RADIO TEST REPORT

Test Report No. 14851969M-A-R2

Customer	**Panasonic Automotive Systems Co., Ltd.**
Description of EUT	**Drive Recorder**
Model Number of EUT	**AN2302**
FCC ID	**ACJ932AN2302**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**September 12, 2023**
Remarks	**-**

Representative Test Engineer	Approved By
Hiromitsu Tanabe Engineer	Kazuhiro Ando Engineer

CERTIFICATE 1266.01

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

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- The information provided from the customer for this report is identified in Section 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No. 14851969M-A

This report is a revised version of 14851969M-A-R1. 14851969M-A-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14851969M-A	July 10, 2023	-
1	14851969M-A-R1	August 25, 2023	P.1, P.5, P.11 - Correction of the Model Number of EUT; From “CY-VNMDN0AD” to “AN2302” P.5 - Correction of the Antenna Gain; From “0.4 dBi” to “1.0 dBi” P.19 to P.21 - Correction of the Antenna Gain and associated data.
2	14851969M-A-R2	September 12, 2023	P.23 - Added the measurement data of the Duty Factor for 11n-20 MCS 0

Reference: Abbreviations (Including words undescribed in this report)

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

CONTENTS PAGE

SECTION 1: Customer Information

Company Name	Panasonic Automotive Systems Co., Ltd.
Address	4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken, Japan 224-8520
Telephone Number	+81-45-555-8145
Contact Person	Yuki Nagano

The information provided from the customer is as follows;
- Customer, Description 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 and Test 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

Description	Drive Recorder
Model Number	AN2302
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	June 20, 2023
Test Date	June 22 to 29, 2023

2.2 Product Description

General Specification

Rating	DC 6.0 V to 16.0 V (Typical: DC 13.2 V)
Operating temperature	-30 deg. C to 85 deg. C

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	1.0 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
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	**FCC:** Section 15.207	N/A	N/A	*1)
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	2.6 dB 191.527 MHz, QP, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)
	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: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.
* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

*1) The test is not applicable since the EUT does not have AC Mains.
*2) 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.

FCC Part 15.31 (e)
This EUT provides the stable voltage constantly to RF Module regardless of input voltage.
Therefore, this EUT complies with the requirement.

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

3.3 Addition to Standard

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
99% Occupied Bandwidth	**ISED:** RSS-Gen 6.7	**ISED:** -	N/A	-	Conducted

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

3.4 Uncertainty

Measurement uncertainty is not taken into account when stating conformity with a specified requirement.
Note: When margins obtained from test results are less than the measurement uncertainty, the test results may exceed the limit.

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

Conducted emission

Frequency range	Uncertainty (+/-)
0.15 MHz to 30 MHz	3.2 dB

Radiated emission

Measurement distance	Frequency range	Uncertainty (+/-)
3 m	9 kHz to 30 MHz	2.9 dB
	30 MHz to 200 MHz	6.2 dB
	200 MHz to 1000 MHz	6.3 dB
	1 GHz to 6 GHz	5.0 dB
	6 GHz to 18 GHz	5.4 dB
	18 GHz to 40 GHz	5.5 dB
1 m	1 GHz to 18 GHz	5.4 dB
	18 GHz to 40 GHz	5.6 dB
0.5 m	26.5 GHz to 40 GHz	5.9 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
6 dB Bandwidth / 99 % Occupied Bandwidth	1.6 %
Maximum Output Power	0.73 dB
Burst Rate	0.256 %
Power Density	2.2 dB
Conducted Spurious Emission (9 kHz to 30 MHz)	2.2 dB

3.5 Test Location

UL Japan, Inc. Kashima EMC Lab.
1614 Mushihata, Katori-shi, Chiba-ken, 289-0341 Japan
Telephone: +81-478-88-6500
A2LA Certificate Number: 1266.01 / FCC Test Firm Registration Number: 910230
ISED Lab Company Number: 4659A / CAB identifier: JP0006

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Open site	6.0 x 5.5 x 2.5	20 x 40	10 m
No.5 Open site	8.6 x 7.1 x 2.4	18 x 23	10 m
No.1 Shielded room	5.4 x 4.5 x 2.3	-	-
No.5 Shielded Room	4.2 x 3.1 x 2.5	-	-
No.9 Shielded Room	6.1 x 3.6 x 2.8	-	-
No.6 Semi-anechoic Chamber	8.5 x 5.5 x 5.2	-	3 m
No.10 Semi-anechoic Chamber	18.4 x 9.9 x 7.7	-	10 m
No.11 Semi-anechoic Chamber	9.0 x 6.5 x 5.2	-	3 m
No.1 Measurement room	5.0 x 3.7 x 2.6	-	-
No.2 Measurement room	4.3 x 4.4 x 2.7	-	-

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)

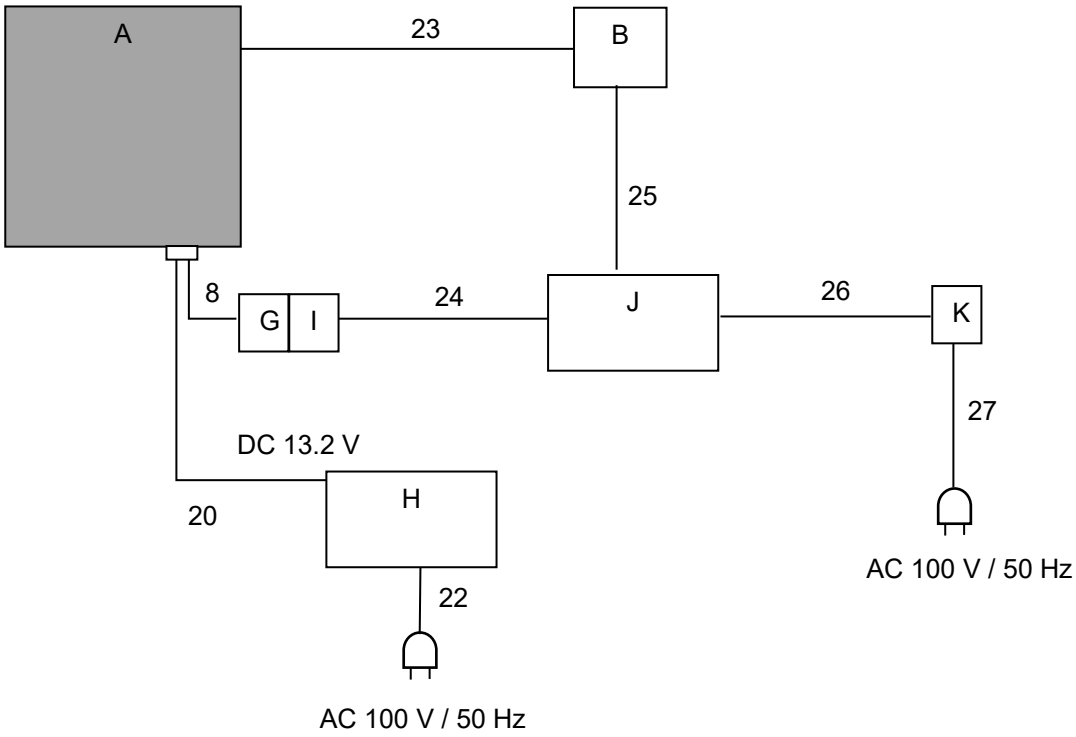
Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 2, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power Setting: 7 dBm (Setting: 16) Software: Factory inspection command sender Version: 1.01 (Date: 2023.02.27, 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. 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.	

*The Details of Operating Mode(s)

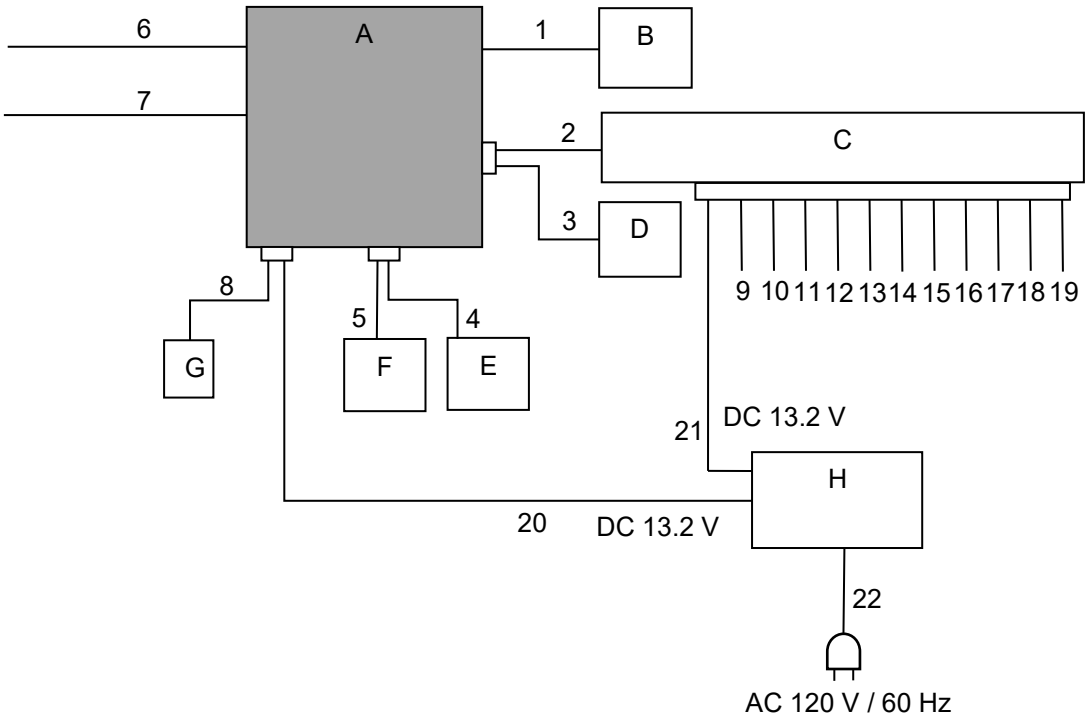
Test Item	Operating Mode	Tested Frequency
Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	Tx 11g *1)	2437 MHz
Radiated Spurious Emission (Above 1 GHz), 6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	Tx 11b Tx 11g Tx 11n-20	2412 MHz 2437 MHz 2462 MHz
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.		

4.2 Configuration and Peripherals

Antenna Terminal conducted test



Radiated 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	Drive Recorder	AN2302	BOMPAK-DVR-PP0-1-077	Panasonic Automotive Systems Co., Ltd.	EUT
B	Control Board	20 D J1192	031	Panasonic Automotive Systems Co., Ltd.	-
C	Monitor	CX-SNM9X3AD	500554	Panasonic Automotive Systems Co., Ltd.	-
D	Rear Camera	GP-KDL6A1EC	24C200068	Panasonic Automotive Systems Co., Ltd.	-
E	Front Camera	903-0111	130458-12	Panasonic Automotive Systems Co., Ltd.	-
F	In Camera	903-0112	93423-2	Panasonic Automotive Systems Co., Ltd.	-
G	RS-232C Adapter	-	-	Panasonic Automotive Systems Co., Ltd.	-
H	DC Power Supply	GSV3000	1708192899	DIAMOND ANTENNA	-
I	RS-232C USB Converter	CANUSB	AM-NDVR061	LAWICEL	-
J	Laptop PC	E130	LR-L593L	Lenovo	-
K	AC Adapter	92P1156	11S92P1156Z1 ZDXN26D4TC	Lenovo	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Communication Cable	0.25	Shielded	Shielded	-
2	Monitor Cable	2.0	Shielded	Shielded	-
3	Rear camera Cable	2.0	Shielded	Shielded	-
4	Front camera Cable	2.0	Shielded	Shielded	-
5	In camera Cable	2.0	Shielded	Shielded	-
6	Signal Cable	1.0	Shielded	Shielded	-
7	Signal Cable	2.0	Shielded	Shielded	-
8	CAN_L, CAN_H	3.2	Unshielded	Unshielded	-
9	CAM_L	2.0	Unshielded	Unshielded	-
10	CAM_H	2.0	Unshielded	Unshielded	-
11	CAM_GND	2.0	Unshielded	Unshielded	-
12	AVM_REQ/REV_DET	2.0	Unshielded	Unshielded	-
13	AVM_CHG/CAM_6V	2.0	Unshielded	Unshielded	-
14	UART_TX	2.0	Unshielded	Unshielded	-
15	UART_RX	2.0	Unshielded	Unshielded	-
16	ILL_DET	2.0	Unshielded	Unshielded	-
17	OEC+(MIRROR_CONT(+))	2.0	Unshielded	Unshielded	-
18	GND(MIRROR_CONT(-))	2.0	Unshielded	Unshielded	-
19	VIDEO	2.0	Unshielded	Unshielded	-
20	DC Cable	2.1	Unshielded	Unshielded	-
21	DC Cable	2.1	Unshielded	Unshielded	-
22	AC Cable	1.8	Unshielded	Unshielded	2-wire
23	Flat Cable	0.2	Unshielded	Unshielded	-
24	USB Cable	1.0	Shielded	Shielded	-
25	USB Cable	2.0	Shielded	Shielded	-
26	DC Cable	1.8	Unshielded	Unshielded	-
27	AC Cable	1.5	Unshielded	Unshielded	2-wire

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 0.5 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. 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 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.
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	Below 1 GHz	Above 1 GHz
Antenna Type	Hybrid	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.

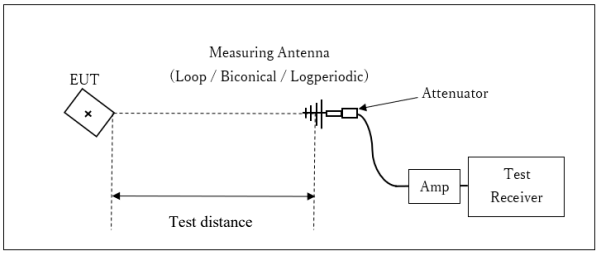
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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.

