

RADIO TEST REPORT

Test Report No. 15474876H-A-R3

Customer	DENSO CORPORATION
Description of EUT	Cockpit Control Unit
Model Number of EUT	DNNS125
FCC ID	HYQDNNS125
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	December 11, 2024
Remarks	Wireless LAN (2.4 GHz band) part(s)

Representative Test EngineerNachi Konegawa
Engineer**Approved By**Ryota Yamanaka
Engineer

CERTIFICATE 5107.02

- ☐ 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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REVISION HISTORY

Original Test Report No.: 15474876H-A

This report is a revised version of 15474876H-A-R2. 15474876H-A-R2 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15474876H-A	September 6, 2024	-
1	15474876H-A-R1	October 25, 2024	P.6 and correspondence page Correction of Antenna gain for 2.4 GHz band: WLAN: from 1.10 dBi to 1.78 dBi Bluetooth: from 1.10 dBi to 1.83 dBi
1	15474876H-A-R1	October 25, 2024	P.10 Correction of Worst rate for 11n-20 from MCS 6 to MCS 14
1	15474876H-A-R1	October 25, 2024	P.26 Deletion of Rate check data for 11n-20 (MIMO) MCS 0 to 7
1	15474876H-A-R1	October 25, 2024	P.28 Correction of Duty factor for 11g, and recalculation the Result
1	15474876H-A-R1	October 25, 2024	P.41, 44 Correction of duty factor, and re calculation the results.
1	15474876H-A-R1	October 25, 2024	P.30 Correction of Duty factor calculation for 11g 6 Mbps
1	15474876H-A-R1	October 25, 2024	P.36 Addition of 20dBc data sheet
2	15474876H-A-R2	December 5, 2024	P.5, 24, 25, 26 Retest of Rate Check, addition of test date and test instruments
3	15474876H-A-R3	December 11, 2024	P.24 Addition of notes for Rate check

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

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SECTION 1: Customer Information

Company Name	DENSO CORPORATION
Address	1-1 Showa-cho, Kariya-shi, Aichi ken, 448-8661 Japan
Telephone Number	+81-70-2236-5904
Contact Person	Naoto Makino

The information provided by 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

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Cockpit Control Unit
Model Number	DNNS125
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	May 31, 2024
Test Date	June 4 to December 4, 2024

2.2 Product Description

General Specification

Rating	DC 13.2 V
Operating temperature	-30 deg. C to 65 deg. C

Radio Specification

This report contains data provided by the customer which can impact the validity of results. UL Japan, Inc. is only responsible for the validity of results after the integration of the data provided by the customer. The data provided by the customer is marked "a)" in the table below.

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

Equipment Type	Transceiver	
Frequency of Operation	2412 MHz to 2462 MHz	
Type of Modulation	DSSS, OFDM	
Antenna Gain ^{a)}	Main Antenna: Chain 0	Sub Antenna: Chain 1
	1.78 dBi	1.78 dBi

Bluetooth (BR / EDR)

Equipment Type	Transceiver	
Frequency of Operation	2402 MHz to 2480 MHz	
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK)	
Antenna Type	External Antenna	
Antenna Gain ^{a)}	1.83 dBi	

WLAN (IEEE802.11a/11n-20/11ac-20/11n-40/11ac-40/11ac-80)

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band	5180 MHz to 5240 MHz 5745 MHz to 5825 MHz
	40 MHz Band	5190 MHz to 5230 MHz 5755 MHz to 5795 MHz
	80 MHz Band	5210 MHz 5775 MHz
Type of Modulation	OFDM	
Antenna Gain ^{a)}	Main Antenna: Chain 0	Sub Antenna: Chain 1
	0.30 dBi (5180 MHz to 5240 MHz)	0.30 dBi (5180 MHz to 5240 MHz)
	0.99 dBi (5745 MHz to 5825 MHz)	0.99 dBi (5745 MHz to 5825 MHz)

AM/FM (incl. RDS)

Equipment Type	Receiver	
Frequency of Operation	522 kHz to 1710 kHz	
	87 MHz to 108 MHz	

FM tuner specification Intermediate frequency: 220 kHz

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 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	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)		Complied	Conducted
Power Density	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section 15.247(e) ISED: RSS-247 5.2(b)		Complied	Conducted
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	0.9 dB 3509.1 MHz, AV, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *2)

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 is not the device that is designed to be connected to the public utility (AC) power line.

*2) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

FCC Part 15.31 (e)

This EUT provides stable voltage constantly to the wireless transmitter regardless of input voltage. Instead of a new battery, DC power supply was used for the test. 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 vehicle. 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 $k = 2$.

Radiated emission

Measurement distance	Frequency range	Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz	dB	3.3
10 m		dB	3.1
3 m	30 MHz to 200 MHz	Horizontal	4.7
		Vertical	4.7
	200 MHz to 1000 MHz	Horizontal	4.8
		Vertical	6.0
10 m	30 MHz to 200 MHz	Horizontal	5.2
		Vertical	5.1
	200 MHz to 1000 MHz	Horizontal	5.2
		Vertical	5.2
3 m	1 GHz to 6 GHz	dB	5.0
	6 GHz to 18 GHz	dB	5.2
1 m	10 GHz to 18 GHz	dB	5.3
	18 GHz to 26.5 GHz	dB	5.2
	26.5 GHz to 40 GHz	dB	4.7
0.5 m	26.5 GHz to 40 GHz	dB	4.8

Antenna Terminal Conducted

Item	Unit	Calculated Uncertainty (+/-)
Antenna terminated conducted emission / Power density / Burst power	dB	3.47
Adjacent channel power (ACP)	dB	2.28
Bandwidth (OBW)	%	0.96
Time readout (time span upto 100 msec)	%	0.11
Time readout (time span upto 1000 msec)	%	0.11
Time readout (time span upto 60 sec)	%	0.02
Power measurement (Power meter < 8 GHz)	dB	1.46
Power measurement (Call box < 6 GHz)	dB	1.69
Frequency readout (Frequency counter)	ppm	0.67
Frequency readout (Spectrum analyzer frequency readout function)	ppm	2.13
Temperature (constant temperature bath)	deg. C	0.69
Humidity (constant temperature bath)	%RH	2.98
Modulation characteristics	%	6.93
Frequency for mobile	ppm	0.08
Contention-based protocol	dB	2.26

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

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

Telephone: +81-596-24-8999

A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919

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

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	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

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)

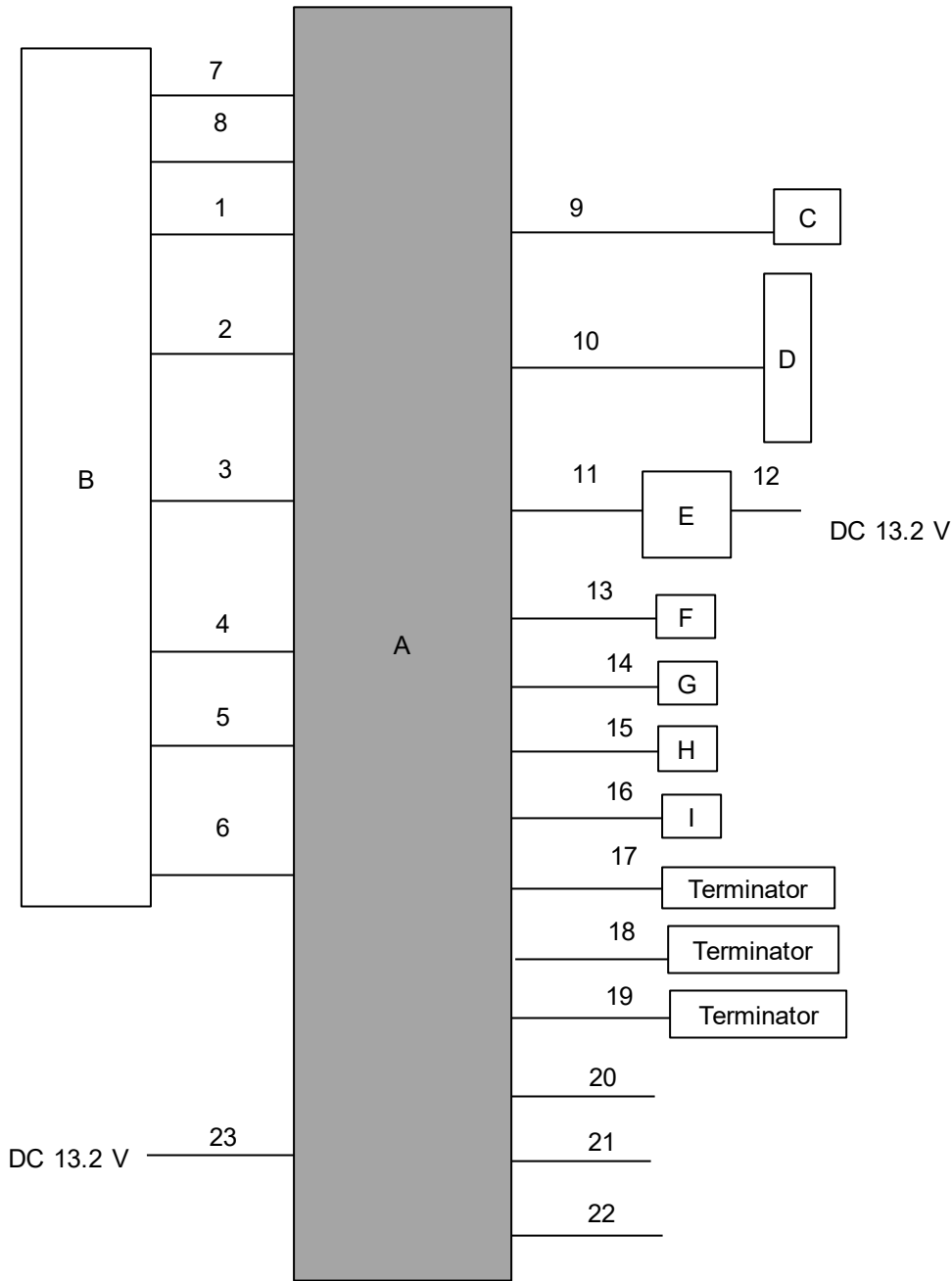
Mode	Remarks*
IEEE 802.11b (11b)	2 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 14, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power Setting: 11b: 14 dBm 11g, 11n-20: 11 dBm Software: MSoc Version: F67WHM010-708 (Date: November 12, 2020, Storage location: EUT memory)	
*This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. 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 Antenna	Tested Frequency
Radiated Spurious Emission (Below 1 GHz) Conducted Spurious Emission	Tx 11n-20 *1)	0	2462 MHz
Radiated Spurious Emission (Above 1 GHz), 6dB Bandwidth, Maximum Peak Output Power, Power Density, 99% Occupied Bandwidth	Tx 11b Tx 11g	0	2412 MHz 2437 MHz 2462 MHz
	Tx 11n-20	0, 1	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

