature / Humidity	21 deg. C / 45 % RH	21 deg. C / 42 % RH	21 deg. C / 44 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi	Takafumi Noguchi
	(1GHz - 10 GHz)	(Above 10 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2412MHz		



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

Conducted Spurious Emission

Report No. 13809761H
 Test place Ise EMC Lab. No.8 Measurement Room
 Date May 18, 2021
 Temperature / Humidity 25.5 deg. C / 50 % RH
 Engineer Akihiko Maeda
 Mode Tx 11n-20 2412 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.29	-97.3	0.50	9.8	2.0	1	-84.9	300	6.0	-23.7	47.3	71.0	
150.00	-88.2	0.51	9.8	2.0	1	-75.8	300	6.0	-14.5	24.0	38.5	

$$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log(\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$$

$$\text{EIRP [dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log(N)$$

N: Number of output

*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/18/2020	12
RE	MHF-25	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/23/2020	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/18/2021	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/1902S579(5m)	03/04/2021	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	10/01/2020	12
RE	MAEC-02	142004	AC2 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/26/2020	24
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/06/2020	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/18/2020	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MHF-16	141406	High Pass Filter 7-20GHz	TOKIMEC	TF37NCCA	7001	09/23/2020	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	06/15/2020	12
RE	MAEC-02-SVSWR	142006	AC2 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
RE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	08/18/2020	12
RE	MCC-12	141317	Coaxial Cable	UL Japan Inc.	-	-	09/25/2020	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/18/2021	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B+BBA9106	8031	07/29/2020	12
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/29/2020	12
RE	MAT-07	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/13/2020	12
RE	MAEC-02-SVSWR	142006	AC2 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
AT	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/10/2021	12
AT	MCC-92	141398	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	30813/2	05/11/2021	12
AT	MAT-57	141333	Attenuator(10dB)	Suhner	6810.19.A	-	12/07/2020	12
AT	MCC-64	141327	Coaxial Cable	UL Japan	-	-	02/03/2021	12
AT	MAT-10	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/13/2020	12
AT	MOS-28	141567	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0008	01/15/2021	12
AT	MMM-17	141557	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	70900530	01/07/2021	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.

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

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