Figure 2: Test Setup

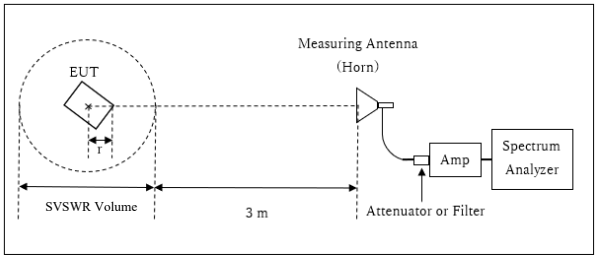
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

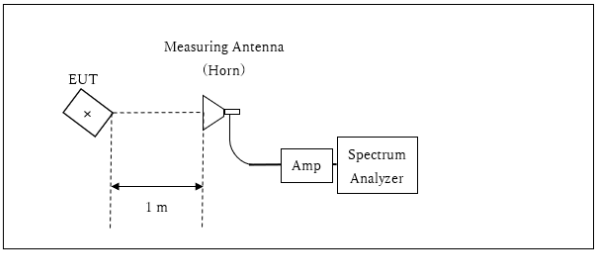


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.9 m / 3.0 m) = 2.28 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.9 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.1 m

10 GHz to 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB
*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 10 GHz)	Spurious (10 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)
Horizontal	Y	Y	Y	X	Y	Z
Vertical	Y	Y	Y	X	Y	X

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

Measurement Range : 30 MHz to 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	50 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
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) 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 Ohmes. 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

APPENDIX 1: Test Data

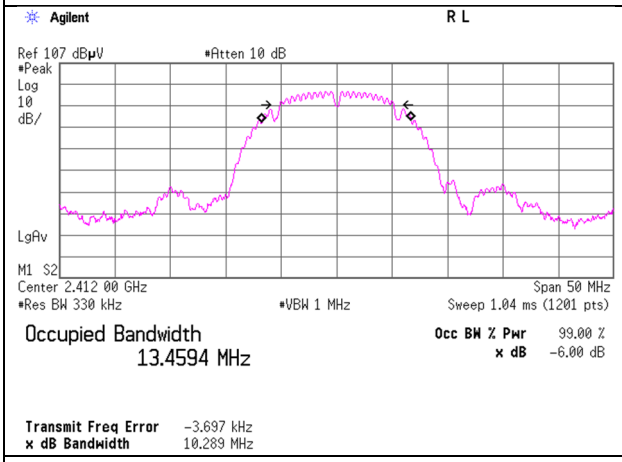
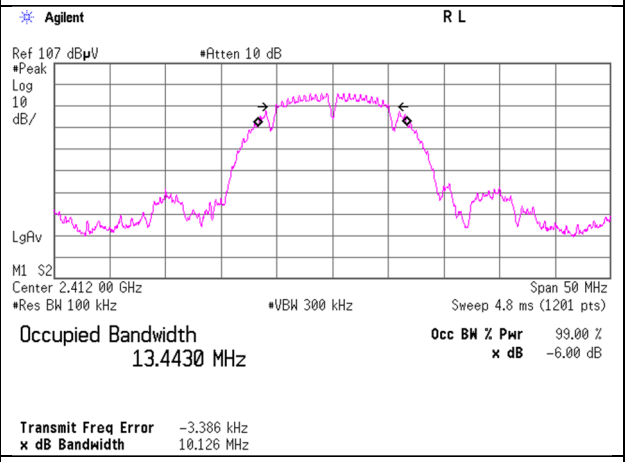
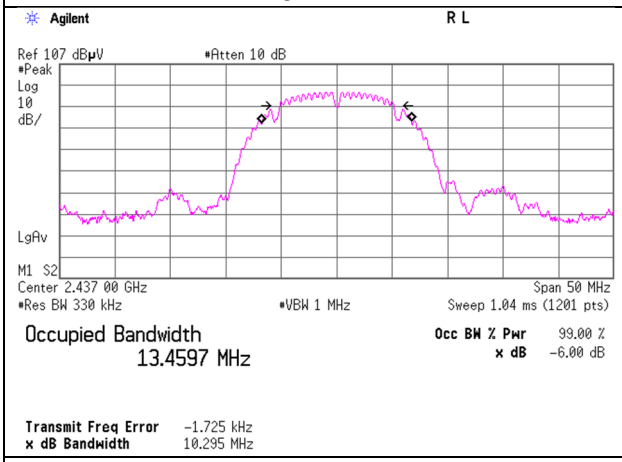
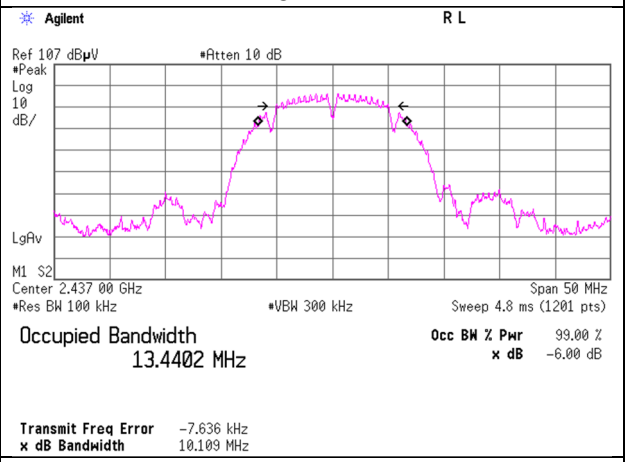
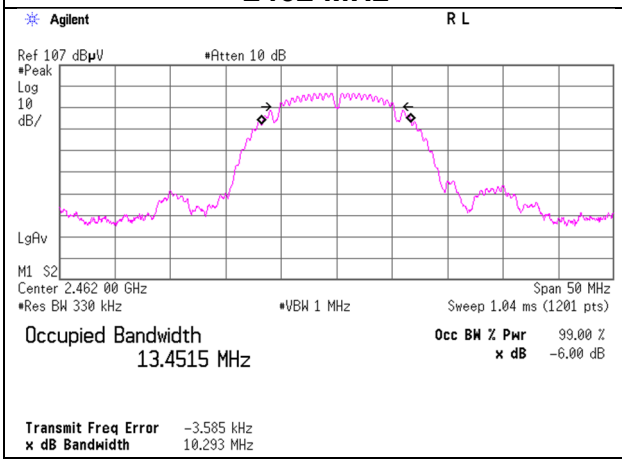
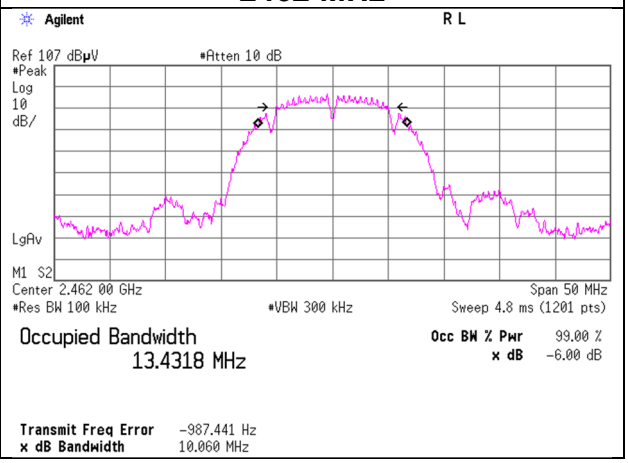
99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 23, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	13459.4	10.126	> 0.5000
	2437	***13459.7***	10.109	> 0.5000
	2462	13451.5	10.060	> 0.5000
11g	2412	16999.8	16.431	> 0.5000
	2437	***17039.1***	16.442	> 0.5000
	2462	17014.4	16.407	> 0.5000
11n-20	2412	17848.1	17.638	> 0.5000
	2437	***17851.1***	17.648	> 0.5000
	2462	17851.0	17.663	> 0.5000

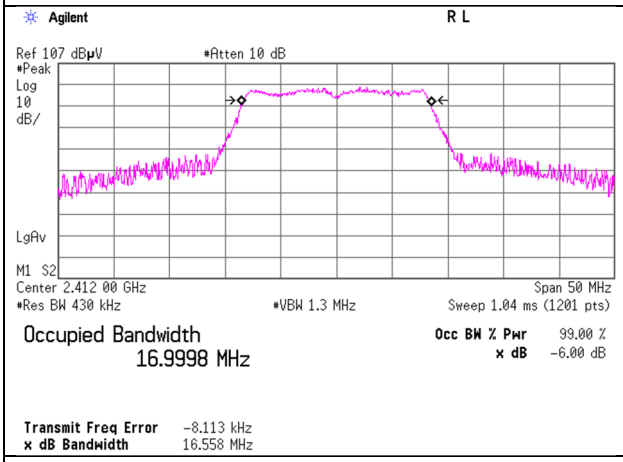
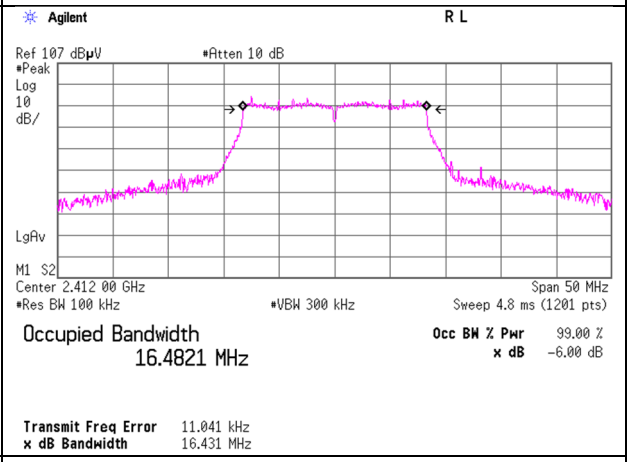
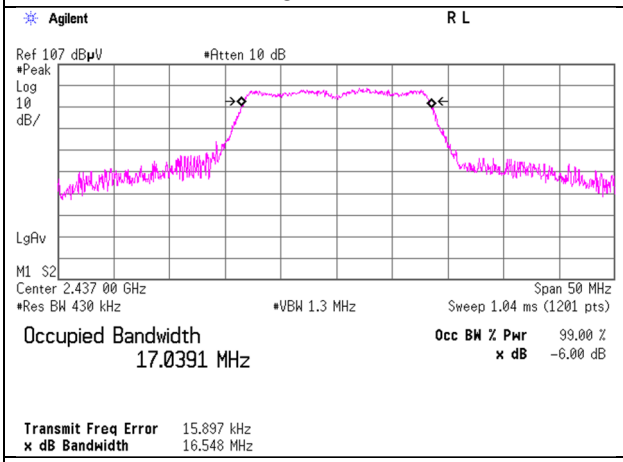
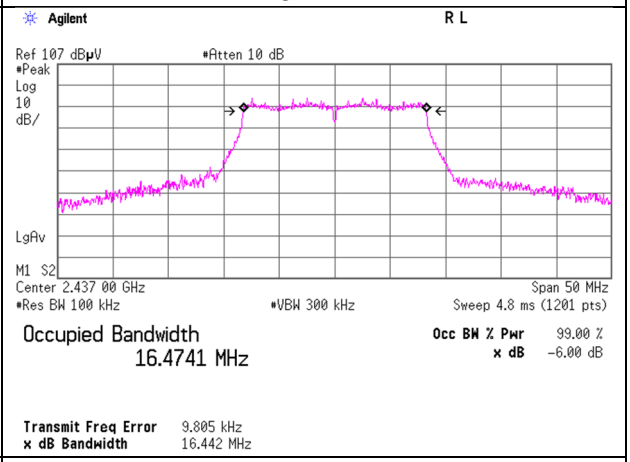
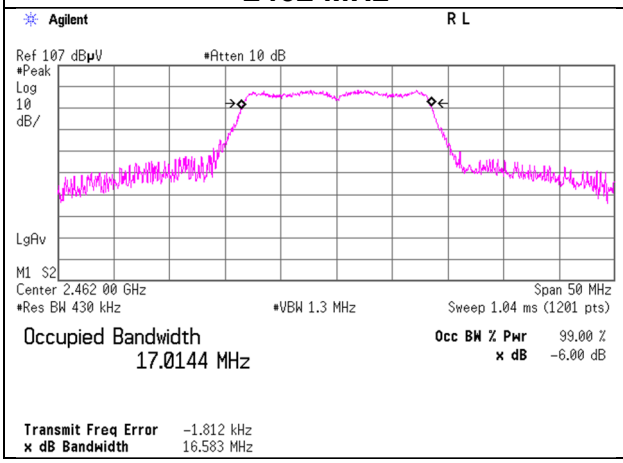
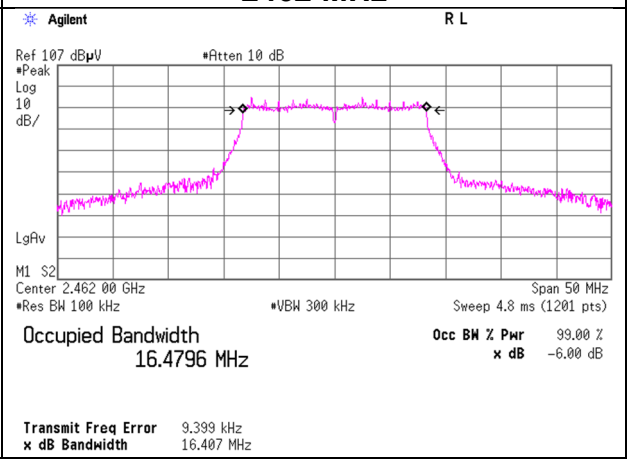
99 % Occupied Bandwidth and 6 dB Bandwidth