For Radiated Emission



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

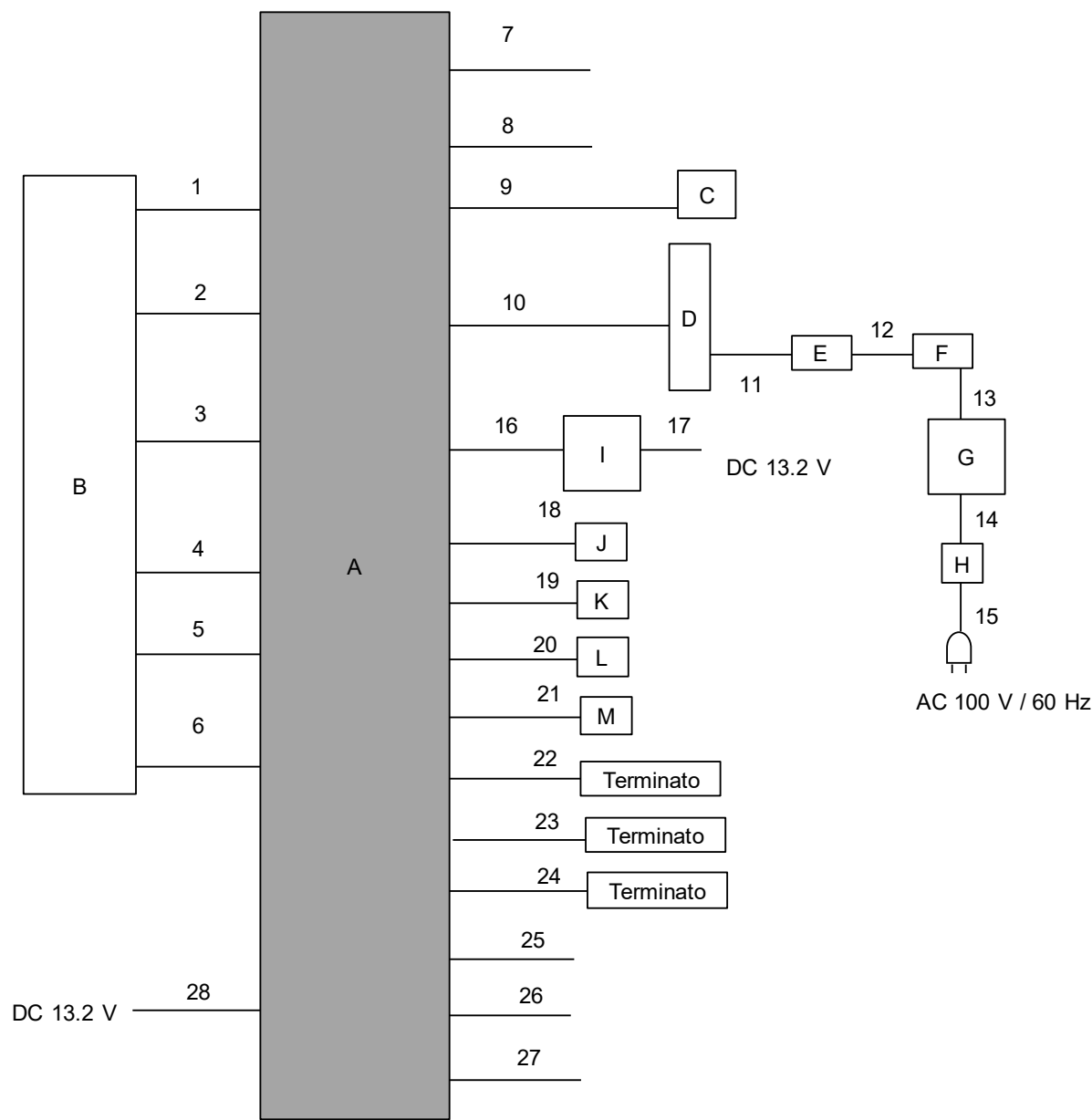
Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Cockpit Control Unit	DNNS125	0468726400500243000 00000	DENSO CORPORATION	EUT
B	Display (CID)	DNNS132-2	86412FN450	DENSO CORPORATION	-
C	Mic	-	-	Panasonic	-
D	USB BOX	86257AN00A	No.7	SUBARU	-
E	Meter	TN257550-6773	85002AN02A	DENSO CORPORATION	-
F	Speaker	SPEAKER ASSY 4FD	-	FOSTER	-
G	Speaker	SPEAKER ASSY 4FD	-	FOSTER	-
H	Speaker	SPEAKER ASSY 4RD	-	FOSTER	-
I	Speaker	SPEAKER ASSY 4RD	-	FOSTER	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.2	Unshielded	Unshielded	-
2	Signal Cable	0.2	Unshielded	Unshielded	-
3	GND Cable	0.2	Unshielded	Unshielded	-
4	GND Cable	0.2	Unshielded	Unshielded	-
5	GND Cable	0.2	Unshielded	Unshielded	-
6	GND Cable	0.2	Unshielded	Unshielded	-
7	RF Cable	0.1	Shielded	Shielded	-
8	RF Cable	0.1	Shielded	Shielded	-
9	Mic Cable	1.0	Unshielded	Unshielded	-
10	Signal Cable	0.5	Unshielded	Unshielded	-
11	Signal Cable	1.0	Unshielded	Unshielded	-
12	DC Cable	2.5	Unshielded	Unshielded	-
13	Speaker Cable	2.0	Unshielded	Unshielded	-
14	Speaker Cable	2.0	Unshielded	Unshielded	-
15	Speaker Cable	2.0	Unshielded	Unshielded	-
16	Speaker Cable	2.0	Unshielded	Unshielded	-
17	Antenna Cable	1.5	Shielded	Shielded	-
18	Antenna Cable	1.5	Shielded	Shielded	-
19	Antenna Cable	1.0	Shielded	Shielded	-
20	Signal Cable	1.0	Unshielded	Unshielded	-
21	Signal Cable	1.0	Unshielded	Unshielded	-
22	Signal Cable	1.0	Unshielded	Unshielded	-
23	DC Cable	2.5	Unshielded	Unshielded	-

For Antenna Terminal Conducted 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	Cockpit Control Unit	DNNS125	046872640050024330 100091	DENSO CORPORATION	EUT
B	Display (CID)	DNNS132-2	86412FN450	DENSO CORPORATION	-
C	Mic	-	-	Panasonic	-
D	USB BOX	86257AN00A	No.7	SUBARU	-
E	USB-LAN Adapter	LUA3-U2-ATX	26495680506450	BUFFALO INC.	-
F	USB-LAN Adapter	LUA3-U2-ATX	26495680506351	BUFFALO INC.	-
G	Laptop PC	PR63PBAA337AD7X	6F053983H	TOSHIBA	-
H	AC Adapter	PA51770-1ACA	G71C000GZ120	TOSHIBA	-
I	Meter	TN257550-6773	85002AN02A	DENSO CORPORATION	-
J	Speaker	SPEAKER ASSY 4FD	-	FOSTER	-
K	Speaker	SPEAKER ASSY 4FD	-	FOSTER	-
L	Speaker	SPEAKER ASSY 4RD	-	FOSTER	-
M	Speaker	SPEAKER ASSY 4RD	-	FOSTER	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	0.2	Unshielded	Unshielded	-
2	Signal Cable	0.2	Unshielded	Unshielded	-
3	GND Cable	0.2	Unshielded	Unshielded	-
4	GND Cable	0.2	Unshielded	Unshielded	-
5	GND Cable	0.2	Unshielded	Unshielded	-
6	GND Cable	0.2	Unshielded	Unshielded	-
7	RF Cable	0.1	Shielded	Shielded	-
8	RF Cable	0.1	Shielded	Shielded	-
9	Mic Cable	1.0	Unshielded	Unshielded	-
10	Signal Cable	0.5	Unshielded	Unshielded	-
11	USB Cable	0.2	Shielded	Shielded	-
12	LAN Cable	1.5	Unshielded	Unshielded	-
13	USB Cable	0.2	Shielded	Shielded	-
14	DC Cable	1.3	Unshielded	Unshielded	-
15	AC Cable	0.8	Unshielded	Unshielded	-
16	Signal Cable	1.0	Unshielded	Unshielded	-
17	DC Cable	2.5	Unshielded	Unshielded	-
18	Speaker Cable	2.0	Unshielded	Unshielded	-
19	Speaker Cable	2.0	Unshielded	Unshielded	-
20	Speaker Cable	2.0	Unshielded	Unshielded	-
21	Speaker Cable	2.0	Unshielded	Unshielded	-
22	Antenna Cable	1.5	Shielded	Shielded	-
23	Antenna Cable	1.5	Shielded	Shielded	-
24	Antenna Cable	1.0	Shielded	Shielded	-
25	Signal Cable	1.0	Unshielded	Unshielded	-
26	Signal Cable	1.0	Unshielded	Unshielded	-
27	Signal Cable	1.0	Unshielded	Unshielded	-
28	DC Cable	2.5	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. 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	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

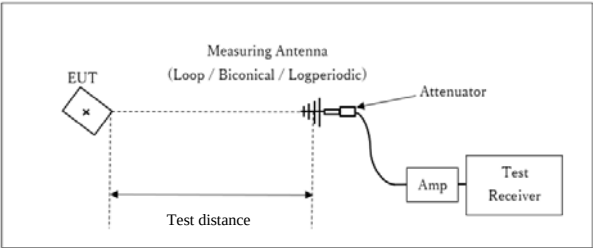
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired 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	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	<u>11.12.2.5.1</u> RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces <u>11.12.2.5.2</u> 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

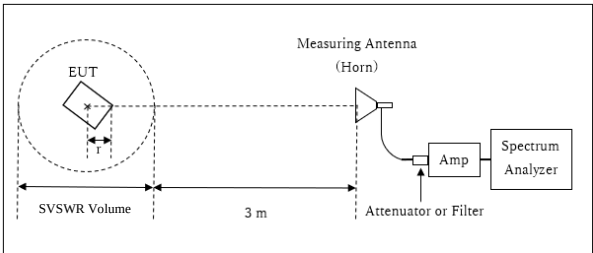
Figure 1: Test Setup

Below 1 GHz



Test Distance: 3 m

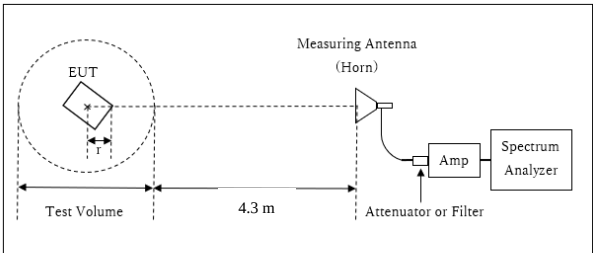
1 GHz to 6 GHz



[1 GHz to 6 GHz]
Distance Factor: $20 \times \log (3.8 \text{ m} / 3.0 \text{ m}) = 2.06 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.8 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.2 \text{ m}$

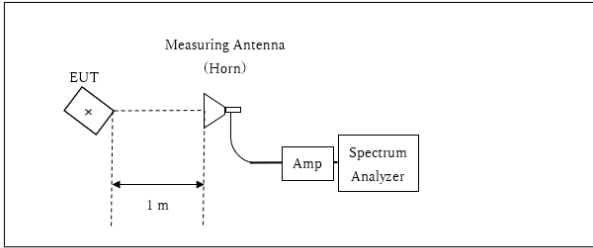
6 GHz to 10 GHz



Distance Factor: $20 \times \log (4.8 \text{ m} / 3.0 \text{ m}) = 4.09 \text{ dB}$
* Test Distance: $(4.3 + \text{SVSWR Volume} / 2) - r = 4.8 \text{ m}$

SVSWR Volume : 1.4 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.2 \text{ m}$

10 GHz to 26.5 GHz



Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.5 \text{ dB}$
*Test Distance: 1 m

The test was made on EUT at the normal use position.

Test results are rounded off and limit are rounded down, 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	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
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	10 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 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.