11b

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

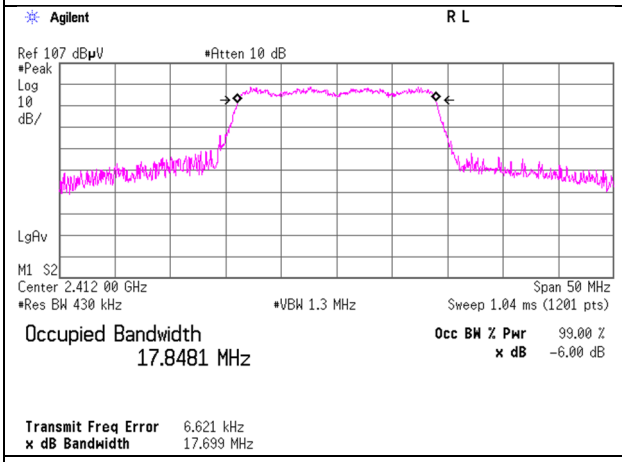
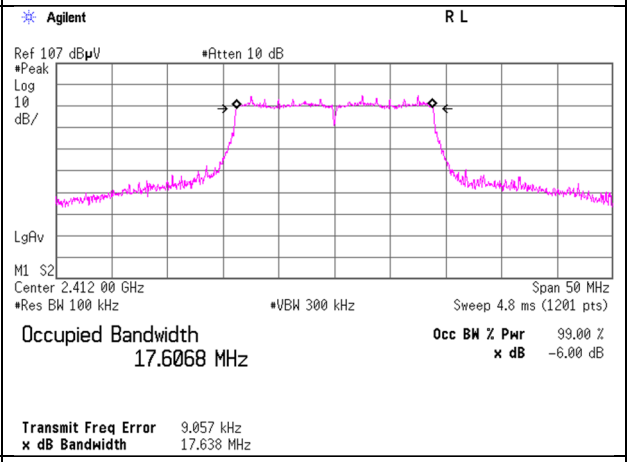
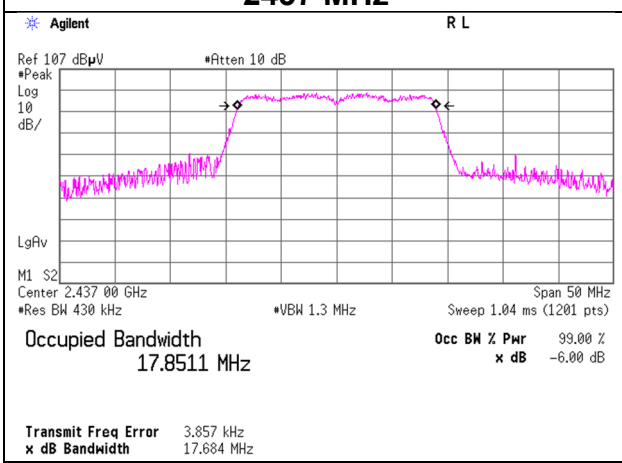
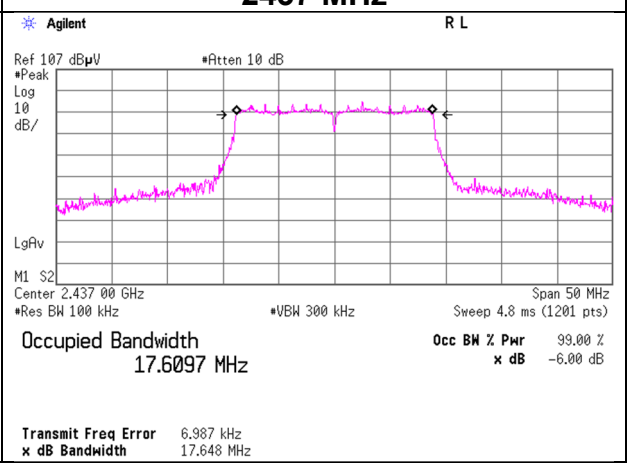
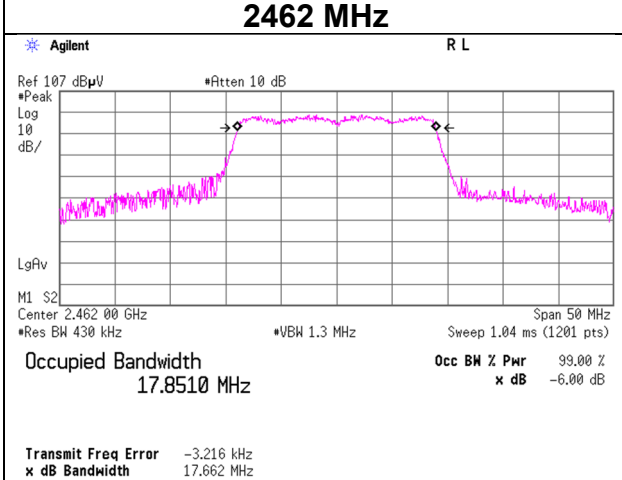
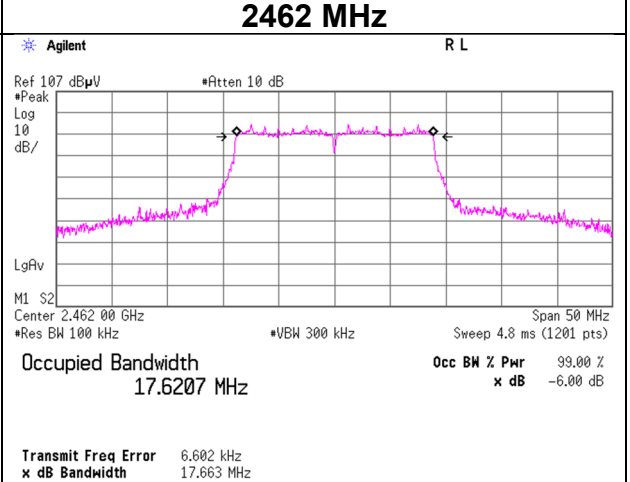
99 % Occupied Bandwidth and 6 dB Bandwidth

11g

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20

99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

Maximum Peak Output Power

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 22, 2023
Temperature / Humidity	23 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	-1.58	1.69	10.05	10.16	10.38	30.00	1000	19.84	1.0	11.16	13.06	36.02	4000	24.86
2437	-1.46	1.69	10.05	***10.28***	***10.67***	30.00	1000	19.72	1.0	***11.28***	***13.43***	36.02	4000	24.74
2462	-1.48	1.70	10.05	10.27	10.64	30.00	1000	19.73	1.0	11.27	13.40	36.02	4000	24.75

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-1.46	*
2	-1.52	
5.5	-1.50	
11	-1.47	

*: Worst Rate
All comparisons were carried out on the same frequency and measurement factors.

Maximum Peak Output Power

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 23, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx 11g

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	4.44	1.69	10.05	16.18	41.50	30.00	1000	13.82	1.0	17.18	52.24	36.02	4000	18.84
2437	4.68	1.69	10.05	***16.42***	***43.85***	30.00	1000	13.58	1.0	***17.42***	***55.21***	36.02	4000	18.60
2462	4.58	1.70	10.05	16.33	42.95	30.00	1000	13.67	1.0	17.33	54.08	36.02	4000	18.69

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	4.68	*
9	4.53	
12	4.58	
18	4.60	
24	4.58	
36	4.55	
48	4.54	
54	4.55	

*: Worst Rate
All comparisons were carried out on the same frequency and measurement factors.

Maximum Peak Output Power

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 23, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx 11n-20

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	4.41	1.69	10.05	16.15	41.21	30.00	1000	13.85	1.0	17.15	51.88	36.02	4000	18.87
2437	4.52	1.69	10.05	16.26	42.27	30.00	1000	13.74	1.0	17.26	53.21	36.02	4000	18.76
2462	4.55	1.70	10.05	***16.30***	***42.66***	30.00	1000	13.70	1.0	***17.30***	***53.70***	36.02	4000	18.72

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

MCS Number	Reading [dBm]	Remark
0	4.50	
1	4.49	
2	4.52	*
3	4.50	
4	4.51	
5	4.51	
6	4.51	
7	4.50	

*: Worst MCS
All comparisons were carried out on the same frequency and measurement factors.

Average Output Power
(Reference data for RF Exposure)

Test place	Kashima EMC Lab. No.2 Measurement Room	
Date	June 22, 2023	June 23, 2023
Temperature / Humidity	23 deg. C / 47 % RH	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe
Mode	Tx	

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-4.34	1.69	10.05	7.40	5.50	0.00	7.40	5.50
2437	-4.26	1.69	10.05	***7.48***	***5.60***	0.00	***7.48***	***5.60***
2462	-4.28	1.70	10.05	7.47	5.58	0.00	7.47	5.58

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-4.47	1.69	10.05	7.27	5.33	0.02	7.29	5.36
2437	-4.37	1.69	10.05	***7.37***	***5.46***	0.02	***7.39***	***5.48***
2462	-4.41	1.70	10.05	7.34	5.42	0.02	7.36	5.45

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-4.27	1.69	10.05	7.47	5.58	0.01	7.48	5.60
2437	-4.21	1.69	10.05	***7.53***	***5.66***	0.01	***7.54***	***5.68***
2462	-4.22	1.70	10.05	***7.53***	***5.66***	0.01	***7.54***	***5.68***

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.

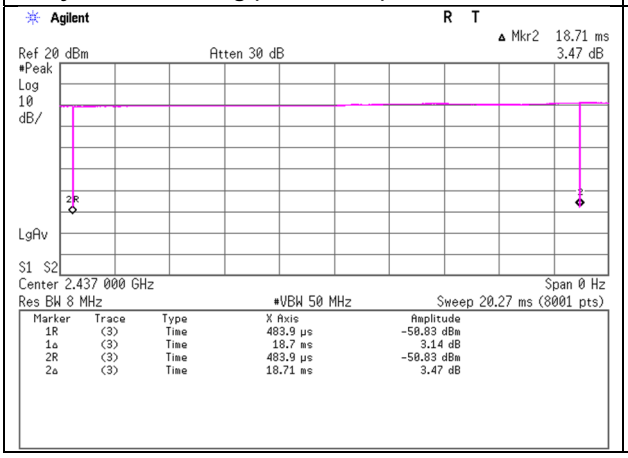
The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Burst rate confirmation

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 22, 2023
Temperature / Humidity	23 deg. C / 47 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx

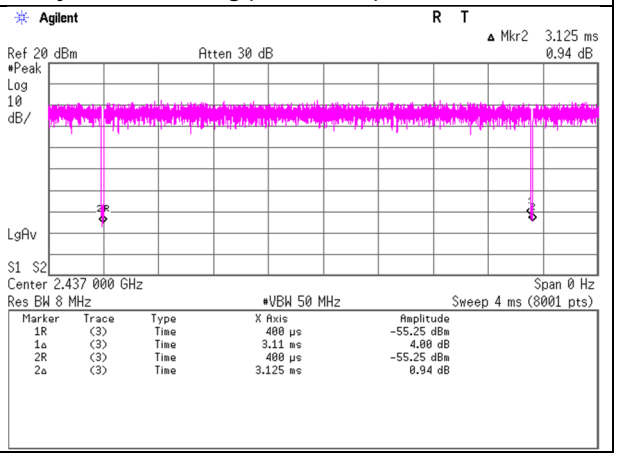
11b 1 Mbps

Tx on / (Tx on + Tx off) =	0.999
Tx on / (Tx on + Tx off) * 100 =	99.9 %
Duty factor = 10 * log (18.71 / 18.7) =	0.00 dB



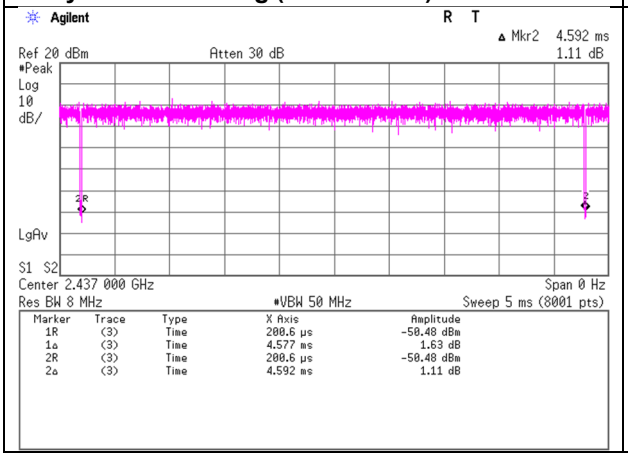
11g 6 Mbps

Tx on / (Tx on + Tx off) =	0.995
Tx on / (Tx on + Tx off) * 100 =	99.5 %
Duty factor = 10 * log (3.125 / 3.11) =	0.02 dB



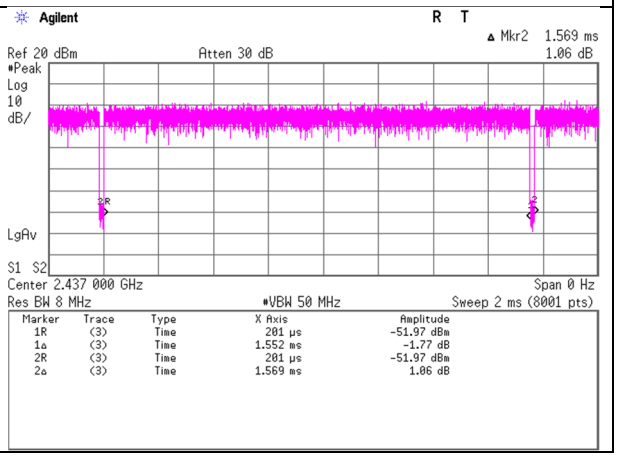
11n-20 MCS 0

Tx on / (Tx on + Tx off) =	0.997
Tx on / (Tx on + Tx off) * 100 =	99.7 %
Duty factor = 10 * log (4.592 / 4.577) =	0.01 dB



11n-20 MCS 2

Tx on / (Tx on + Tx off) =	0.989
Tx on / (Tx on + Tx off) * 100 =	98.9 %
Duty factor = 10 * log (1.569 / 1.552) =	0.05 dB