Test results are rounded off and limit are rounded down, 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

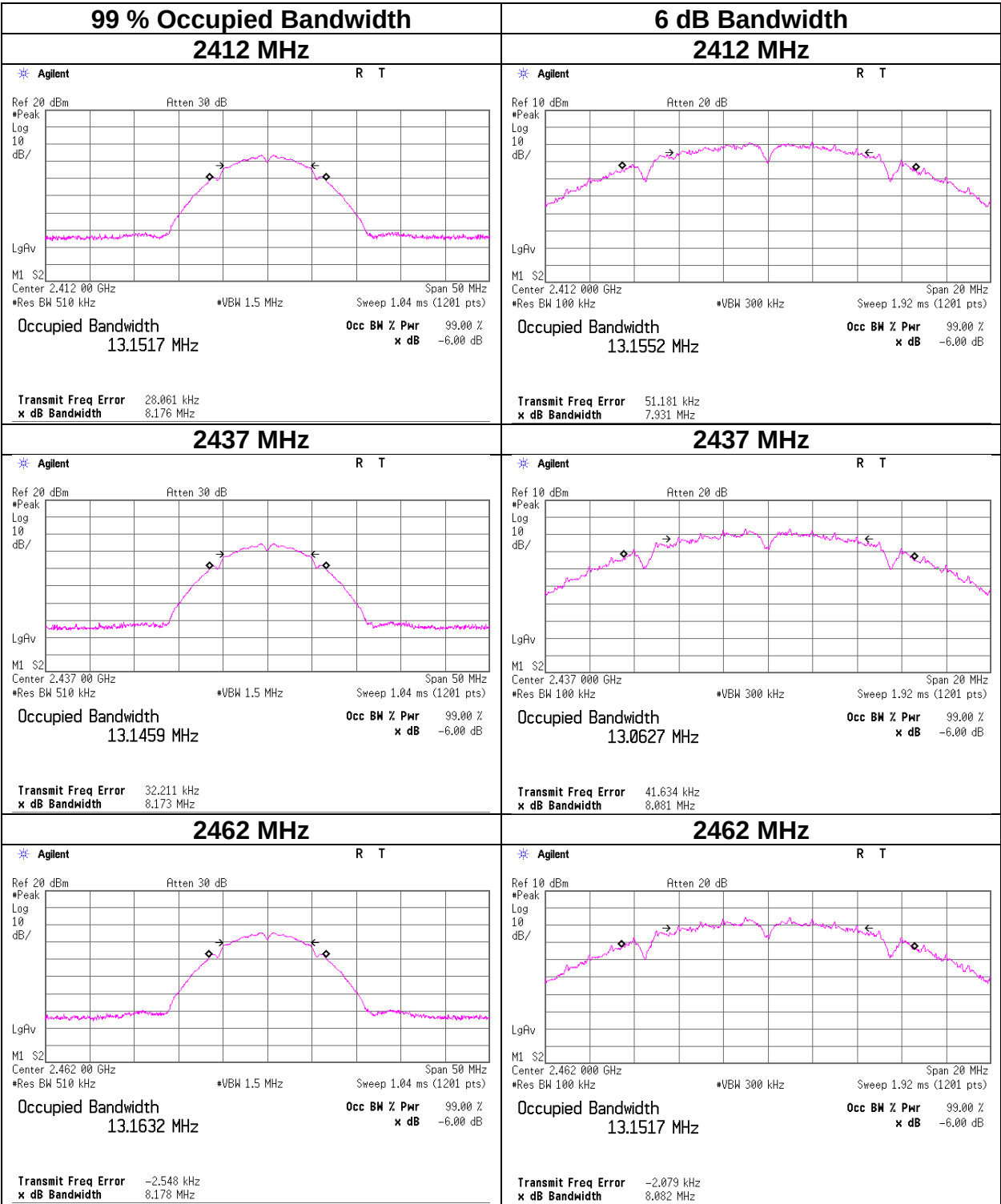
Test place Ise EMC Lab. No.4 Measurement Room
Date June 6, 2024
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Hiroki Numata
Mode Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	13151.7	7.931	> 0.5000
	2437	13145.9	8.081	> 0.5000
	2462	13163.2	8.082	> 0.5000
11g	2412	17057.9	16.494	> 0.5000
	2437	17135.8	16.495	> 0.5000
	2462	17104.8	16.503	> 0.5000

Mode	Antenna	Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [kHz]
11n-20	0	2412	18186.3	17.701	> 500
		2437	18169.1	17.701	> 500
		2462	18192.9	17.704	> 500
	1	2412	18133.3	17.678	> 500
		2437	18183.8	17.673	> 500
		2462	18124.8	17.685	> 500

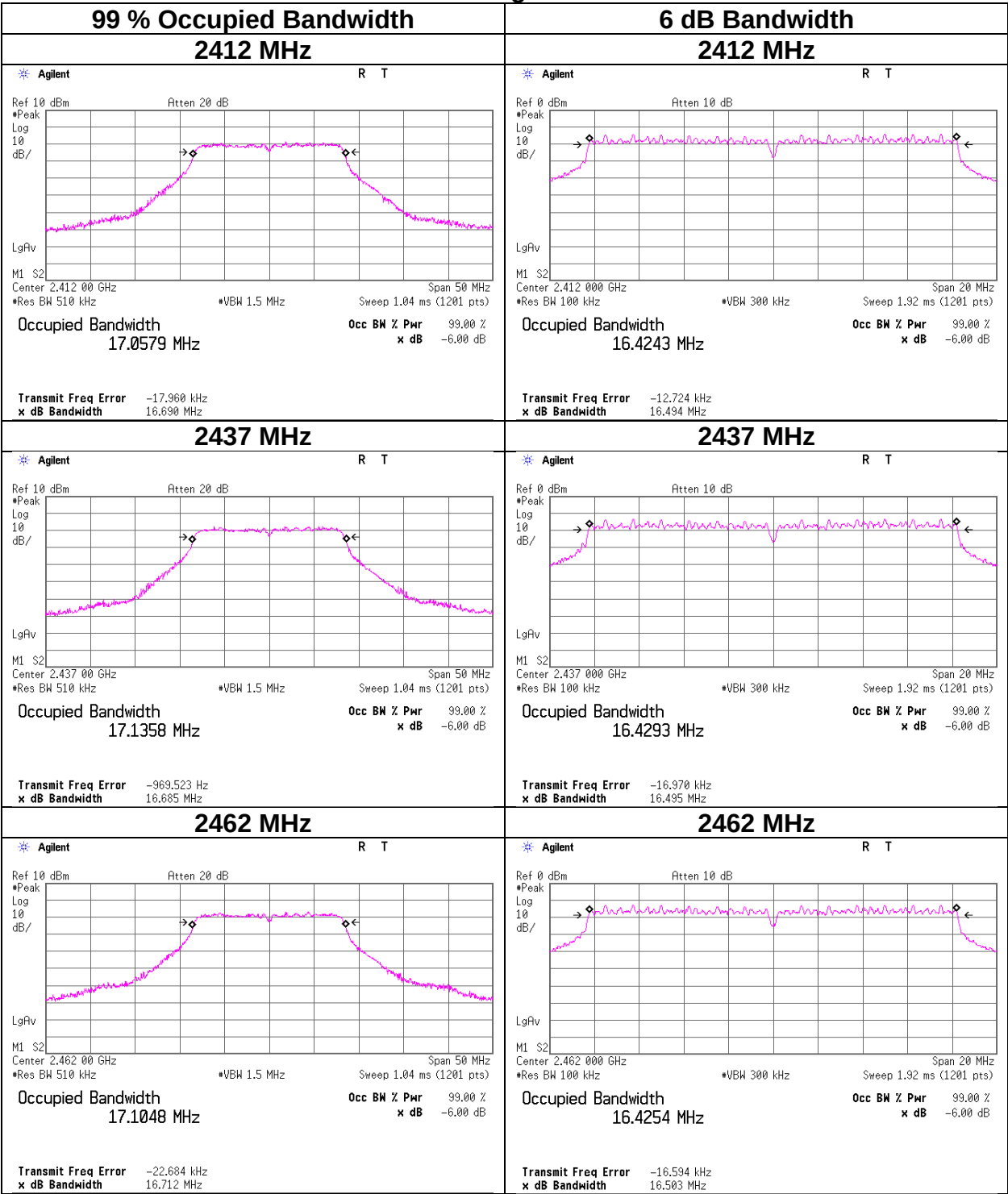
99 % Occupied Bandwidth and 6 dB Bandwidth

11b



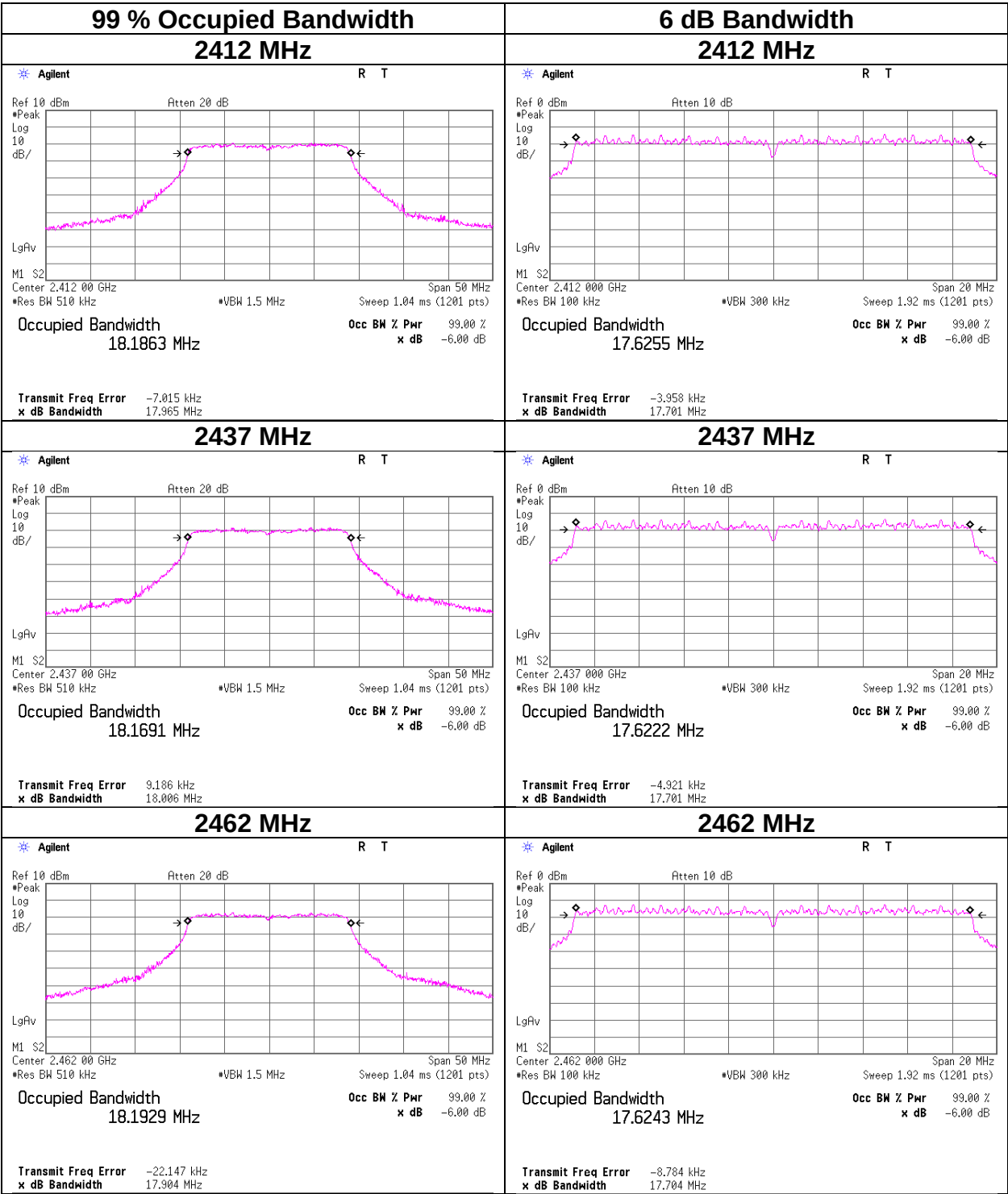
99 % Occupied Bandwidth and 6 dB Bandwidth