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

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 28, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	22 deg. C / 57 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2412 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	54.3	27.57	13.51	46.25	2.28	51.41	73.9	22.4	162	154	
Hori.	4824.000	PK	55.9	32.62	5.62	45.77	2.28	50.65	73.9	23.2	250	14	
Hori.	7236.000	PK	49.8	37.22	6.95	44.87	2.28	51.34	73.9	22.5	150	0	Floor noise
Hori.	9648.000	PK	48.8	38.13	7.87	43.22	2.28	53.83	73.9	20.0	164	156	
Hori.	12060.000	PK	51.5	38.63	8.90	43.45	-9.54	46.04	73.9	27.8	163	268	
Hori.	14472.000	PK	50.0	40.30	9.86	42.88	-9.54	47.74	73.9	26.1	175	90	
Hori.	19296.000	PK	48.8	-3.60	9.91	0.00	-9.54	45.57	73.9	28.3	152	222	*1)
Hori.	24120.000	PK	48.3	-4.71	11.20	0.00	-9.54	45.25	73.9	28.6	171	224	*1)
Hori.	2390.000	AV	45.1	27.57	13.51	46.25	2.28	42.21	53.9	11.6	162	154	
Hori.	4824.000	AV	49.5	32.62	5.62	45.77	2.28	44.27	53.9	9.6	250	14	
Hori.	7236.000	AV	40.8	37.22	6.95	44.87	2.28	42.38	53.9	11.5	150	0	Floor noise
Hori.	9648.000	AV	40.2	38.13	7.87	43.22	2.28	45.27	53.9	8.6	164	156	
Hori.	12060.000	AV	45.3	38.63	8.90	43.45	-9.54	39.84	53.9	14.0	163	268	
Hori.	14472.000	AV	42.3	40.30	9.86	42.88	-9.54	40.04	53.9	13.8	175	90	
Hori.	19296.000	AV	44.3	-3.60	9.91	0.00	-9.54	41.07	53.9	12.8	152	222	*1)
Hori.	24120.000	AV	42.0	-4.71	11.20	0.00	-9.54	38.95	53.9	14.9	171	224	*1)
Vert.	2390.000	PK	54.3	27.57	13.51	46.25	2.28	51.41	73.9	22.4	320	41	
Vert.	4824.000	PK	59.7	32.62	5.62	45.77	2.28	54.43	73.9	19.4	150	11	
Vert.	7236.000	PK	49.9	37.22	6.95	44.87	2.28	51.51	73.9	22.3	150	336	
Vert.	9648.000	PK	47.9	38.13	7.87	43.22	2.28	53.00	73.9	20.9	120	296	
Vert.	12060.000	PK	51.1	38.63	8.90	43.45	-9.54	45.64	73.9	28.2	183	180	
Vert.	14472.000	PK	50.3	40.30	9.86	42.88	-9.54	48.04	73.9	25.8	150	225	
Vert.	19296.000	PK	48.3	-3.60	9.91	0.00	-9.54	45.07	73.9	28.8	117	0	*1)
Vert.	24120.000	PK	47.3	-4.71	11.20	0.00	-9.54	44.25	73.9	29.6	142	0	*1)
Vert.	2390.000	AV	45.0	27.57	13.51	46.25	2.28	42.11	53.9	11.7	320	41	
Vert.	4824.000	AV	55.6	32.62	5.62	45.77	2.28	50.30	53.9	**3.6**	150	11	
Vert.	7236.000	AV	41.0	37.22	6.95	44.87	2.28	42.54	53.9	11.3	150	336	
Vert.	9648.000	AV	43.8	38.13	7.87	43.22	2.28	48.83	53.9	5.0	120	296	
Vert.	12060.000	AV	45.3	38.63	8.90	43.45	-9.54	39.84	53.9	14.0	183	180	
Vert.	14472.000	AV	43.5	40.30	9.86	42.88	-9.54	41.24	53.9	12.6	150	225	
Vert.	19296.000	AV	43.0	-3.60	9.91	0.00	-9.54	39.77	53.9	14.1	117	0	*1)
Vert.	24120.000	AV	38.5	-4.71	11.20	0.00	-9.54	35.45	53.9	18.4	142	0	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

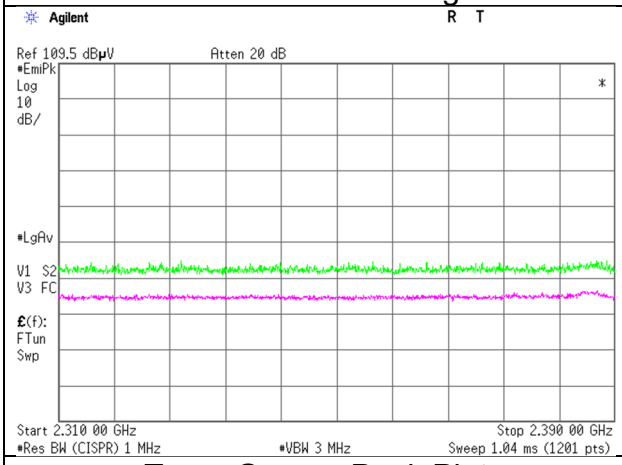
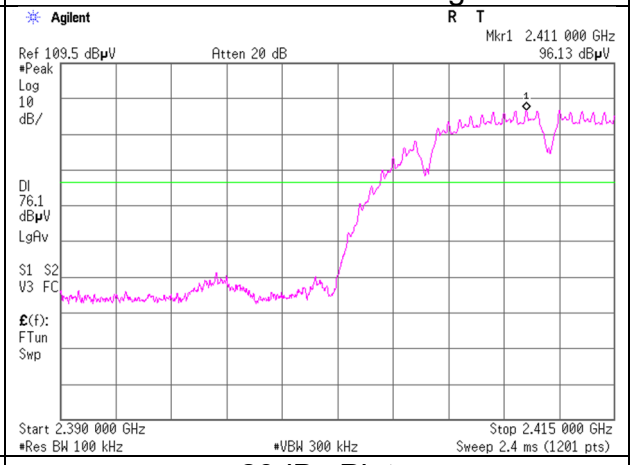
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

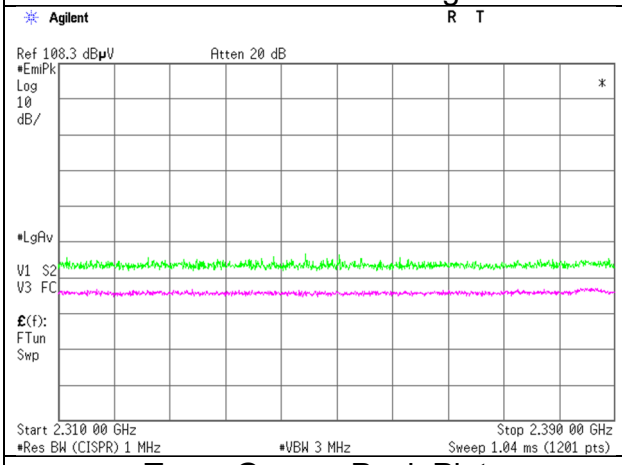
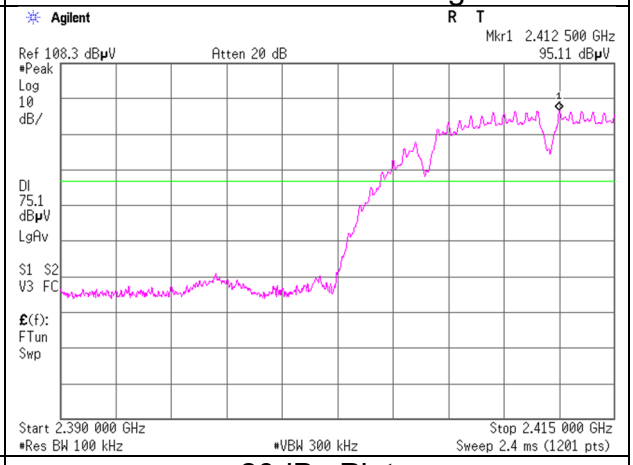
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	96.1	27.62	13.53	46.23	2.28	93.33	-	-	Carrier
Hori.	2397.030	PK	48.9	27.58	13.52	46.24	2.28	46.03	73.33	27.3	
Hori.	2400.000	PK	45.3	27.58	13.52	46.24	2.28	42.46	73.33	30.8	
Vert.	2412.000	PK	95.1	27.62	13.53	46.23	2.28	92.31	-	-	Carrier
Vert.	2397.050	PK	48.3	27.58	13.52	46.24	2.28	45.47	72.31	26.8	
Vert.	2400.000	PK	45.6	27.58	13.52	46.24	2.28	42.69	72.31	29.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe (1 GHz to 2.8 GHz)
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2437 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	55.0	32.65	5.64	45.75	2.28	49.82	73.9	24.0	135	19	
Hori.	7311.000	PK	50.4	37.24	6.97	44.76	2.28	52.09	73.9	21.8	150	0	Floor noise
Hori.	9748.000	PK	48.8	38.22	7.91	43.18	2.28	53.98	73.9	19.9	138	355	
Hori.	12185.000	PK	50.4	38.65	8.97	43.31	-9.54	45.17	73.9	28.7	153	107	
Hori.	14622.000	PK	48.8	40.03	9.89	42.60	-9.54	46.58	73.9	27.3	188	286	
Hori.	19496.000	PK	47.4	-3.51	9.96	0.00	-9.54	44.31	73.9	29.5	157	305	*1)
Hori.	24370.000	PK	48.3	-4.63	11.27	0.00	-9.54	45.40	73.9	28.5	155	317	*1)
Hori.	4874.000	AV	48.0	32.65	5.64	45.75	2.28	42.86	53.9	11.0	135	19	
Hori.	7311.000	AV	41.2	37.24	6.97	44.76	2.28	42.89	53.9	11.0	150	0	Floor noise
Hori.	9748.000	AV	39.4	38.22	7.91	43.18	2.28	44.67	53.9	9.2	138	355	
Hori.	12185.000	AV	42.4	38.65	8.97	43.31	-9.54	37.17	53.9	16.7	153	107	
Hori.	14622.000	AV	41.1	40.03	9.89	42.60	-9.54	38.88	53.9	15.0	188	286	
Hori.	19496.000	AV	41.4	-3.51	9.96	0.00	-9.54	38.31	53.9	15.5	157	305	*1)
Hori.	24370.000	AV	42.0	-4.63	11.27	0.00	-9.54	39.10	53.9	14.8	155	317	*1)
Vert.	4874.000	PK	58.5	32.65	5.64	45.75	2.28	53.29	73.9	20.6	150	13	
Vert.	7311.000	PK	47.4	37.24	6.97	44.76	2.28	49.11	73.9	24.7	150	313	
Vert.	9748.000	PK	50.5	38.22	7.91	43.18	2.28	55.69	73.9	18.2	127	294	
Vert.	12185.000	PK	50.3	38.65	8.97	43.31	-9.54	45.07	73.9	28.8	179	178	
Vert.	14622.000	PK	49.3	40.03	9.89	42.60	-9.54	47.08	73.9	26.8	151	223	
Vert.	19496.000	PK	46.2	-3.51	9.96	0.00	-9.54	43.12	73.9	30.7	116	312	*1)
Vert.	24370.000	PK	46.3	-4.63	11.27	0.00	-9.54	43.37	73.9	30.5	147	309	*1)
Vert.	4874.000	AV	54.3	32.65	5.64	45.75	2.28	49.12	53.9	**4.7**	150	13	
Vert.	7311.000	AV	42.8	37.24	6.97	44.76	2.28	44.48	53.9	9.4	150	313	
Vert.	9748.000	AV	42.6	38.22	7.91	43.18	2.28	47.78	53.9	6.1	127	294	
Vert.	12185.000	AV	44.3	38.65	8.97	43.31	-9.54	39.07	53.9	14.8	179	178	
Vert.	14622.000	AV	41.7	40.03	9.89	42.60	-9.54	39.48	53.9	14.4	151	223	
Vert.	19496.000	AV	37.6	-3.51	9.96	0.00	-9.54	34.51	53.9	19.3	116	312	*1)
Vert.	24370.000	AV	37.5	-4.63	11.27	0.00	-9.54	34.61	53.9	19.2	147	309	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) Antenna factor includes amplifier gain