11g



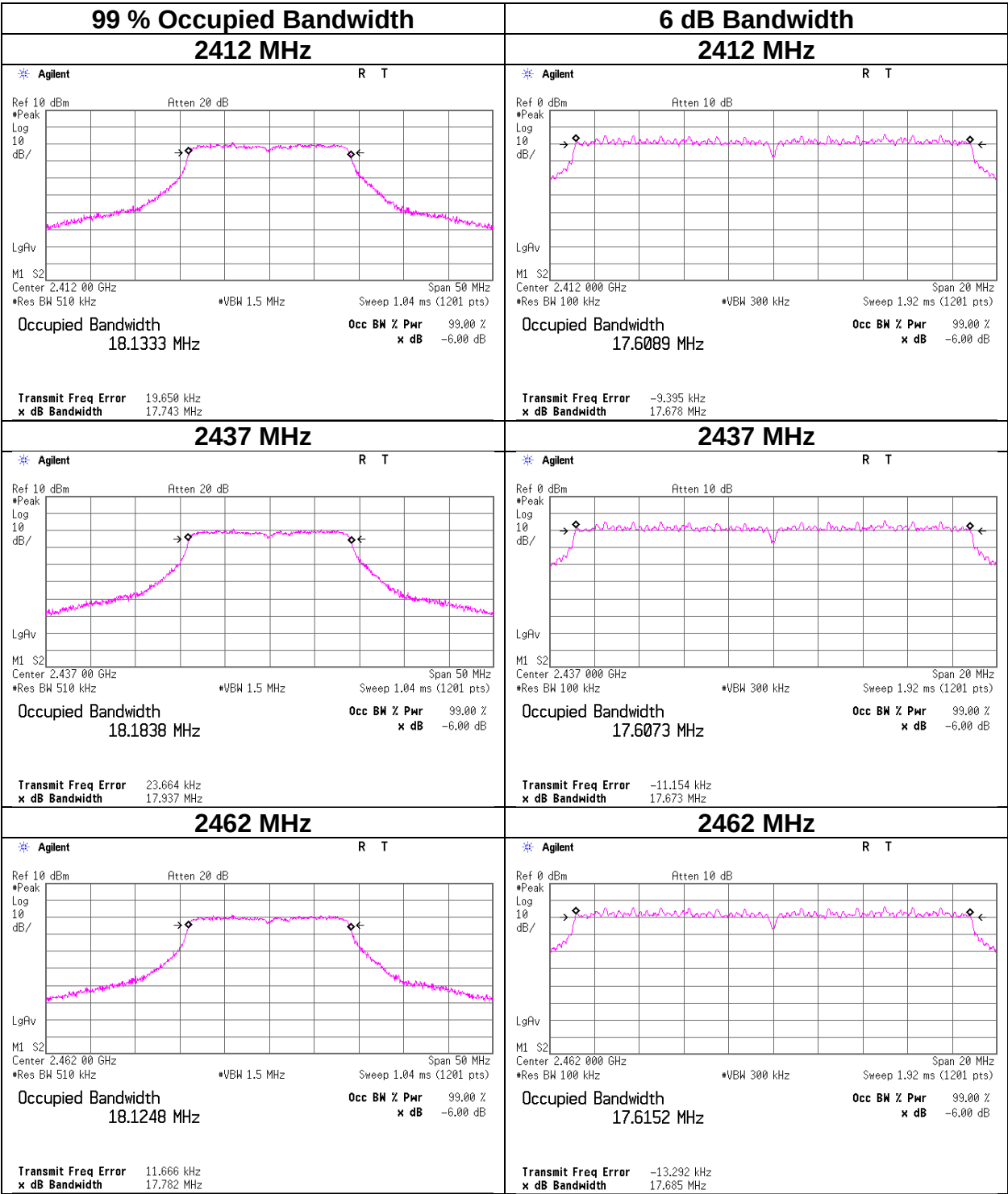
99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20 Antenna 0



99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20 Antenna 1



Maximum Peak Output Power

Test place Ise EMC Lab. No.6 Measurement Room
Date June 4, 2024 June 5, 2024 December 4, 2024
Temperature / Humidity 22 deg. C / 41 % RH 21 deg. C / 56 % RH 23 deg. C / 41 % RH
Engineer Kiyoshiro Okazaki Hiroki Numata Takafumi Noguchi
Mode Tx 11b

Antenna 0				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	2.79	2.53	10.03	15.35	34.25	30.00	1000	14.65	1.78	17.13	51.61	36.02	4000	18.89
2437	3.76	2.54	10.03	16.33	42.93	30.00	1000	13.67	1.78	18.11	64.67	36.02	4000	17.91
2462	4.76	2.54	10.03	17.33	54.04	30.00	1000	12.67	1.78	19.11	81.42	36.02	4000	16.91

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437 MHz

Rate	Reading Antenna 0	Reading Antenna 1	Remark
[Mbps]	[dBm]	[dBm]	
1	5.33	4.49	
2	5.47	4.51	*
5.5	5.46	4.52	
11	5.37	4.54	

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

Maximum Peak Output Power

Test place Ise EMC Lab. No.6 Measurement Room
Date June 4, 2024 June 5, 2024 December 4, 2024
Temperature / Humidity 22 deg. C / 41 % RH 21 deg. C / 56 % RH 23 deg. C / 41 % RH
Engineer Kiyoshiro Okazaki Hiroki Numata Takafumi Noguchi
Mode Tx 11g

Antenna 0				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin	Antenna Gain [dBi]	Result		Limit		Margin
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	6.34	2.53	10.03	18.90	77.62	30.00	1000	11.10	1.78	20.68	116.95	36.02	4000	15.34
2437	7.65	2.54	10.03	20.22	105.20	30.00	1000	9.78	1.78	22.00	158.49	36.02	4000	14.02
2462	8.32	2.54	10.03	20.89	122.74	30.00	1000	9.11	1.78	22.67	184.93	36.02	4000	13.35

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437 MHz

Rate	Reading	Reading	Remark
[Mbps]	Antenna 0 [dBm]	Antenna 1 [dBm]	
6	5.85	5.04	
9	6.01	5.24	
12	6.39	5.60	
18	6.23	5.48	
24	8.77	8.17	
36	8.67	8.12	
48	8.75	8.04	
54	8.79	8.30	*

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

Maximum Peak Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Date June 5, 2024
Temperature / Humidity 21 deg. C / 56 % RH
Engineer Hiroki Numata
Mode Tx 11n-20

Antenna 0 + Antenna 1			Conducted Power					e.i.r.p. for RSS-247						
Freq.	Antenna 0 Conducted Power Result	Antenna 1 Conducted Power Result	Result		Limit		Margin	Antenna 0 e.i.r.p. Result	Antenna 1 e.i.r.p. Result	Result		Limit		Margin
[MHz]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	88.72	81.66	22.31	170.37	30.00	1000	7.69	133.66	123.03	24.09	256.69	36.02	4000.00	11.93
2437	104.47	83.18	22.73	187.65	30.00	1000	7.27	157.40	125.31	24.51	282.71	36.02	4000.00	11.51
2462	124.45	89.95	23.31	214.40	30.00	1000	6.69	187.50	135.52	25.09	323.02	36.02	4000.00	10.93

Sample Calculation:

Conducted Power Result = Antenna 0 Conducted Power Result + Antenna 1 Conducted Power Result

e.i.r.p. Result = Antenna 0 e.i.r.p. Result + Antenna 1 e.i.r.p. Result

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power Result		Antenna Gain [dBi]	e.i.r.p. Result	
				[dBm]	[mW]		[dBm]	[mW]
2412	6.92	2.53	10.03	19.48	88.72	1.78	21.26	133.66
2437	7.62	2.54	10.03	20.19	104.47	1.78	21.97	157.40
2462	8.38	2.54	10.03	20.95	124.45	1.78	22.73	187.50

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power Result		Antenna Gain [dBi]	e.i.r.p. Result	
				[dBm]	[mW]		[dBm]	[mW]
2412	6.56	2.53	10.03	19.12	81.66	1.78	20.90	123.03
2437	6.63	2.54	10.03	19.20	83.18	1.78	20.98	125.31
2462	6.97	2.54	10.03	19.54	89.95	1.78	21.32	135.52

Sample Calculation:

Conducted Power Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

e.i.r.p. Result = Conducted Power Result + Antenna Gain

2412 MHz

Tx	MCS Number	Antenna 0		Antenna 1		Total Reading Power		Remark
		[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	
SISO	0	3.25	2.11	-	-	3.25	2.11	
	1	3.54	2.26	-	-	3.54	2.26	
	2	3.57	2.28	-	-	3.57	2.28	
	3	5.61	3.64	-	-	5.61	3.64	
	4	5.90	3.89	-	-	5.90	3.89	
	5	6.01	3.99	-	-	6.01	3.99	
	6	6.81	4.80	-	-	6.81	4.80	
	7	6.04	4.02	-	-	6.04	4.02	
	0	-	-	3.21	2.09	3.21	2.09	
	1	-	-	3.52	2.25	3.52	2.25	
	2	-	-	3.55	2.26	3.55	2.26	
	3	-	-	5.67	3.69	5.67	3.69	
	4	-	-	5.77	3.78	5.77	3.78	
	5	-	-	5.80	3.80	5.80	3.80	
	6	-	-	6.76	4.74	6.76	4.74	
MIMO	7	-	-	5.68	3.70	5.68	3.70	
	8	3.43	2.20	3.41	2.19	6.43	4.40	
	9	3.44	2.21	3.44	2.21	6.45	4.42	
	10	3.77	2.38	3.41	2.19	6.60	4.58	
	11	6.06	4.04	5.82	3.82	8.95	7.86	
	12	5.79	3.79	5.90	3.89	8.86	7.68	
	13	5.78	3.78	5.69	3.71	8.75	7.49	
	14	6.17	4.14	5.99	3.97	9.09	8.11	*
	15	6.10	4.07	5.81	3.81	8.97	7.88	

*Worst MCS

All comparison were carried out on same frequency and measurement factors.

Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 6, 2024
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Hiroki Numata
Mode	Tx

11b 1 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	0.37	2.53	10.03	12.93	19.63	0.04	12.97	19.82
2437	1.24	2.53	10.03	13.80	23.99	0.04	13.84	24.21
2462	2.28	2.53	10.03	14.84	30.48	0.04	14.88	30.76

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-3.08	2.53	10.03	9.48	8.87	0.28	9.76	9.46
2437	-2.21	2.53	10.03	10.35	10.84	0.28	10.63	11.56
2462	-1.27	2.53	10.03	11.29	13.46	0.28	11.57	14.35

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 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.

Average Output Power (Reference data for RF Exposure)

Test place	Ise EMC Lab. No.6 Measurement Room
Date	June 6, 2024
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Hiroki Numata
Mode	Tx 11n-20

Antenna 0 + Antenna 1 MCS0

Freq. [MHz]	Antenna 0 Result [mW]	Antenna 1 Result [mW]	Result (Burst average)	
			[dBm]	[mW]
2412	8.71	7.52	12.10	16.23
2437	10.33	8.04	12.64	18.36
2462	13.37	8.99	13.49	22.36

Antenna 0

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-3.49	2.53	10.03	9.07	8.07	0.33	9.40	8.71
2437	-2.76	2.54	10.03	9.81	9.57	0.33	10.14	10.33
2462	-1.64	2.54	10.03	10.93	12.39	0.33	11.26	13.37

Antenna 1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result (Time average)		Duty factor [dB]	Result (Burst power average)	
				[dBm]	[mW]		[dBm]	[mW]
2412	-4.13	2.53	10.03	8.43	6.97	0.33	8.76	7.52
2437	-3.85	2.54	10.03	8.72	7.45	0.33	9.05	8.04
2462	-3.36	2.54	10.03	9.21	8.34	0.33	9.54	8.99

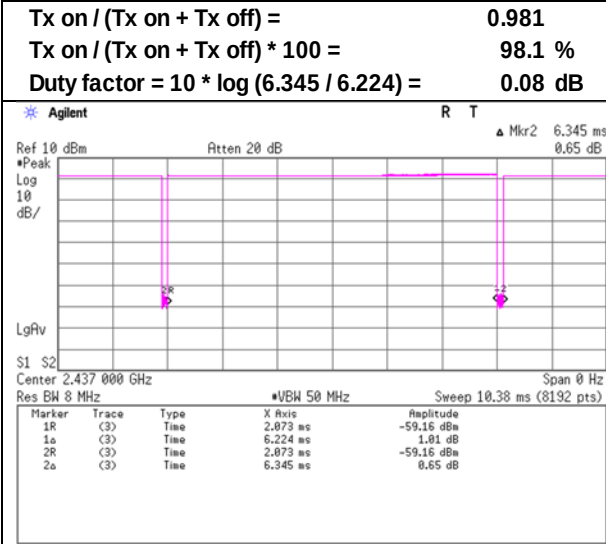
Sample Calculation:

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

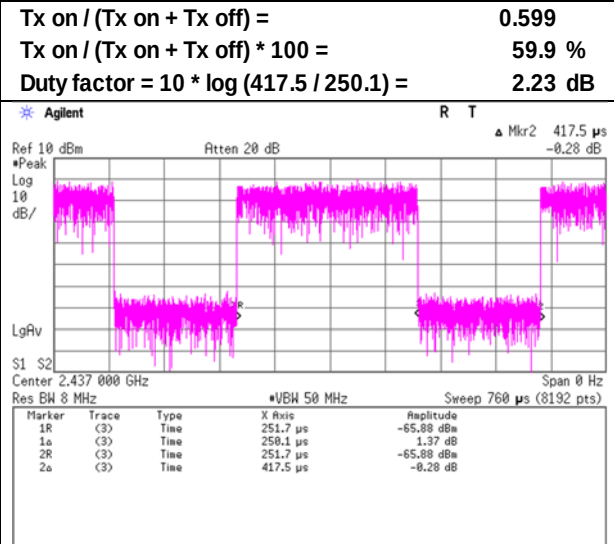
Burst rate confirmation

Test place	Ise EMC Lab. No.3 Semi Anechoic Chamber
Date	June 5, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Nachi Konegawa
Mode	Tx

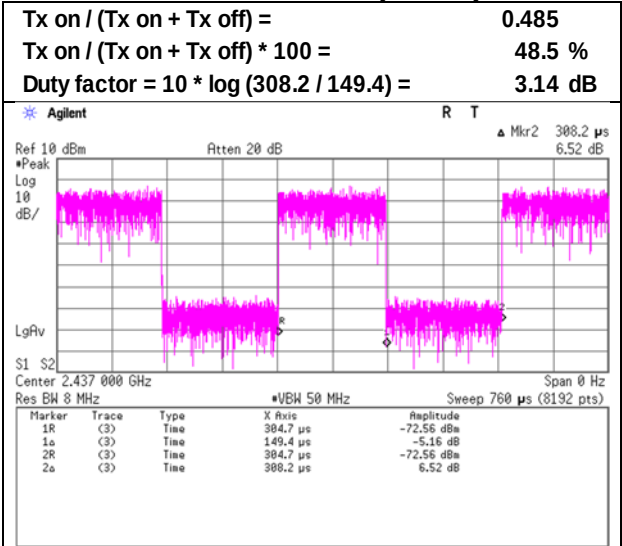
11b 2 Mbps



11g 54 Mbps



11n-20 MCS 14 (MIMO)

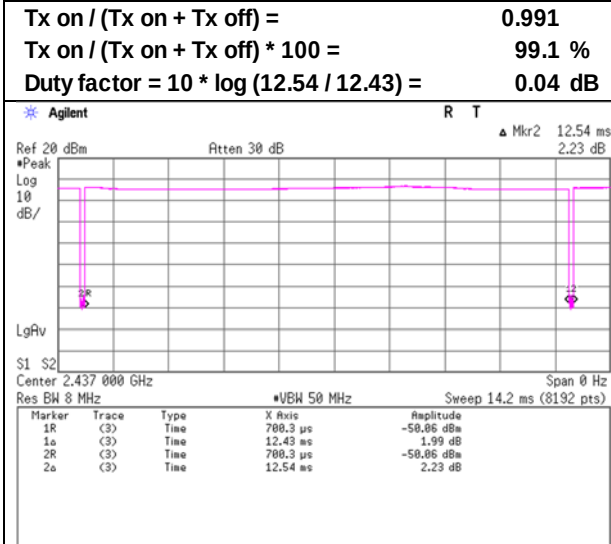


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

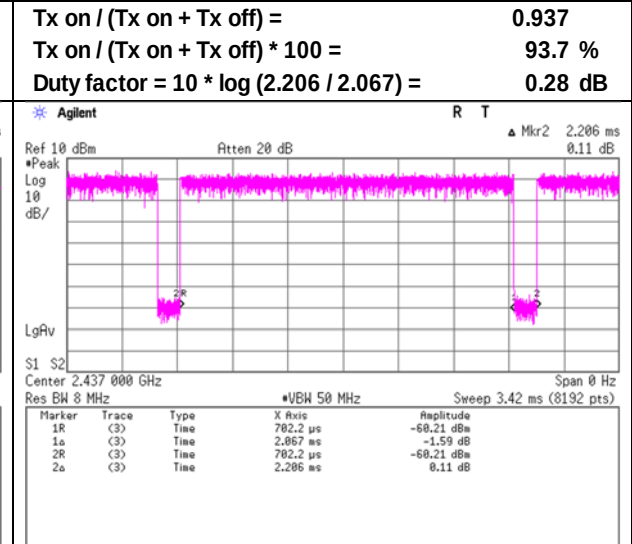
Burst rate confirmation

Test place	Ise EMC Lab. No.4 Measurement Room
Date	June 6, 2024
Temperature / Humidity	22 deg. C / 60 % RH
Engineer	Hiroki Numata
Mode	Tx

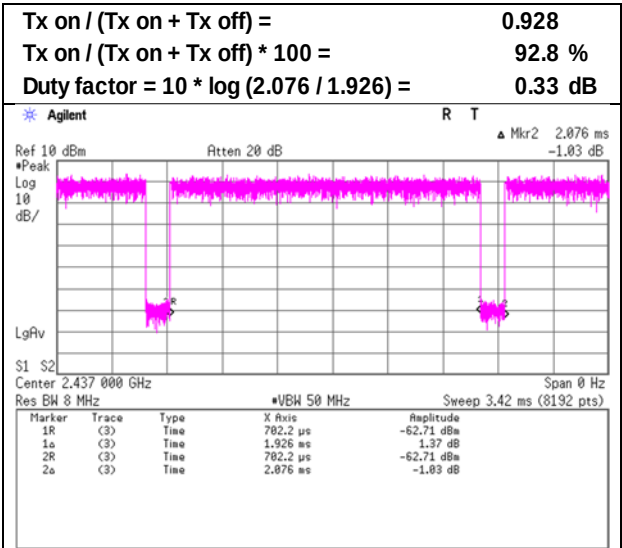
11b 1 Mbps



11g 6 Mbps



11n-20 MCS 0



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

Radiated Spurious Emission

Test place	Ise EMC Lab.	No.4
Semi Anechoic Chamber	No.3	June 10, 2024
Date	June 5, 2024	24 deg. C / 55 % RH
Temperature / Humidity	23 deg. C / 53 % RH	Junki Nagatomi
Engineer	Nachi Konegawa	(6 GHz to 26.5 GHz)
	(1 GHz to 6 GHz)	
Mode	Tx 11b 2412 MHz	

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2390.0	47.3	38.6	27.5	5.1	32.2	0.1	47.7	39.0	73.9	53.9	26.2	14.9	*1)
Hori.	3509.1	49.6	47.5	28.8	7.1	31.7	-	53.8	51.7	73.9	53.9	20.1	2.2	
Hori.	4824.0	40.7	32.2	31.4	7.2	31.2	-	48.1	39.6	73.9	53.9	25.8	14.4	Floor noise
Hori.	7236.0	40.7	32.2	35.6	11.0	32.1	-	55.2	46.7	73.9	53.9	18.7	7.2	Floor noise
Hori.	9648.0	41.2	31.7	35.8	12.1	32.3	-	56.7	47.2	73.9	53.9	17.2	6.7	Floor noise
Vert.	2390.0	45.1	35.9	27.5	5.1	32.2	0.1	45.4	36.3	73.9	53.9	28.5	17.6	*1)
Vert.	3509.1	52.1	48.7	28.8	7.1	31.7	-	56.3	52.9	73.9	53.9	17.6	1.0	
Vert.	4824.0	40.7	32.2	31.4	7.2	31.2	-	48.1	39.6	73.9	53.9	25.8	14.4	Floor noise
Vert.	7236.0	40.8	32.2	35.6	11.0	32.1	-	55.3	46.7	73.9	53.9	18.6	7.2	Floor noise
Vert.	9648.0	41.3	31.7	35.8	12.1	32.3	-	56.8	47.2	73.9	53.9	17.1	6.7	Floor noise

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

Result (AV)= 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).

*QP detector was used up to 1GHz.

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

20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2412.0	95.9	27.5	5.1	32.2	96.2	-	-	Carrier
Hori.	2400.0	40.0	27.5	5.1	32.2	40.4	76.2	35.8	
Vert.	2412.0	92.0	27.5	5.1	32.2	92.4	-	-	Carrier
Vert.	2400.0	37.5	27.5	5.1	32.2	37.9	72.4	34.5	

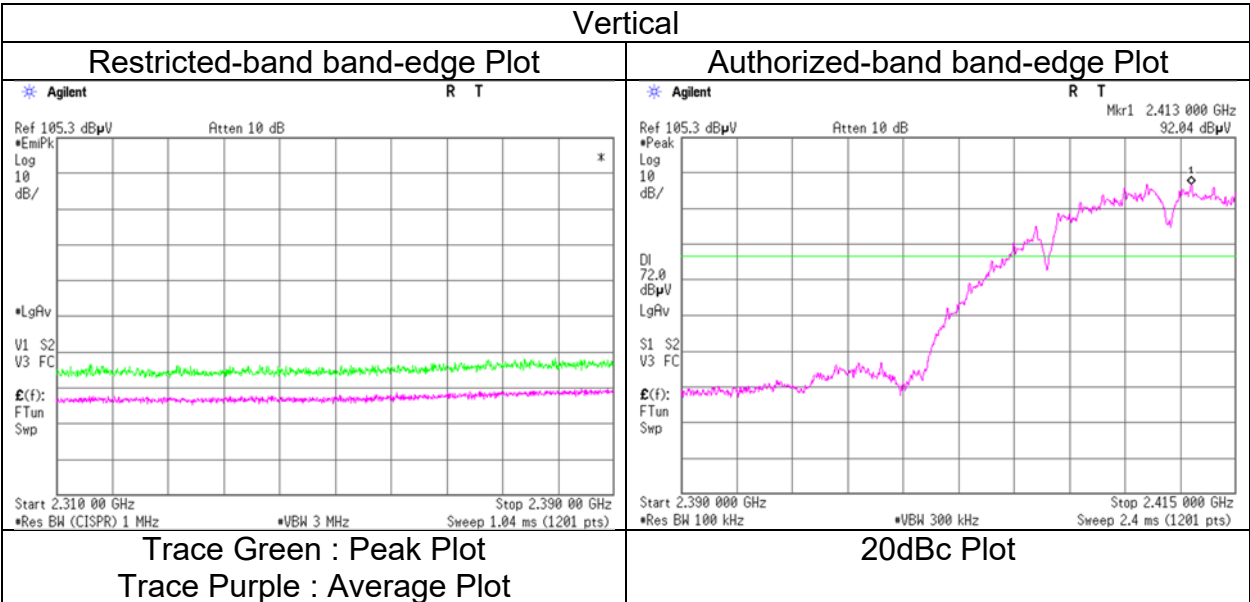
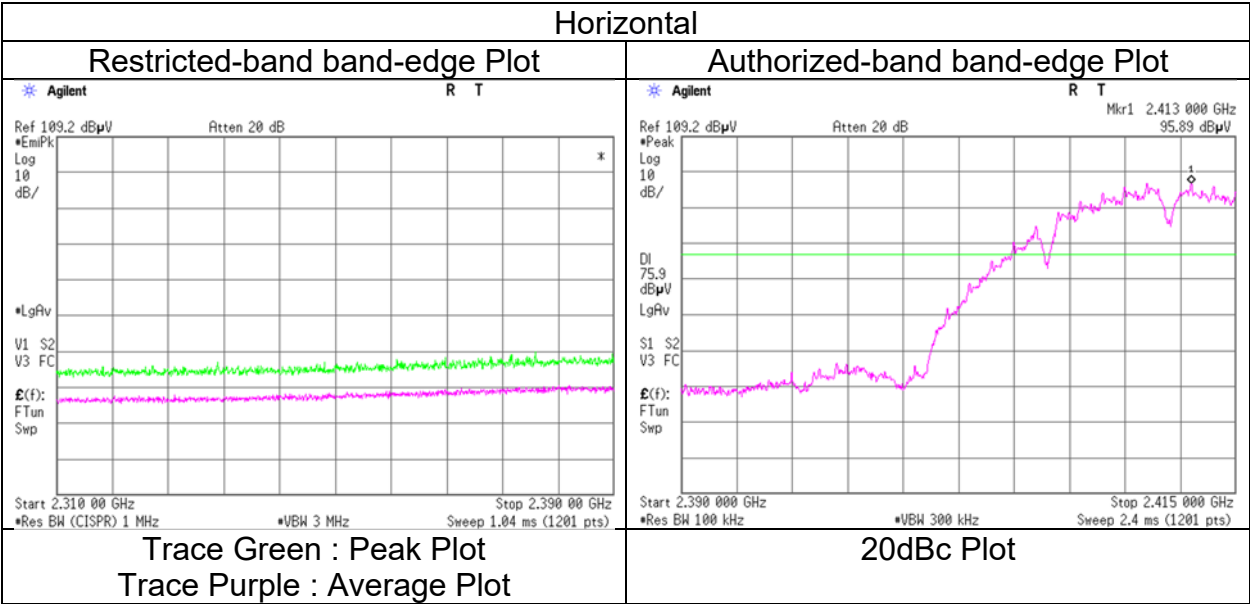
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)