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2462 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	53.4	27.99	13.59	46.18	2.28	51.08	73.9	22.8	159	162	
Hori.	4924.000	PK	55.0	32.65	5.67	45.76	2.28	49.82	73.9	24.0	135	19	
Hori.	7386.000	PK	51.3	37.33	7.01	44.72	2.28	53.22	73.9	20.6	150	0	Floor noise
Hori.	9848.000	PK	48.7	38.36	7.94	43.25	2.28	54.05	73.9	19.8	150	0	Floor noise
Hori.	12310.000	PK	50.4	38.46	9.04	43.29	-9.54	45.07	73.9	28.8	187	114	
Hori.	14772.000	PK	49.7	39.49	9.90	42.91	-9.54	46.64	73.9	27.2	176	283	
Hori.	19696.000	PK	46.8	-3.66	10.02	0.00	-9.54	43.58	73.9	30.3	150	303	*1)
Hori.	24620.000	PK	49.2	-4.45	11.31	0.00	-9.54	46.54	73.9	27.3	150	316	*1)
Hori.	2483.500	AV	44.8	27.99	13.59	46.18	2.28	42.48	53.9	11.4	159	162	
Hori.	4924.000	AV	48.5	32.65	5.67	45.76	2.28	43.31	53.9	10.5	135	19	
Hori.	7386.000	AV	41.7	37.33	7.01	44.72	2.28	43.59	53.9	10.3	150	0	Floor noise
Hori.	9848.000	AV	39.2	38.36	7.94	43.25	2.28	44.56	53.9	9.3	150	0	Floor noise
Hori.	12310.000	AV	45.1	38.46	9.04	43.29	-9.54	39.77	53.9	14.1	187	114	
Hori.	14772.000	AV	41.7	39.49	9.90	42.91	-9.54	38.64	53.9	15.2	176	283	
Hori.	19696.000	AV	40.1	-3.66	10.02	0.00	-9.54	36.88	53.9	17.0	150	303	*1)
Hori.	24620.000	AV	43.9	-4.45	11.31	0.00	-9.54	41.20	53.9	12.7	150	316	*1)
Vert.	2483.500	PK	53.4	27.99	13.59	46.18	2.28	51.08	73.9	22.8	353	36	
Vert.	4924.000	PK	58.1	32.65	5.67	45.76	2.28	52.96	73.9	20.9	150	17	
Vert.	7386.000	PK	47.4	37.33	7.01	44.72	2.28	49.28	73.9	24.6	150	316	
Vert.	9848.000	PK	50.7	38.36	7.94	43.25	2.28	56.07	73.9	17.8	129	313	
Vert.	12310.000	PK	51.7	38.46	9.04	43.29	-9.54	46.37	73.9	27.5	201	301	
Vert.	14772.000	PK	49.1	39.49	9.90	42.91	-9.54	46.04	73.9	27.8	150	226	
Vert.	19696.000	PK	46.5	-3.66	10.02	0.00	-9.54	43.35	73.9	30.5	120	338	*1)
Vert.	24620.000	PK	47.2	-4.45	11.31	0.00	-9.54	44.47	73.9	29.4	122	354	*1)
Vert.	2483.500	AV	45.0	27.99	13.59	46.18	2.28	42.68	53.9	11.2	353	36	
Vert.	4924.000	AV	54.2	32.65	5.67	45.76	2.28	49.03	53.9	**4.8**	150	17	
Vert.	7386.000	AV	43.3	37.33	7.01	44.72	2.28	45.15	53.9	8.7	150	316	
Vert.	9848.000	AV	43.1	38.36	7.94	43.25	2.28	48.47	53.9	5.4	129	313	
Vert.	12310.000	AV	46.7	38.46	9.04	43.29	-9.54	41.37	53.9	12.5	201	301	
Vert.	14772.000	AV	41.6	39.49	9.90	42.91	-9.54	38.54	53.9	15.3	150	226	
Vert.	19696.000	AV	39.8	-3.66	10.02	0.00	-9.54	36.57	53.9	17.3	120	338	*1)
Vert.	24620.000	AV	41.1	-4.45	11.31	0.00	-9.54	38.45	53.9	15.4	122	354	*1)

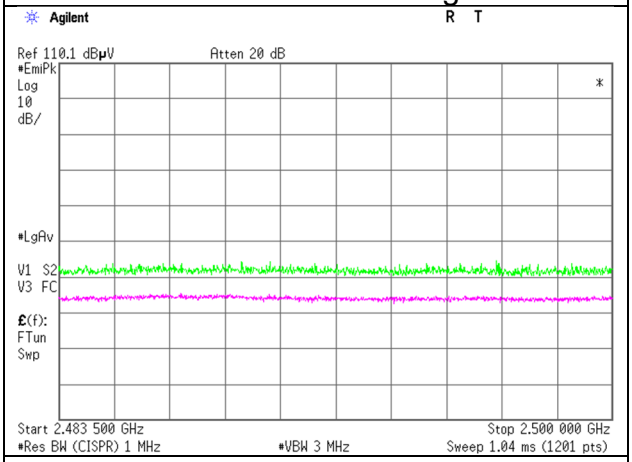
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

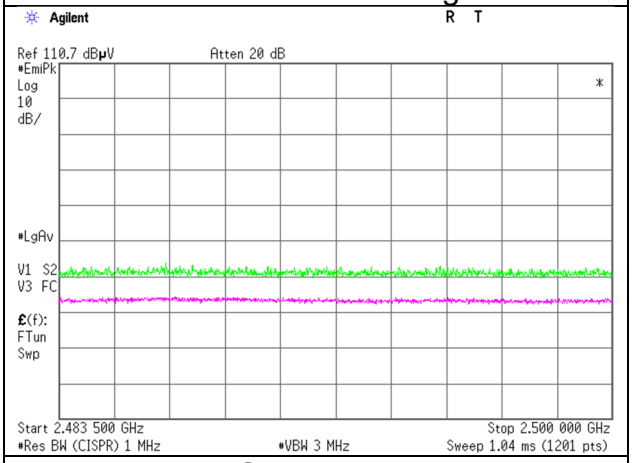
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2412 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	65.4	27.57	13.51	46.25	2.28	62.51	73.9	11.3	155	153	
Hori.	4824.000	PK	54.6	32.62	5.62	45.77	2.28	49.30	73.9	24.6	135	61	
Hori.	7236.000	PK	49.6	37.22	6.95	44.87	2.28	51.17	73.9	22.7	150	0	Floor noise
Hori.	9648.000	PK	47.9	38.13	7.87	43.22	2.28	52.92	73.9	20.9	150	0	Floor noise
Hori.	19296.000	PK	45.4	-3.60	9.91	0.00	-9.54	42.14	73.9	31.7	150	303	*1)
Hori.	24120.000	PK	45.5	-4.71	11.20	0.00	-9.54	42.48	73.9	31.4	150	315	*1)
Hori.	2390.000	AV	49.5	27.57	13.51	46.25	2.28	46.61	53.9	**7.2**	155	153	
Hori.	4824.000	AV	43.9	32.62	5.62	45.77	2.28	38.61	53.9	15.2	135	61	
Hori.	7236.000	AV	40.3	37.22	6.95	44.87	2.28	41.91	53.9	11.9	150	0	Floor noise
Hori.	9648.000	AV	38.9	38.13	7.87	43.22	2.28	43.96	53.9	9.9	150	0	Floor noise
Hori.	19296.000	AV	35.5	-3.60	9.91	0.00	-9.54	32.30	53.9	21.6	150	303	*1)
Hori.	24120.000	AV	36.4	-4.71	11.20	0.00	-9.54	33.32	53.9	20.5	150	315	*1)
Vert.	2390.000	PK	68.3	27.57	13.51	46.25	2.28	65.41	73.9	8.4	331	36	
Vert.	4824.000	PK	56.7	32.62	5.62	45.77	2.28	51.45	73.9	22.4	176	0	
Vert.	7236.000	PK	49.7	37.22	6.95	44.87	2.28	51.26	73.9	22.6	150	0	Floor noise
Vert.	9648.000	PK	47.9	38.13	7.87	43.22	2.28	52.94	73.9	20.9	150	0	Floor noise
Vert.	19296.000	PK	44.8	-3.60	9.91	0.00	-9.54	41.57	73.9	32.3	128	355	*1)
Vert.	24120.000	PK	45.6	-4.71	11.20	0.00	-9.54	42.51	73.9	31.3	130	355	*1)
Vert.	2390.000	AV	48.8	27.57	13.51	46.25	2.28	45.91	53.9	7.9	331	36	
Vert.	4824.000	AV	47.7	32.62	5.62	45.77	2.28	42.49	53.9	11.4	176	0	
Vert.	7236.000	AV	40.7	37.22	6.95	44.87	2.28	42.25	53.9	11.6	150	0	Floor noise
Vert.	9648.000	AV	38.9	38.13	7.87	43.22	2.28	43.95	53.9	9.9	150	0	Floor noise
Vert.	19296.000	AV	35.1	-3.60	9.91	0.00	-9.54	31.88	53.9	22.0	128	355	*1)
Vert.	24120.000	AV	36.3	-4.71	11.20	0.00	-9.54	33.20	53.9	20.7	130	355	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

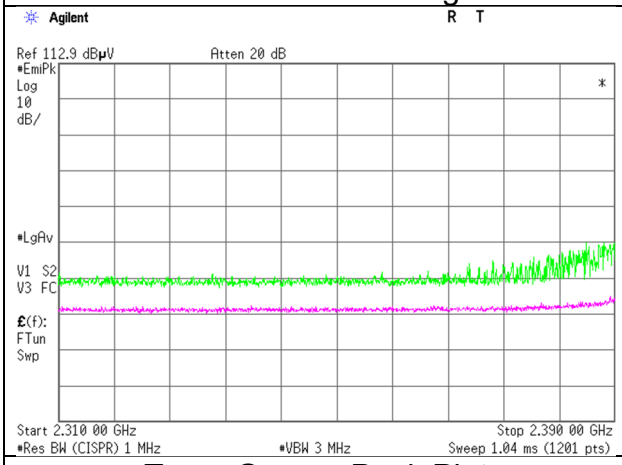
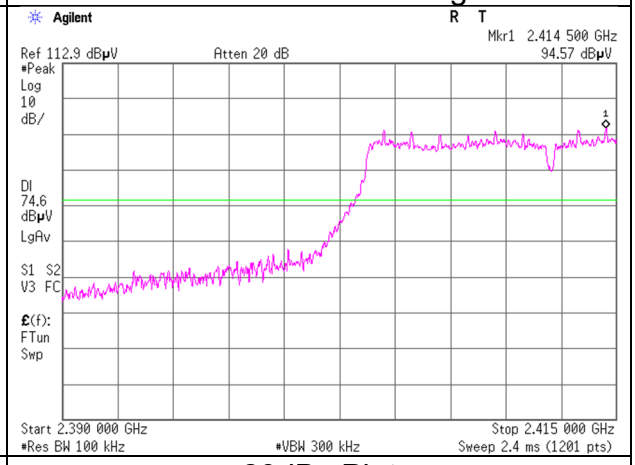
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

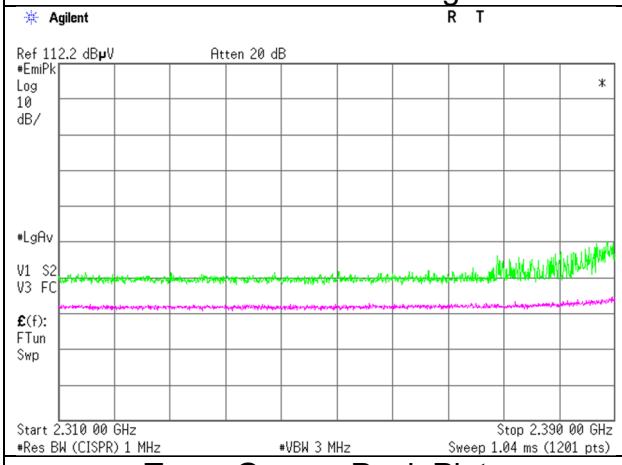
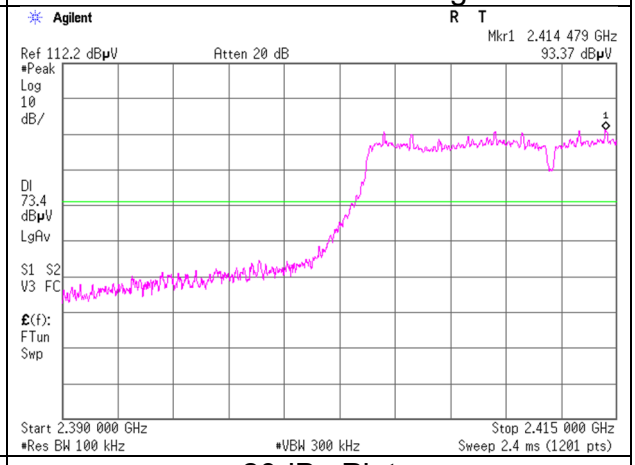
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	94.6	27.62	13.53	46.23	2.28	91.77	-	-	Carrier
Hori.	2400.000	PK	60.7	27.58	13.52	46.24	2.28	57.79	71.77	13.9	
Vert.	2412.000	PK	93.4	27.62	13.53	46.23	2.28	90.57	-	-	Carrier
Vert.	2400.000	PK	57.5	27.58	13.52	46.24	2.28	54.66	70.57	15.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe (1 GHz to 2.8 GHz)
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 29, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	23 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2437 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	47.919	QP	30.5	13.82	5.90	32.17	0.00	18.05	40.0	21.9	400	160	
Hori.	95.839	QP	50.4	8.38	6.37	32.12	0.00	33.03	43.5	10.4	293	193	
Hori.	133.332	QP	41.0	12.72	6.66	32.09	0.00	28.29	43.5	15.2	327	41	
Hori.	191.518	QP	52.7	10.42	7.05	32.04	0.00	38.13	43.5	5.3	183	31	
Hori.	239.592	QP	54.0	11.45	7.34	32.00	0.00	40.79	46.0	5.2	128	178	
Hori.	344.063	QP	45.3	14.29	7.87	31.92	0.00	35.54	46.0	10.4	100	189	
Hori.	4874.000	PK	52.1	32.65	5.64	45.75	2.28	46.92	73.9	26.9	150	0	Floor noise
Hori.	7311.000	PK	50.2	37.24	6.97	44.76	2.28	51.95	73.9	21.9	150	0	Floor noise
Hori.	9748.000	PK	45.1	38.22	7.91	43.18	2.28	50.35	73.9	23.5	150	0	Floor noise
Hori.	19496.000	PK	44.1	-3.51	9.96	0.00	-9.54	41.03	73.9	32.8	150	308	*1)
Hori.	24370.000	PK	44.8	-4.63	11.27	0.00	-9.54	41.91	73.9	31.9	150	321	*1)
Hori.	4874.000	AV	43.0	32.65	5.64	45.75	2.28	37.82	53.9	16.0	150	0	Floor noise
Hori.	7311.000	AV	41.1	37.24	6.97	44.76	2.28	42.86	53.9	11.0	150	0	Floor noise
Hori.	9748.000	AV	39.0	38.22	7.91	43.18	2.28	44.22	53.9	9.6	150	0	Floor noise
Hori.	19496.000	AV	35.0	-3.51	9.96	0.00	-9.54	31.87	53.9	22.0	150	308	*1)
Hori.	24370.000	AV	36.0	-4.63	11.27	0.00	-9.54	33.08	53.9	20.8	150	321	*1)
Vert.	47.908	QP	37.3	13.82	5.89	32.17	0.00	24.84	40.0	15.1	100	276	
Vert.	71.865	QP	36.0	11.16	6.15	32.15	0.00	21.16	40.0	18.8	100	120	
Vert.	95.821	QP	40.7	8.38	6.37	32.12	0.00	23.33	43.5	20.1	100	113	
Vert.	133.331	QP	46.1	12.72	6.66	32.09	0.00	33.39	43.5	10.1	100	330	
Vert.	191.527	QP	55.4	10.42	7.05	32.04	0.00	40.83	43.5	**2.6**	100	0	
Vert.	239.570	QP	51.1	11.45	7.34	32.00	0.00	37.89	46.0	8.1	100	177	
Vert.	331.755	QP	38.7	14.25	7.81	31.93	0.00	28.83	46.0	17.1	100	89	
Vert.	4874.000	PK	56.9	32.65	5.64	45.75	2.28	51.70	73.9	22.2	173	0	
Vert.	7311.000	PK	50.7	37.24	6.97	44.76	2.28	52.38	73.9	21.5	150	0	Floor noise
Vert.	9748.000	PK	47.2	38.22	7.91	43.18	2.28	52.40	73.9	21.5	150	0	Floor noise
Vert.	19496.000	PK	44.5	-3.51	9.96	0.00	-9.54	41.42	73.9	32.4	120	0	*1)
Vert.	24370.000	PK	45.1	-4.63	11.27	0.00	-9.54	42.18	73.9	31.7	114	355	*1)
Vert.	4874.000	AV	46.3	32.65	5.64	45.75	2.28	41.15	53.9	12.7	173	0	
Vert.	7311.000	AV	41.3	37.24	6.97	44.76	2.28	43.04	53.9	10.8	150	0	Floor noise
Vert.	9748.000	AV	38.7	38.22	7.91	43.18	2.28	43.93	53.9	9.9	150	0	Floor noise
Vert.	19496.000	AV	35.1	-3.51	9.96	0.00	-9.54	32.03	53.9	21.8	120	0	*1)
Vert.	24370.000	AV	36.2	-4.63	11.27	0.00	-9.54	33.28	53.9	20.6	114	355	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) Antenna factor includes amplifier gain