Distance factor:

1 GHz - 6 GHz	$20\log(3.8\text{ m} / 3.0\text{ m}) = 2.06\text{ dB}$
6 GHz - 10 GHz	$20\log(4.8\text{ m} / 3.0\text{ m}) = 4.09\text{ dB}$
10 GHz - 26.5 GHz	$20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 5, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Nachi Konegawa
	(1 GHz to 6 GHz)
Mode	Tx 11b 2412 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.4
Date	June 5, 2024	June 10, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH
Engineer	Nachi Konegawa	Junki Nagatomi
	(1 GHz to 6 GHz)	(6 GHz to 26.5 GHz)
Mode	Tx 11b 2437 MHz	

Polarity	Frequency	Reading	Reading	Ant.	Loss	Gain	Duty	Result	Result	Limit	Limit	Margin	Margin	Remark
[Hori/Vert]	[MHz]	(QP / PK)	(AV)	Factor			Factor	(QP / PK)	(AV)	(QP / PK)	(AV)	(QP / PK)	(AV)	
		[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	3509.1	49.7	47.6	28.8	7.1	31.7	-	53.9	51.8	73.9	53.9	20.0	2.1	
Hori.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7311.0	43.0	32.4	35.5	11.0	32.1	-	57.4	46.8	73.9	53.9	16.5	7.1	Floor noise
Hori.	9748.0	42.6	31.0	36.0	12.1	32.4	-	58.3	46.7	73.9	53.9	15.6	7.2	Floor noise
Vert.	3509.1	52.1	48.8	28.8	7.1	31.7	-	56.3	53.0	73.9	53.9	17.6	0.9	
Vert.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Vert.	7311.0	43.1	32.4	35.5	11.0	32.1	-	57.6	46.8	73.9	53.9	16.3	7.1	Floor noise
Vert.	9748.0	43.6	31.0	36.0	12.1	32.4	-	59.4	46.7	73.9	53.9	14.6	7.2	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.3	No.4
Date	June 5, 2024	June 10, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH
Engineer	Nachi Konegawa	Junki Nagatomi
	(1 GHz to 6 GHz)	(6 GHz to 26.5 GHz)
Mode	Tx 11b 2462 MHz	

Polarity	Frequency	Reading	Reading	Ant.	Loss	Gain	Duty	Result	Result	Limit	Limit	Margin	Margin	Remark
[Hori/Vert]	[MHz]	(QP / PK)	(AV)	Factor			Factor	(QP / PK)	(AV)	(QP / PK)	(AV)	(QP / PK)	(AV)	
		[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	49.0	40.1	27.4	5.1	32.2	0.1	49.3	40.5	73.9	53.9	24.7	13.4	*1)
Hori.	3509.1	49.5	47.4	28.8	7.1	31.7	-	53.7	51.6	73.9	53.9	20.2	2.3	
Hori.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Hori.	7386.0	42.4	31.9	35.5	11.1	32.1	-	56.8	46.3	73.9	53.9	17.1	7.6	Floor noise
Hori.	9848.0	41.8	31.6	36.1	12.2	32.4	-	57.6	47.5	73.9	53.9	16.3	6.4	Floor noise
Vert.	2483.5	45.1	36.7	27.4	5.1	32.2	0.1	45.4	37.1	73.9	53.9	28.5	16.9	*1)
Vert.	3509.1	52.2	48.6	28.8	7.1	31.7	-	56.4	52.8	73.9	53.9	17.5	1.2	
Vert.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Vert.	7386.0	42.5	31.9	35.5	11.1	32.1	-	56.9	46.3	73.9	53.9	17.0	7.6	Floor noise
Vert.	9848.0	41.7	31.6	36.1	12.2	32.4	-	57.5	47.5	73.9	53.9	16.4	6.4	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

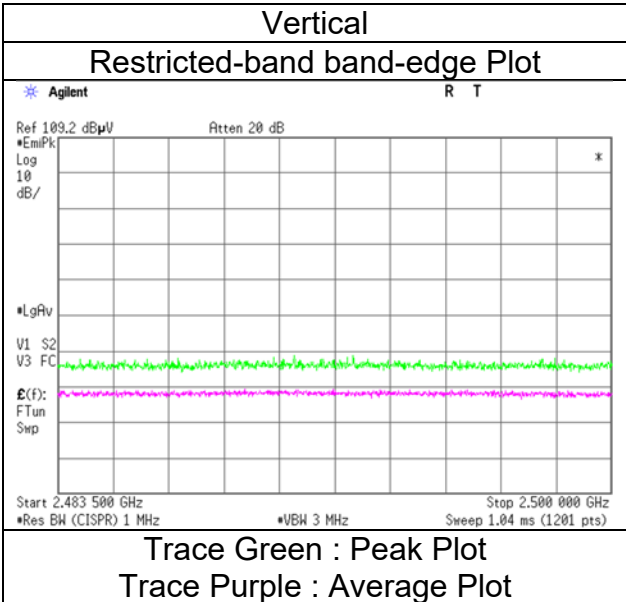
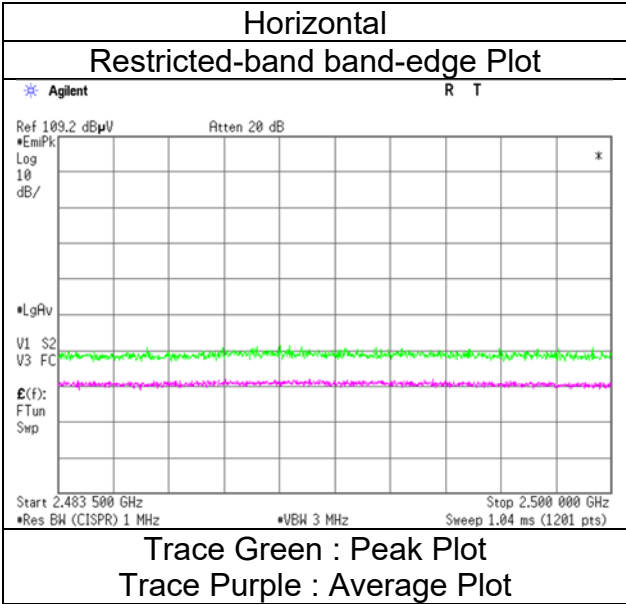
Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.3
June 5, 2024
23 deg. C / 53 % RH
Nachi Konegawa
(1 GHz to 6 GHz)
Tx 11b 2462 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.4	No.3
Date	June 5, 2024	June 10, 2024	June 12, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Engineer	Nachi Konegawa	Junki Nagatomi	Hiroyuki Furutaka
	(1 GHz to 6 GHz)	(10 GHz to 26.5 GHz)	(6 GHz to 10 GHz)
Mode	Tx 11g 2412 MHz		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2390.0	50.6	39.4	27.5	5.1	32.2	2.2	51.0	42.0	73.9	53.9	22.9	11.9	*1)
Hori.	3509.1	49.7	47.6	28.8	7.1	31.7	-	53.9	51.8	73.9	53.9	20.0	2.1	
Hori.	4824.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7236.0	42.5	33.6	35.6	10.3	32.0	-	56.4	47.5	73.9	53.9	17.5	6.4	Floor noise
Hori.	9648.0	42.4	33.9	35.7	10.9	32.7	-	56.3	47.8	73.9	53.9	17.6	6.1	Floor noise
Vert.	2390.0	50.5	38.5	27.5	5.1	32.2	2.2	50.9	41.1	73.9	53.9	23.0	12.8	*1)
Vert.	3509.1	52.1	48.7	28.8	7.1	31.7	-	56.3	52.9	73.9	53.9	17.6	1.0	
Vert.	4824.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Vert.	7236.0	42.2	33.4	35.6	10.3	32.0	-	56.1	47.3	73.9	53.9	17.8	6.6	Floor noise
Vert.	9648.0	41.8	33.9	35.7	10.9	32.7	-	55.7	47.8	73.9	53.9	18.2	6.1	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