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe (1 GHz to 2.8 GHz)	Hiromitsu Tanabe (2.8 GHz to 10 GHz)	Hiromitsu Tanabe (10 GHz to 18 GHz)	Hiromitsu Tanabe (18 GHz to 26.5 GHz)
Mode	Tx 11g 2462 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	66.2	27.99	13.59	46.18	2.28	63.88	73.9	10.0	155	158	
Hori.	4924.000	PK	52.8	32.65	5.67	45.76	2.28	47.67	73.9	26.2	195	196	
Hori.	7386.000	PK	50.8	37.33	7.01	44.72	2.28	52.66	73.9	21.2	150	0	Floor noise
Hori.	9848.000	PK	47.8	38.36	7.94	43.25	2.28	53.16	73.9	20.7	150	0	Floor noise
Hori.	19696.000	PK	44.8	-3.66	10.02	0.00	-9.54	41.63	73.9	32.2	150	323	*1)
Hori.	24620.000	PK	45.1	-4.45	11.31	0.00	-9.54	42.37	73.9	31.5	150	318	*1)
Hori.	2483.500	AV	51.5	27.99	13.59	46.18	2.28	49.18	53.9	**4.7**	155	158	
Hori.	4924.000	AV	43.0	32.65	5.67	45.76	2.28	37.88	53.9	16.0	195	196	
Hori.	7386.000	AV	41.4	37.33	7.01	44.72	2.28	43.26	53.9	10.6	150	0	Floor noise
Hori.	9848.000	AV	38.9	38.36	7.94	43.25	2.28	44.27	53.9	9.6	150	0	Floor noise
Hori.	19696.000	AV	34.5	-3.66	10.02	0.00	-9.54	31.33	53.9	22.5	150	323	*1)
Hori.	24620.000	AV	36.4	-4.45	11.31	0.00	-9.54	33.70	53.9	20.2	150	318	*1)
Vert.	2483.500	PK	65.8	27.99	13.59	46.18	2.28	63.48	73.9	10.4	348	36	
Vert.	4924.000	PK	58.4	32.65	5.67	45.76	2.28	53.23	73.9	20.6	150	318	
Vert.	7386.000	PK	50.6	37.33	7.01	44.72	2.28	52.47	73.9	21.4	150	0	Floor noise
Vert.	9848.000	PK	45.2	38.36	7.94	43.25	2.28	50.57	73.9	23.3	150	0	Floor noise
Vert.	19696.000	PK	44.3	-3.66	10.02	0.00	-9.54	41.13	73.9	32.7	124	349	*1)
Vert.	24620.000	PK	45.7	-4.45	11.31	0.00	-9.54	42.99	73.9	30.9	171	351	*1)
Vert.	2483.500	AV	50.0	27.99	13.59	46.18	2.28	47.68	53.9	6.2	348	36	
Vert.	4924.000	AV	48.6	32.65	5.67	45.76	2.28	43.43	53.9	10.4	150	318	
Vert.	7386.000	AV	41.7	37.33	7.01	44.72	2.28	43.63	53.9	10.2	150	0	Floor noise
Vert.	9848.000	AV	39.0	38.36	7.94	43.25	2.28	44.28	53.9	9.6	150	0	Floor noise
Vert.	19696.000	AV	35.2	-3.66	10.02	0.00	-9.54	32.05	53.9	21.8	124	349	*1)
Vert.	24620.000	AV	36.0	-4.45	11.31	0.00	-9.54	33.32	53.9	20.5	171	351	*1)

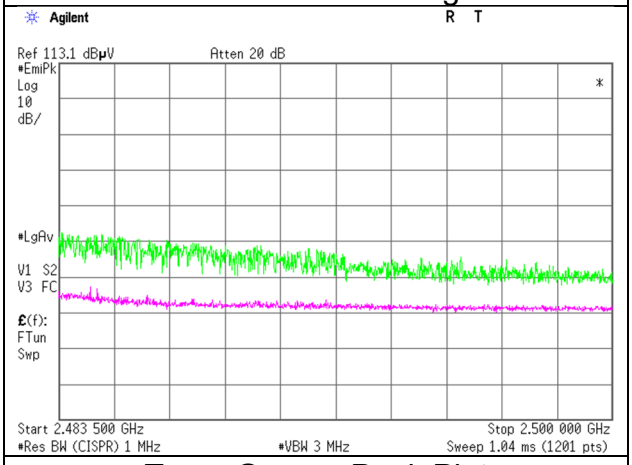
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)
Mode	Tx 11g 2462 MHz

Horizontal

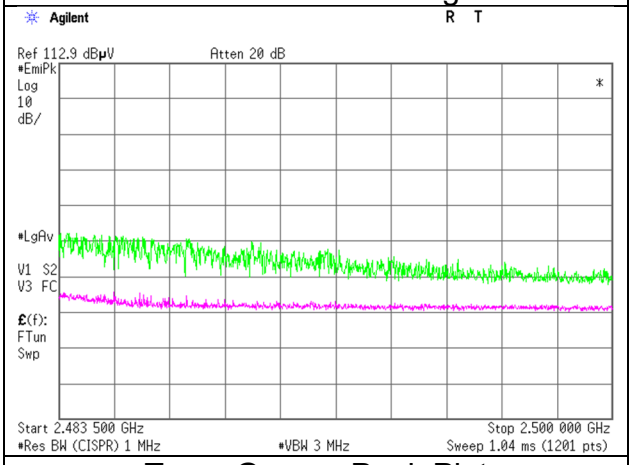
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* 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

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2412 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	65.6	27.57	13.51	46.25	2.28	62.71	73.9	11.1	158	159	
Hori.	4824.000	PK	53.3	32.62	5.62	45.77	2.28	48.01	73.9	25.8	150	0	Floor noise
Hori.	7236.000	PK	50.0	37.22	6.95	44.87	2.28	51.59	73.9	22.3	150	0	Floor noise
Hori.	9648.000	PK	47.7	38.13	7.87	43.22	2.28	52.75	73.9	21.1	150	0	Floor noise
Hori.	19296.000	PK	45.5	-3.60	9.91	0.00	-9.54	42.24	73.9	31.6	150	307	*1)
Hori.	24120.000	PK	45.3	-4.71	11.20	0.00	-9.54	42.22	73.9	31.6	150	309	*1)
Hori.	2390.000	AV	50.6	27.57	13.51	46.25	2.28	47.71	53.9	**6.1**	158	159	
Hori.	4824.000	AV	44.4	32.62	5.62	45.77	2.28	39.15	53.9	14.7	150	0	Floor noise
Hori.	7236.000	AV	40.5	37.22	6.95	44.87	2.28	42.11	53.9	11.7	150	0	Floor noise
Hori.	9648.000	AV	39.1	38.13	7.87	43.22	2.28	44.14	53.9	9.7	150	0	Floor noise
Hori.	19296.000	AV	35.6	-3.60	9.91	0.00	-9.54	32.39	53.9	21.5	150	307	*1)
Hori.	24120.000	AV	36.4	-4.71	11.20	0.00	-9.54	33.31	53.9	20.5	150	309	*1)
Vert.	2390.000	PK	64.5	27.57	13.51	46.25	2.28	61.61	73.9	12.2	378	31	
Vert.	4824.000	PK	58.1	32.62	5.62	45.77	2.28	52.84	73.9	21.0	125	16	
Vert.	7236.000	PK	49.8	37.22	6.95	44.87	2.28	51.39	73.9	22.5	150	0	Floor noise
Vert.	9648.000	PK	48.0	38.13	7.87	43.22	2.28	53.09	73.9	20.8	150	0	Floor noise
Vert.	19296.000	PK	44.7	-3.60	9.91	0.00	-9.54	41.51	73.9	32.3	124	355	*1)
Vert.	24120.000	PK	44.7	-4.71	11.20	0.00	-9.54	41.66	73.9	32.2	120	0	*1)
Vert.	2390.000	AV	48.7	27.57	13.51	46.25	2.28	45.81	53.9	8.0	378	31	
Vert.	4824.000	AV	49.2	32.62	5.62	45.77	2.28	43.98	53.9	9.9	125	16	
Vert.	7236.000	AV	40.8	37.22	6.95	44.87	2.28	42.36	53.9	11.5	150	0	Floor noise
Vert.	9648.000	AV	39.0	38.13	7.87	43.22	2.28	44.09	53.9	9.8	150	0	Floor noise
Vert.	19296.000	AV	35.9	-3.60	9.91	0.00	-9.54	32.70	53.9	21.2	124	355	*1)
Vert.	24120.000	AV	36.2	-4.71	11.20	0.00	-9.54	33.13	53.9	20.7	120	0	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

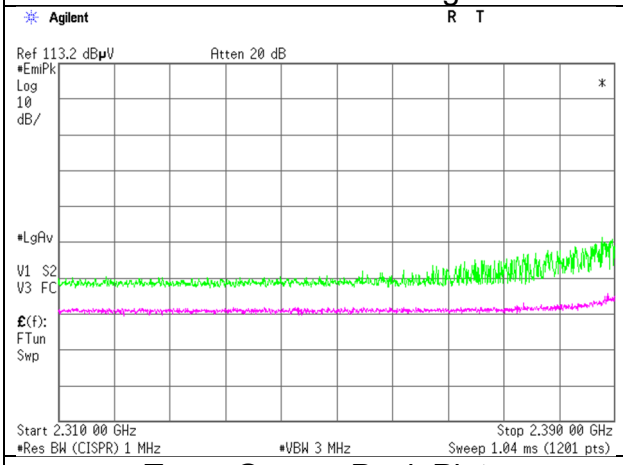
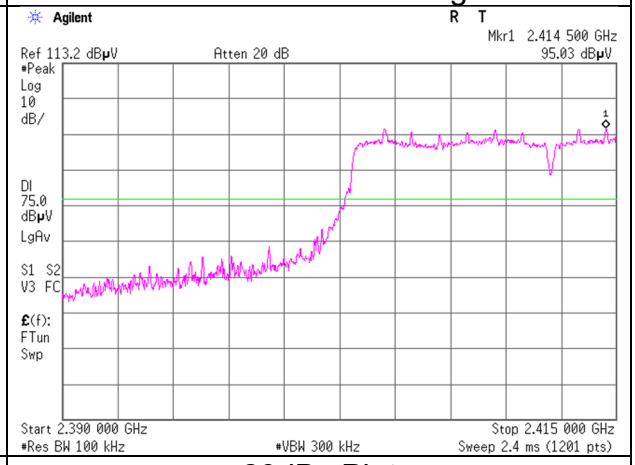
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

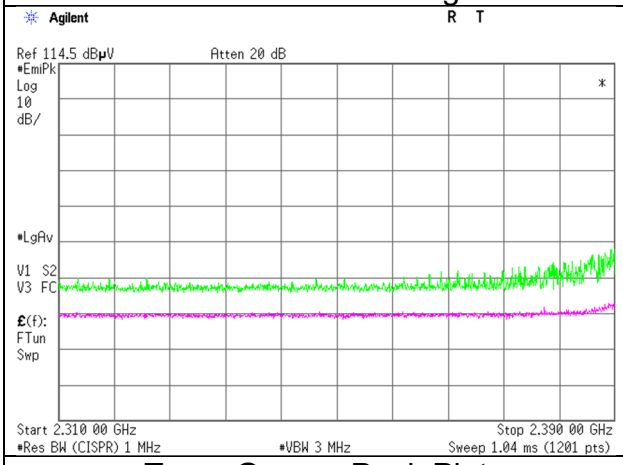
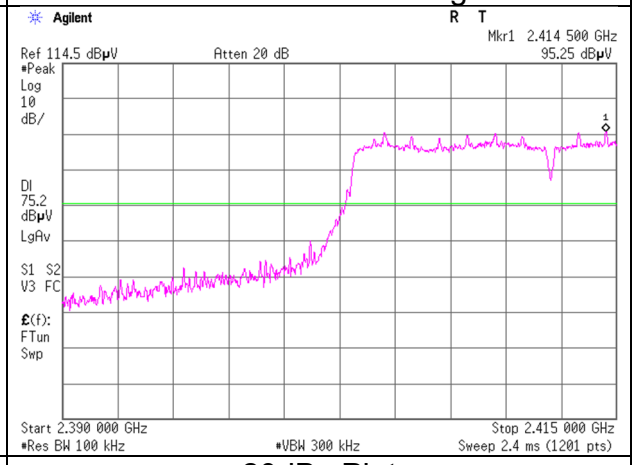
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	95.0	27.62	13.53	46.23	2.28	92.23	-	-	Carrier
Hori.	2400.000	PK	62.3	27.58	13.52	46.24	2.28	59.42	72.23	12.8	
Vert.	2412.000	PK	95.3	27.62	13.53	46.23	2.28	92.45	-	-	Carrier
Vert.	2400.000	PK	61.6	27.58	13.52	46.24	2.28	58.70	72.45	13.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe (1 GHz to 2.8 GHz)
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* 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

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2437 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	52.0	32.65	5.64	45.75	2.28	46.86	73.9	27.0	150	0	Floor noise
Hori.	7311.000	PK	49.8	37.24	6.97	44.76	2.28	51.49	73.9	22.4	150	0	Floor noise
Hori.	9748.000	PK	47.1	38.22	7.91	43.18	2.28	52.28	73.9	21.6	150	0	Floor noise
Hori.	19496.000	PK	44.7	-3.51	9.96	0.00	-9.54	41.63	73.9	32.2	150	322	*1)
Hori.	24370.000	PK	45.8	-4.63	11.27	0.00	-9.54	42.87	73.9	31.0	150	313	*1)
Hori.	4874.000	AV	43.3	32.65	5.64	45.75	2.28	38.15	53.9	15.7	150	0	Floor noise
Hori.	7311.000	AV	41.0	37.24	6.97	44.76	2.28	42.77	53.9	11.1	150	0	Floor noise
Hori.	9748.000	AV	38.7	38.22	7.91	43.18	2.28	43.88	53.9	**10.0**	150	0	Floor noise
Hori.	19496.000	AV	34.9	-3.51	9.96	0.00	-9.54	31.77	53.9	22.1	150	322	*1)
Hori.	24370.000	AV	36.7	-4.63	11.27	0.00	-9.54	33.75	53.9	20.1	150	313	*1)
Vert.	4874.000	PK	56.9	32.65	5.64	45.75	2.28	51.75	73.9	22.1	120	21	
Vert.	7311.000	PK	50.3	37.24	6.97	44.76	2.28	52.02	73.9	21.8	150	0	Floor noise
Vert.	9748.000	PK	47.6	38.22	7.91	43.18	2.28	52.79	73.9	21.1	150	0	Floor noise
Vert.	19496.000	PK	44.7	-3.51	9.96	0.00	-9.54	41.65	73.9	32.2	150	355	*1)
Vert.	24370.000	PK	45.7	-4.63	11.27	0.00	-9.54	42.84	73.9	31.0	150	355	*1)
Vert.	4874.000	AV	48.0	32.65	5.64	45.75	2.28	42.81	53.9	11.0	120	21	
Vert.	7311.000	AV	41.0	37.24	6.97	44.76	2.28	42.71	53.9	11.1	150	0	Floor noise
Vert.	9748.000	AV	38.5	38.22	7.91	43.18	2.28	43.75	53.9	10.1	150	0	Floor noise
Vert.	19496.000	AV	35.1	-3.51	9.96	0.00	-9.54	31.97	53.9	21.9	150	355	*1)
Vert.	24370.000	AV	36.5	-4.63	11.27	0.00	-9.54	33.62	53.9	20.2	150	355	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*1) Antenna factor includes amplifier gain

Radiated Spurious Emission

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 26, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	22 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)	(2.8 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2462 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	68.2	27.99	13.59	46.18	2.28	65.88	73.9	8.0	157	159	
Hori.	4924.000	PK	52.4	32.65	5.67	45.76	2.28	47.23	73.9	26.6	150	0	Floor noise
Hori.	7386.000	PK	50.7	37.33	7.01	44.72	2.28	52.59	73.9	21.3	150	0	Floor noise
Hori.	9848.000	PK	47.2	38.36	7.94	43.25	2.28	52.50	73.9	21.4	150	0	Floor noise
Hori.	19696.000	PK	44.8	-3.66	10.02	0.00	-9.54	41.66	73.9	32.2	150	311	*1)
Hori.	24620.000	PK	45.3	-4.45	11.31	0.00	-9.54	42.66	73.9	31.2	150	315	*1)
Hori.	2483.500	AV	52.1	27.99	13.59	46.18	2.28	49.78	53.9	**4.1**	157	159	
Hori.	4924.000	AV	42.1	32.65	5.67	45.76	2.28	36.93	53.9	16.9	150	0	Floor noise
Hori.	7386.000	AV	41.6	37.33	7.01	44.72	2.28	43.45	53.9	10.4	150	0	Floor noise
Hori.	9848.000	AV	38.8	38.36	7.94	43.25	2.28	44.16	53.9	9.7	150	0	Floor noise
Hori.	19696.000	AV	35.3	-3.66	10.02	0.00	-9.54	32.13	53.9	21.7	150	311	*1)
Hori.	24620.000	AV	36.5	-4.45	11.31	0.00	-9.54	33.77	53.9	20.1	150	315	*1)
Vert.	2483.500	PK	68.1	27.99	13.59	46.18	2.28	65.78	73.9	8.1	347	39	
Vert.	4924.000	PK	57.0	32.65	5.67	45.76	2.28	51.86	73.9	22.0	123	21	
Vert.	7386.000	PK	50.7	37.33	7.01	44.72	2.28	52.62	73.9	21.2	150	0	Floor noise
Vert.	9848.000	PK	48.8	38.36	7.94	43.25	2.28	54.15	73.9	19.7	150	0	Floor noise
Vert.	19696.000	PK	43.4	-3.66	10.02	0.00	-9.54	40.24	73.9	33.6	150	156	*1)
Vert.	24620.000	PK	46.0	-4.45	11.31	0.00	-9.54	43.29	73.9	30.6	175	347	*1)
Vert.	2483.500	AV	52.0	27.99	13.59	46.18	2.28	49.68	53.9	4.2	347	39	
Vert.	4924.000	AV	47.5	32.65	5.67	45.76	2.28	42.35	53.9	11.5	123	21	
Vert.	7386.000	AV	41.0	37.33	7.01	44.72	2.28	42.88	53.9	11.0	150	0	Floor noise
Vert.	9848.000	AV	38.8	38.36	7.94	43.25	2.28	44.08	53.9	9.8	150	0	Floor noise
Vert.	19696.000	AV	34.4	-3.66	10.02	0.00	-9.54	31.23	53.9	22.6	150	156	*1)
Vert.	24620.000	AV	36.2	-4.45	11.31	0.00	-9.54	33.56	53.9	20.3	175	347	*1)

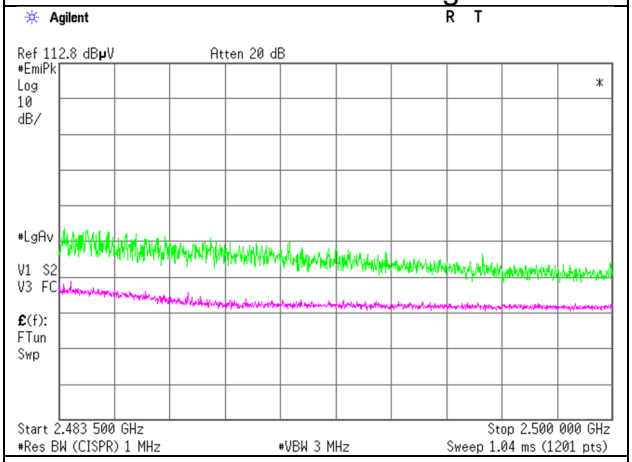
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.9m / 3.0 m) = 2.28 dB
10 GHz - 26.5 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*1) Antenna factor includes amplifier gain

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Kashima EMC Lab.
Semi Anechoic Chamber	No.11
Date	June 26, 2023
Temperature / Humidity	22 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe
	(1 GHz to 2.8 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

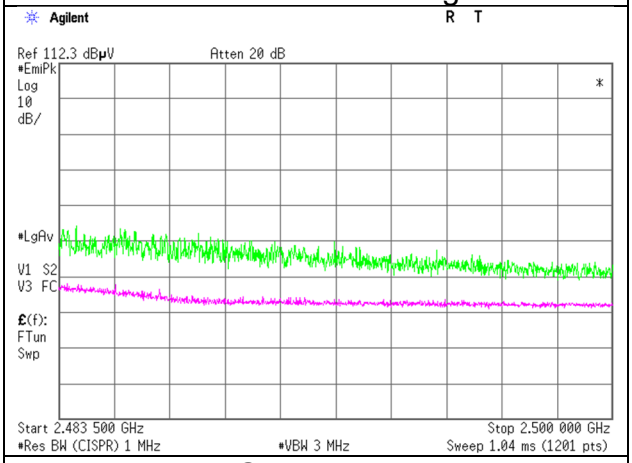
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

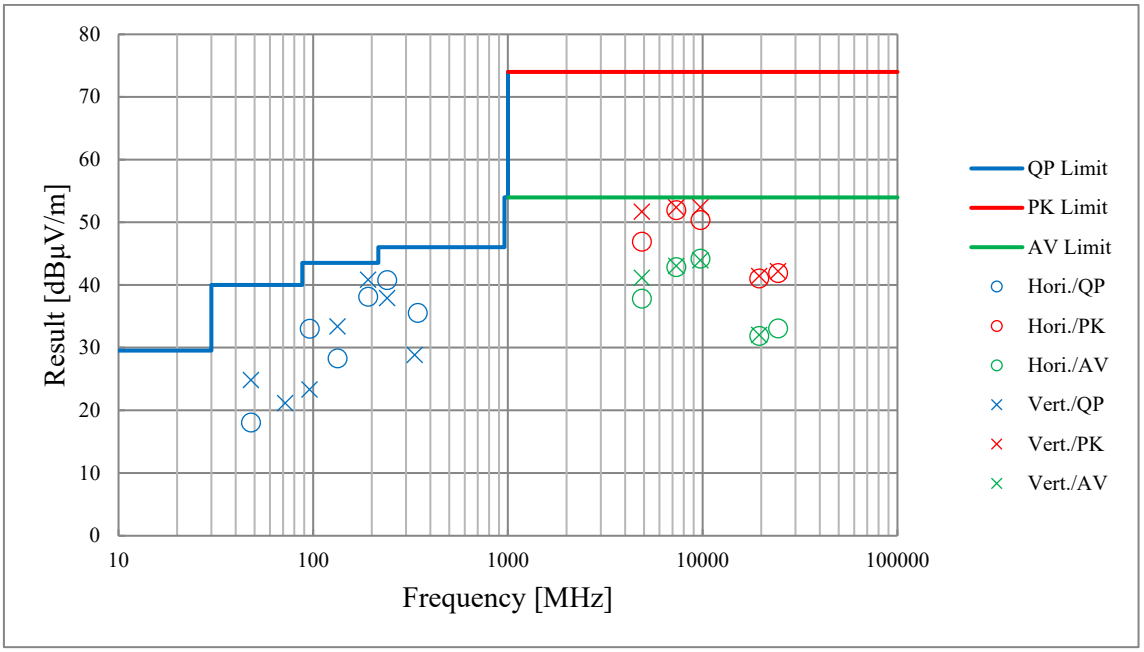


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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 mode for Maximum Peak Output Power)

Test place	Kashima EMC Lab.			
Semi Anechoic Chamber	No.11	No.11	No.11	No.11
Date	June 29, 2023	June 26, 2023	June 28, 2023	June 29, 2023
Temperature / Humidity	23 deg. C / 58 % RH	22 deg. C / 58 % RH	22 deg. C / 57 % RH	23 deg. C / 58 % RH
Engineer	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe	Hiromitsu Tanabe
	(30 MHz to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2437 MHz			

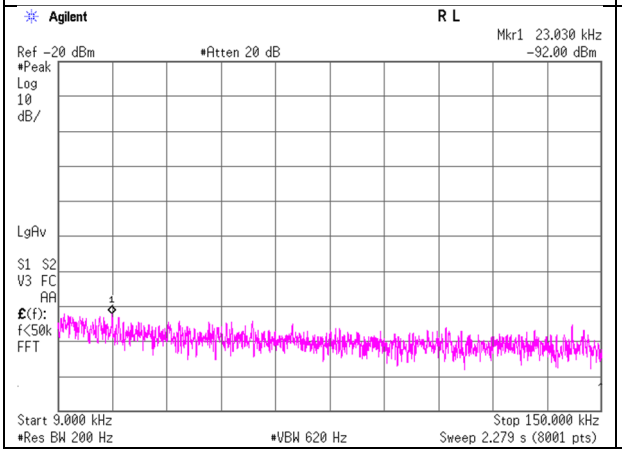


*These plots data contain sufficient numbers to show the trend of characteristic features for EUT.

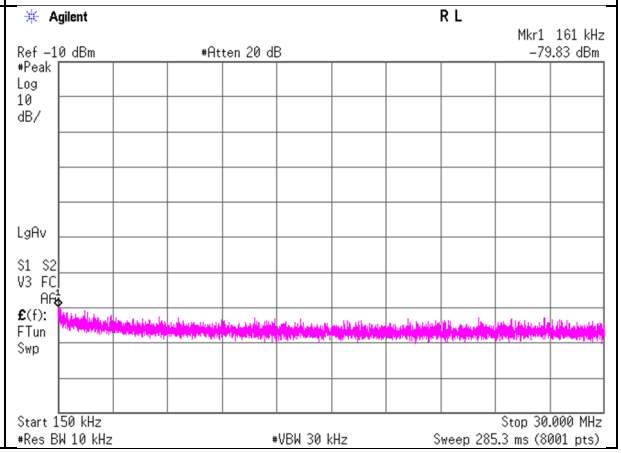
Conducted Spurious Emission

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 23, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx 11g 2437 MHz

9 kHz to 150 kHz



150 kHz to 30 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
23.03	-92.0	1.08	9.95	2.0	1	-79.0	300	6.0	-17.7	40.3	58.0	
161.00	-79.8	1.09	9.95	2.0	1	-66.8	300	6.0	-5.5	23.4	28.9	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + 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.