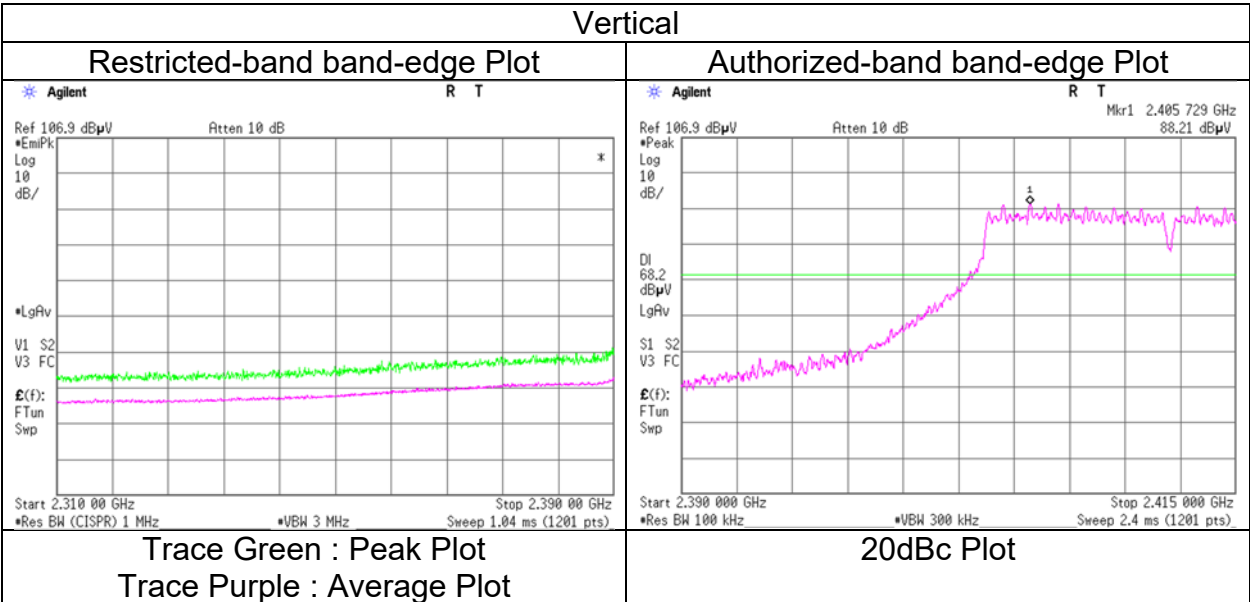
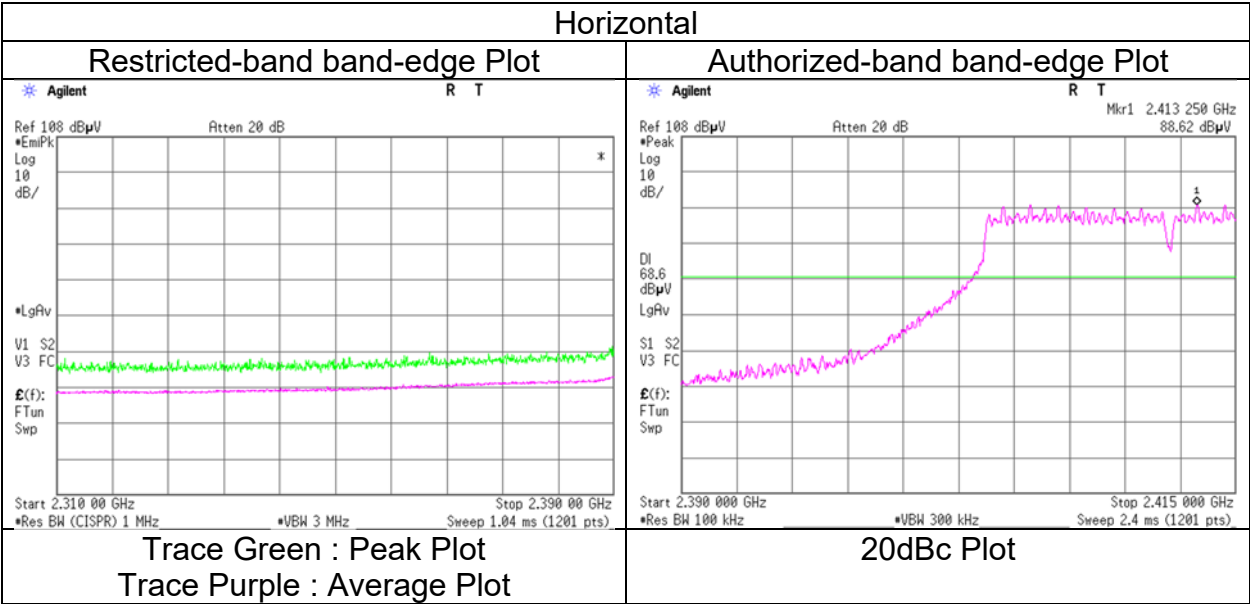
20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2412.0	88.6	27.5	5.1	32.2	88.9	-	-	Carrier
Hori.	2400.0	55.2	27.5	5.1	32.2	55.5	68.9	13.4	
Vert.	2412.0	88.2	27.5	5.1	32.2	88.5	-	-	Carrier
Vert.	2400.0	55.0	27.5	5.1	32.2	55.3	68.5	13.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 5, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Nachi Konegawa
	(1 GHz to 6 GHz)
Mode	Tx 11g 2412 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.4	No.3
Date	June 5, 2024	June 10, 2024	June 12, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)	Junki Nagatomi (10 GHz to 26.5 GHz)	Hiroyuki Furutaka (6 GHz to 10 GHz)
Mode	Tx 11g 2437 MHz		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	3509.1	49.7	47.6	28.8	7.1	31.7	-	53.9	51.8	73.9	53.9	20.0	2.1	
Hori.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7311.0	41.8	33.4	35.6	10.3	32.0	-	55.7	47.3	73.9	53.9	18.2	6.6	Floor noise
Hori.	9748.0	41.6	33.3	35.9	10.9	32.7	-	55.7	47.4	73.9	53.9	18.2	6.5	Floor noise
Vert.	3509.1	52.2	48.8	28.8	7.1	31.7	-	56.4	53.0	73.9	53.9	17.5	0.9	
Vert.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Vert.	7311.0	41.8	33.5	35.6	10.3	32.0	-	55.7	47.4	73.9	53.9	18.2	6.5	Floor noise
Vert.	9748.0	41.7	33.4	35.9	10.9	32.7	-	55.8	47.5	73.9	53.9	18.1	6.4	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.4	No.3
Date	June 5, 2024	June 10, 2024	June 12, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Engineer	Nachi Konegawa	Junki Nagatomi	Hiroyuki Furutaka
	(1 GHz to 6 GHz)	(10 GHz to 26.5 GHz)	(6 GHz to 10 GHz)
Mode	Tx 11g 2462 MHz		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2483.5	53.2	41.9	27.4	5.1	32.2	2.2	53.5	44.4	73.9	53.9	20.4	9.5	*1)
Hori.	3509.1	49.7	47.6	28.8	7.1	31.7	-	53.9	51.8	73.9	53.9	20.0	2.1	
Hori.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Hori.	7386.0	41.7	33.6	35.5	10.4	32.1	-	55.5	47.4	73.9	53.9	18.4	6.5	Floor noise
Hori.	9848.0	42.3	33.6	36.0	11.0	32.7	-	56.6	47.9	73.9	53.9	17.3	6.0	Floor noise
Vert.	2483.5	49.4	38.5	27.4	5.1	32.2	2.2	49.7	41.0	73.9	53.9	24.2	12.9	*1)
Vert.	3509.1	52.1	48.7	28.8	7.1	31.7	-	56.3	52.9	73.9	53.9	17.6	1.0	
Vert.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Vert.	7386.0	41.8	33.7	35.5	10.4	32.1	-	55.6	47.5	73.9	53.9	18.3	6.4	Floor noise
Vert.	9848.0	42.4	33.6	36.0	11.0	32.7	-	56.7	47.9	73.9	53.9	17.2	6.0	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

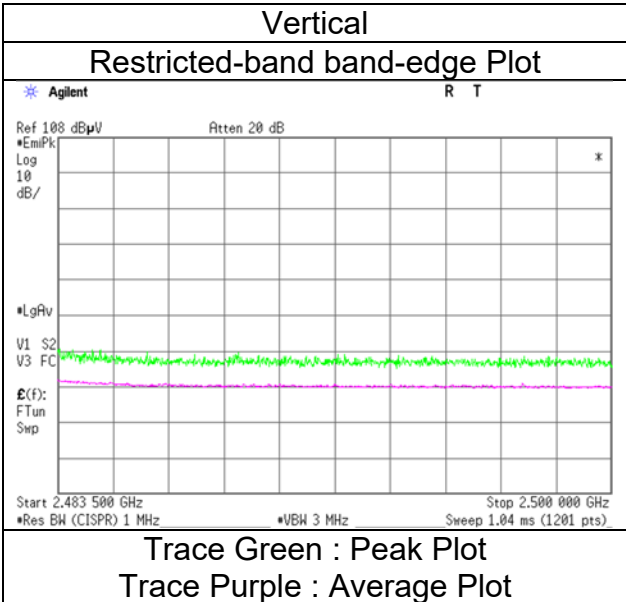
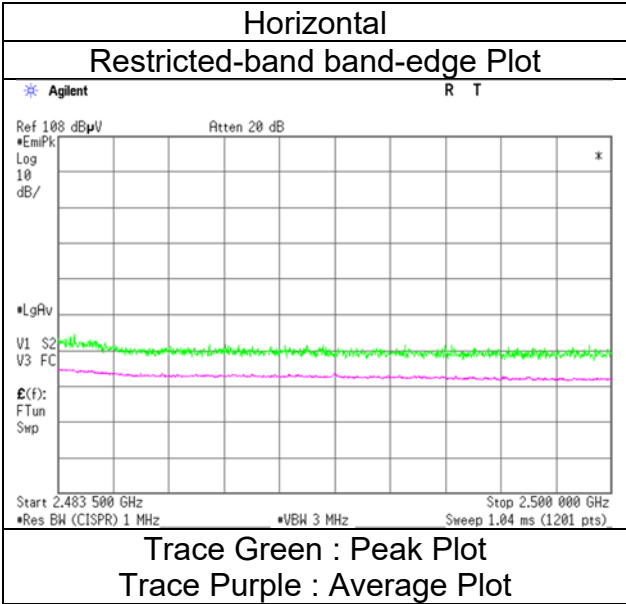
Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.3
June 5, 2024
23 deg. C / 53 % RH
Nachi Konegawa
(1 GHz to 6 GHz)
Tx 11g 2462 MHz



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

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.4	No.3
Date	June 5, 2024	June 10, 2024	June 12, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Engineer	Nachi Konegawa	Junki Nagatomi	Hiroyuki Furutaka
	(1 GHz to 6 GHz)	(10 GHz to 26.5 GHz)	(6 GHz to 10 GHz)
Mode	Tx 11n-20 2412 MHz		

Polarity	Frequency	Reading (QP / PK)	Reading (AV)	Ant. Factor	Loss	Gain	Duty Factor	Result (QP / PK)	Result (AV)	Limit (QP / PK)	Limit (AV)	Margin (QP / PK)	Margin (AV)	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	2390.0	50.7	38.3	27.5	5.1	32.2	3.1	51.1	41.8	73.9	53.9	22.8	12.1	*1)
Hori.	3509.1	49.6	47.6	28.8	7.1	31.7	-	53.8	51.8	73.9	53.9	20.1	2.1	
Hori.	4824.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7236.0	42.6	33.7	35.6	10.3	32.0	-	56.5	47.6	73.9	53.9	17.4	6.3	Floor noise
Hori.	9648.0	42.3	33.8	35.7	10.9	32.7	-	56.2	47.7	73.9	53.9	17.7	6.2	Floor noise
Vert.	2390.0	48.5	37.7	27.5	5.1	32.2	3.1	48.8	41.2	73.9	53.9	25.1	12.7	*1)
Vert.	3509.1	52.2	48.8	28.8	7.1	31.7	-	56.4	53.0	73.9	53.9	17.5	0.9	
Vert.	4824.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Vert.	7236.0	42.3	33.5	35.6	10.3	32.0	-	56.2	47.4	73.9	53.9	17.7	6.5	Floor noise
Vert.	9648.0	42.2	33.8	35.7	10.9	32.7	-	56.1	47.7	73.9	53.9	17.8	6.2	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