Power Density

Test place	Kashima EMC Lab. No.2 Measurement Room
Date	June 23, 2023
Temperature / Humidity	23 deg. C / 50 % RH
Engineer	Hiromitsu Tanabe
Mode	Tx

11b

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-23.19	1.69	10.05	-11.45	8.00	19.45
2437	-23.13	1.69	10.05	-11.39	8.00	19.39
2462	-23.12	1.70	10.05	***-11.37***	8.00	19.37

11g

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-30.52	1.69	10.05	-18.78	8.00	26.78
2437	-30.07	1.69	10.05	-18.33	8.00	26.33
2462	-29.90	1.70	10.05	***-18.15***	8.00	26.15

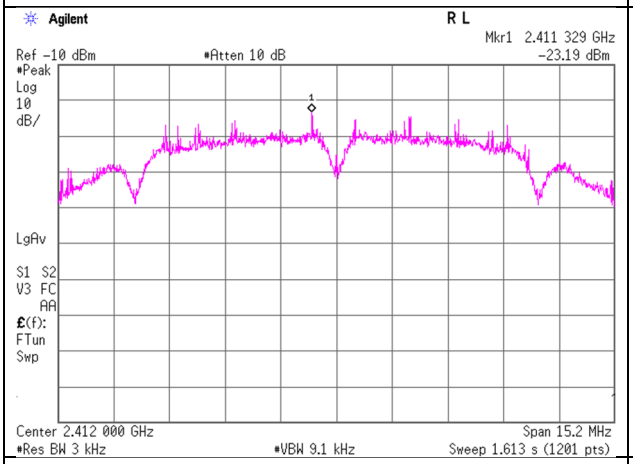
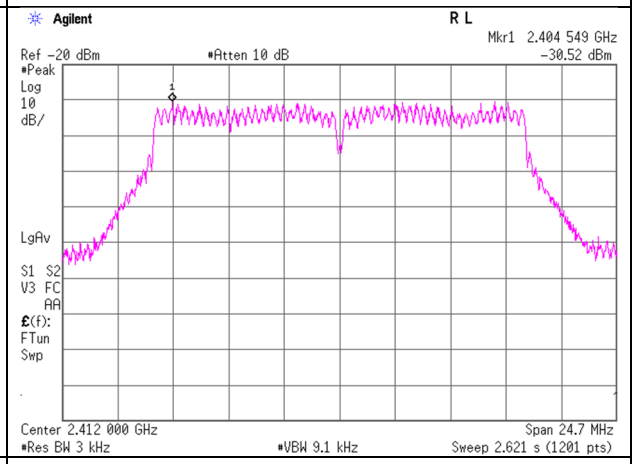
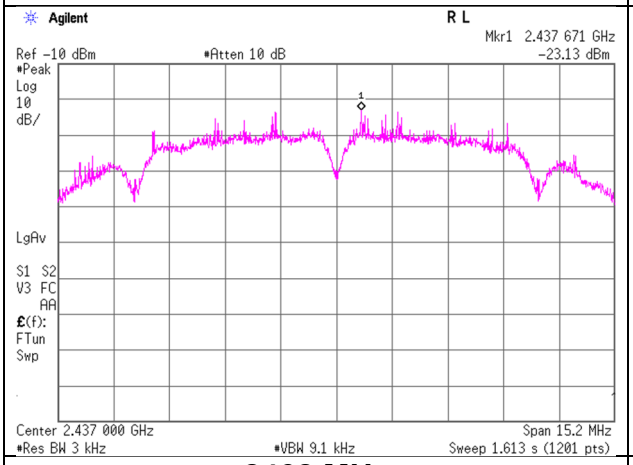
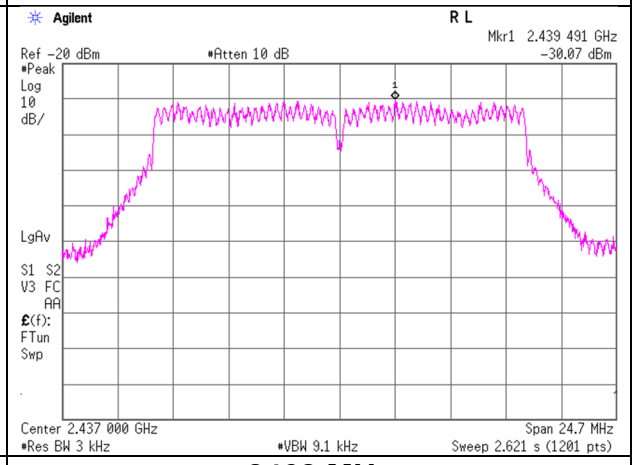
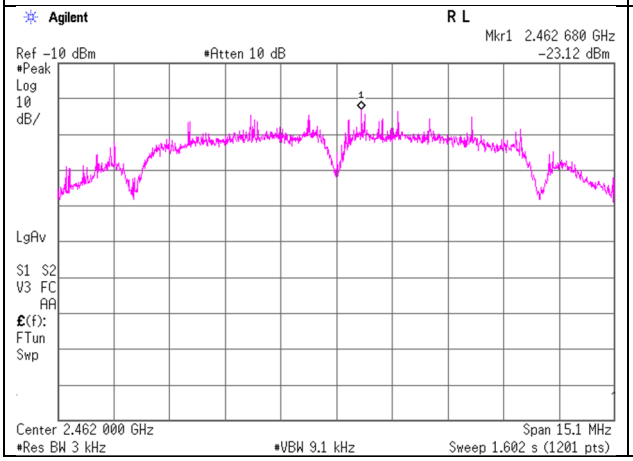
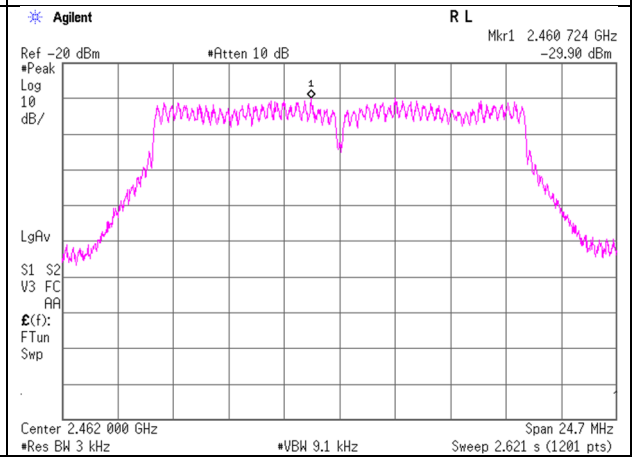
11n

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-29.99	1.69	10.05	-18.25	8.00	26.25
2437	-29.37	1.69	10.05	***-17.63***	8.00	25.63
2462	-29.79	1.70	10.05	-18.04	8.00	26.04

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

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

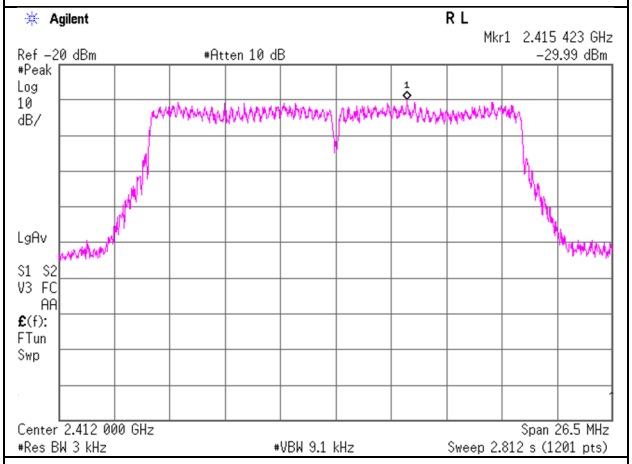
Power Density

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

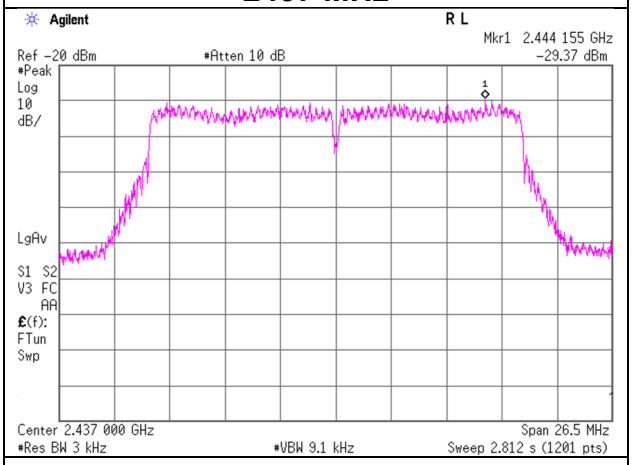
Power Density

11n-20

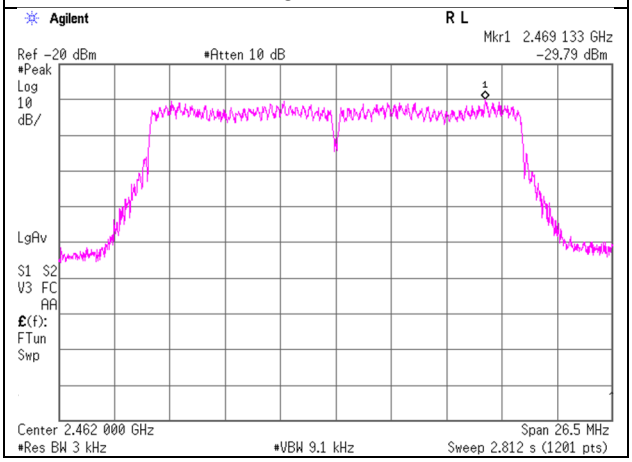
2412 MHz



2437 MHz



2462 MHz



APPENDIX 2: Test Instruments

Test Equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2023/06/21	12
AT	CAT10-17	143023	10dB Fixed Atten.	Weinschel - API Technologies Corp	54A-10	56251	2023/05/25	12
AT	CCC-W01	143109	Micro Wave Cable	Suhner	SUCOFLEX102	MY3662/2	2023/05/25	12
AT	CPM-16	143588	Peak Power Analyzer	Keysight Technologies Inc	8990B	MY51000276	2023/06/20	12
AT	CPSO-24	143606	Power Sensor	Keysight Technologies Inc	N1923A	MY54070024	2023/06/20	12
AT	CTS-08	144210	Digital Multimeter	Fluke Corporation	112	89790193	2022/10/12	12
AT	COS-27	200034	Temperature & Humidity Logger	HIOKI E.E. CORPORATION	LR5001/LR9504	200636456/200699552	2022/07/22	12
AT	CBM-10	143133	Barometer	Sanoh Co., Ltd	SBR-151	001439	2023/03/10	36
RE	CHA-25	143456	Double Ridged Wave Guide	ETS-Lindgren (Cedar Park, Texas)	3115	00204573	2023/02/04	12
RE	TSA-01	143642	Spectrum Analyzer	Keysight Technologies Inc	N9030A	MY53310670 Version A.13.12	2023/05/23	12
RE	TPA-14	175395	Pre Amplifier	Erzia Technologies S.L.	ERZ-LNA-0100-2700-45-4	16A2001702002	2022/12/16	12
RE	CAEC-11 (SVSWR)	144644	Semi Anechoic Chamber	TDK	SVSWR (No.11)	11	2023/05/15	12
RE	CCC-G14	192241	Microwave Cable	Huber+Suhner	SF104/PC35m/PC35m/1000mm	805411/4	2023/01/12	12
RE	CCC-G19	231901	Micro Wave Cable	Junkosha	MWX221	FEB-20-23-020	2023/03/10	12
RE	CAT10-17	143023	10dB Fixed Atten.	Weinschel - API Technologies Corp	54A-10	56251	2023/05/25	12
RE	CHF-04	143442	HPF	Micro-Tronics	HPM50111-02	009	2023/05/24	12
RE	CSA-07	143643	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY52490024	2023/06/21	12
RE	CSCL-27	222746	Measure	SHINWA RULES CO., LTD.	80862	none	-	-
RE	COS-26	200033	Temperature & Humidity Logger	HIOKI E.E. CORPORATION	LR5001/LR9504	200636447/200699543	2022/07/22	12
RE	CTS-06	144208	Digital Multimeter	Fluke Corporation	112	89790159	2022/10/12	12
RE	CBM-10	143133	Barometer	Sanoh Co., Ltd	SBR-151	001439	2023/03/10	36
RE	COTS-CEMI-03	178804	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3 (RE,CE,ME,PE)	Ver 3.1.0484	-	-
RE	CHA-07	143438	Double Ridged Horn	ETS-Lindgren (Cedar Park, Texas)	3160-09	00166043	2022/06/18	12
RE	CAF-19	142937	Pre-Amplifier	TOYO	HAP18-26W	00000035	2022/06/18	12
RE	CCC-W10	142992	Micro Wave Cable	Suhner	SUCOFLEX102	MY010/2A	2022/08/03	12
RE	CCC-S11-R	143169	11Site RE 3m System	N/A	none(No.11 RE)	none	2022/11/17	12
RE	CBL-09	143122	LOGBICON	Schwarzbeck Mess-Elektronik OHG	VULB 9168	508	2023/04/18	12
RE	CAT5-04	178807	5dB Fixed Atten.	Pasternack Enterprises	PE7047-5	none	2023/04/18	12
RE	CAF-16	142936	Pre-Amplifier	SONOMA INSTRUMENT	310N	325015	2023/05/23	12
RE	CTR-01	144193	Test Receiver	Rohde & Schwarz	ESU40	100426	2023/04/20	12
RE	CAEC-11(NSA)	144648	Semi Anechoic Chamber	TDK	NSA (No.11)	11	2023/05/11	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:

AT: Antenna Terminal Conducted test
RE: Radiated Emission