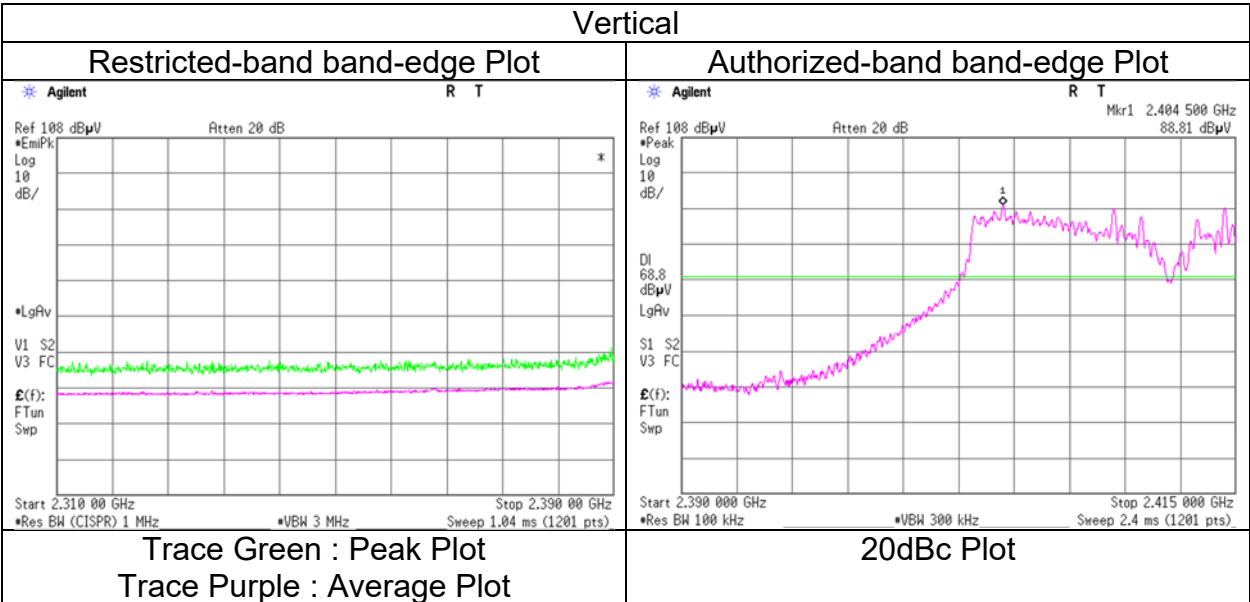
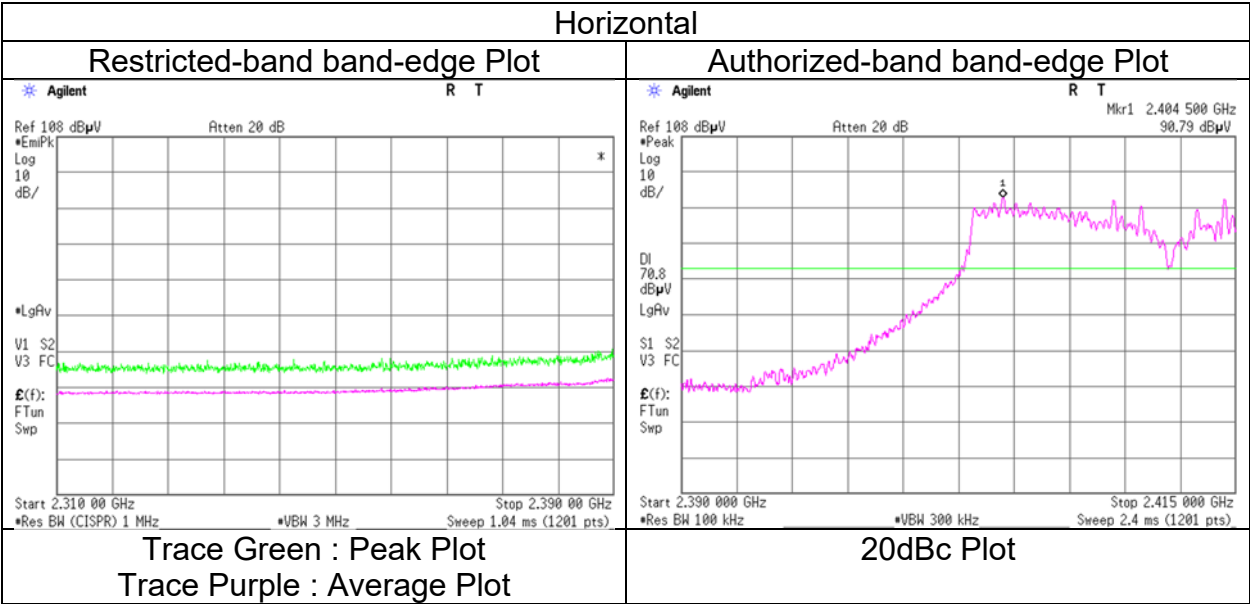
20dBc Data Sheet

Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2412.0	90.8	27.5	5.1	32.2	91.1	-	-	Carrier
Hori.	2400.0	56.6	27.5	5.1	32.2	57.0	71.1	14.1	
Vert.	2412.0	88.8	27.5	5.1	32.2	89.1	-	-	Carrier
Vert.	2400.0	54.1	27.5	5.1	32.2	54.5	69.1	14.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor:
1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 5, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Nachi Konegawa
	(1 GHz to 6 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 and authorized band edge were shown in tabular data.

Radiated Spurious Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.3
June 5, 2024
23 deg. C / 53 % RH
Nachi Konegawa
(1 GHz to 6 GHz)
Tx 11n-20 2437 MHz

No.4
June 10, 2024
24 deg. C / 55 % RH
Junki Nagatomi
(10 GHz to 26.5 GHz)

No.3
June 12, 2024
21 deg. C / 59 % RH
Hiroyuki Furutaka
(6 GHz to 10 GHz)

Polarity	Frequency	Reading	Reading	Ant.	Loss	Gain	Duty	Result	Result	Limit	Limit	Margin	Margin	Remark
[Hori/Vert]	[MHz]	(QP / PK)	(AV)	Factor	[dB]	[dB]	[dB]	(QP / PK)	(AV)	(QP / PK)	(AV)	(QP / PK)	(AV)	
		[dBuV]	[dBuV]	[dB/m]				[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	3509.1	49.7	47.6	28.8	7.1	31.7	-	53.9	51.8	73.9	53.9	20.0	2.1	
Hori.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Hori.	7311.0	41.9	33.5	35.6	10.3	32.0	-	55.8	47.4	73.9	53.9	18.1	6.5	Floor noise
Hori.	9748.0	41.5	33.2	35.9	10.9	32.7	-	55.6	47.3	73.9	53.9	18.3	6.6	Floor noise
Vert.	3509.1	52.1	48.7	28.8	7.1	31.7	-	56.3	52.9	73.9	53.9	17.6	1.0	
Vert.	4874.0	40.8	32.1	31.4	7.2	31.2	-	48.2	39.5	73.9	53.9	25.7	14.4	Floor noise
Vert.	7311.0	41.7	33.5	35.6	10.3	32.0	-	55.6	47.4	73.9	53.9	18.3	6.5	Floor noise
Vert.	9748.0	41.6	33.3	35.9	10.9	32.7	-	55.7	47.4	73.9	53.9	18.2	6.5	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.

Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.3	No.4	No.3
Date	June 5, 2024	June 10, 2024	June 12, 2024
Temperature / Humidity	23 deg. C / 53 % RH	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)	Junki Nagatomi (10 GHz to 26.5 GHz)	Hiroyuki Furutaka (6 GHz to 10 GHz) (Below 1 GHz)
Mode	Tx 11n-20 2462 MHz		

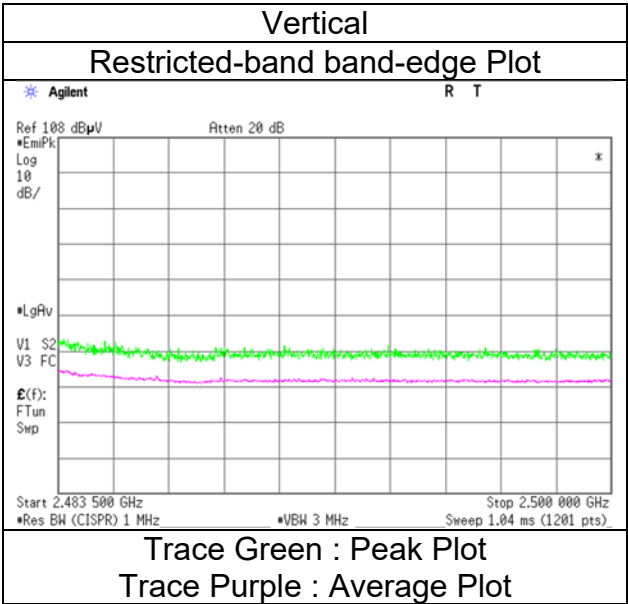
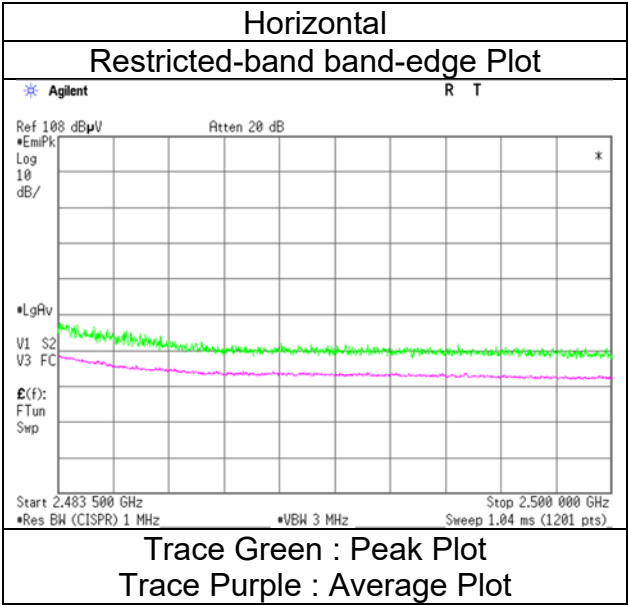
Polarity	Frequency	Reading	Reading	Ant.	Loss	Gain	Duty	Result	Result	Limit	Limit	Margin	Margin	Remark
[Hori/Vert]	[MHz]	(QP / PK)	(AV)	Factor	[dB]	[dB]	Factor	(QP / PK)	(AV)	(QP / PK)	(AV)	(QP / PK)	(AV)	
		[dBuV]	[dBuV]	[dB/m]			[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	
Hori.	128.5	30.3	-	13.5	8.2	32.1	-	19.9	-	43.5	-	23.6	-	
Hori.	203.7	36.1	-	11.6	8.9	32.1	-	24.6	-	43.5	-	19.0	-	
Hori.	240.3	41.8	-	11.5	9.2	32.0	-	30.4	-	46.0	-	15.6	-	
Hori.	374.3	34.7	-	15.0	10.2	32.0	-	27.9	-	46.0	-	18.1	-	
Hori.	423.7	31.9	-	16.2	10.5	32.0	-	26.5	-	46.0	-	19.5	-	
Hori.	502.8	28.6	-	17.8	10.9	32.0	-	25.3	-	46.0	-	20.7	-	
Hori.	2483.5	56.8	44.5	27.4	5.1	32.2	3.1	57.1	47.9	73.9	53.9	16.8	6.0	*1)
Hori.	3509.1	49.7	47.5	28.8	7.1	31.7	-	53.9	51.7	73.9	53.9	20.1	2.2	
Hori.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Hori.	7386.0	41.8	33.5	35.5	10.4	32.1	-	55.6	47.3	73.9	53.9	18.3	6.6	Floor noise
Hori.	9848.0	42.2	33.5	36.0	11.0	32.7	-	56.5	47.8	73.9	53.9	17.4	6.1	Floor noise
Vert.	99.1	39.3	-	10.2	7.9	32.2	-	25.2	-	43.5	-	18.3	-	
Vert.	116.4	33.8	-	12.6	8.1	32.1	-	22.3	-	43.5	-	21.2	-	
Vert.	120.0	33.7	-	12.9	8.1	32.1	-	22.5	-	43.5	-	21.0	-	
Vert.	131.3	32.2	-	13.7	8.2	32.1	-	22.0	-	43.5	-	21.5	-	
Vert.	207.2	35.4	-	11.5	8.9	32.1	-	23.7	-	43.5	-	19.8	-	
Vert.	363.0	31.2	-	15.1	10.1	32.0	-	24.3	-	46.0	-	21.7	-	
Vert.	2483.5	51.2	41.8	27.4	5.1	32.2	3.1	51.5	45.3	73.9	53.9	22.4	8.6	*1)
Vert.	3509.1	52.1	48.7	28.8	7.1	31.7	-	56.3	52.9	73.9	53.9	17.6	1.0	
Vert.	4924.0	40.9	31.9	31.5	7.2	31.1	-	48.4	39.4	73.9	53.9	25.5	14.5	Floor noise
Vert.	7386.0	41.7	33.6	35.5	10.4	32.1	-	55.5	47.4	73.9	53.9	18.4	6.5	Floor noise
Vert.	9848.0	42.3	33.5	36.0	11.0	32.7	-	56.6	47.8	73.9	53.9	17.3	6.1	Floor noise

Result (QP / PK) = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Result (AV)= 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).
*QP detector was used up to 1GHz.
*1) Not Out of Band emission(Leakage Power)

Distance factor: 1 GHz - 6 GHz 20log (3.8 m / 3.0 m) = 2.06 dB
 6 GHz - 10 GHz 20log (4.8 m / 3.0 m) = 4.09 dB
 10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

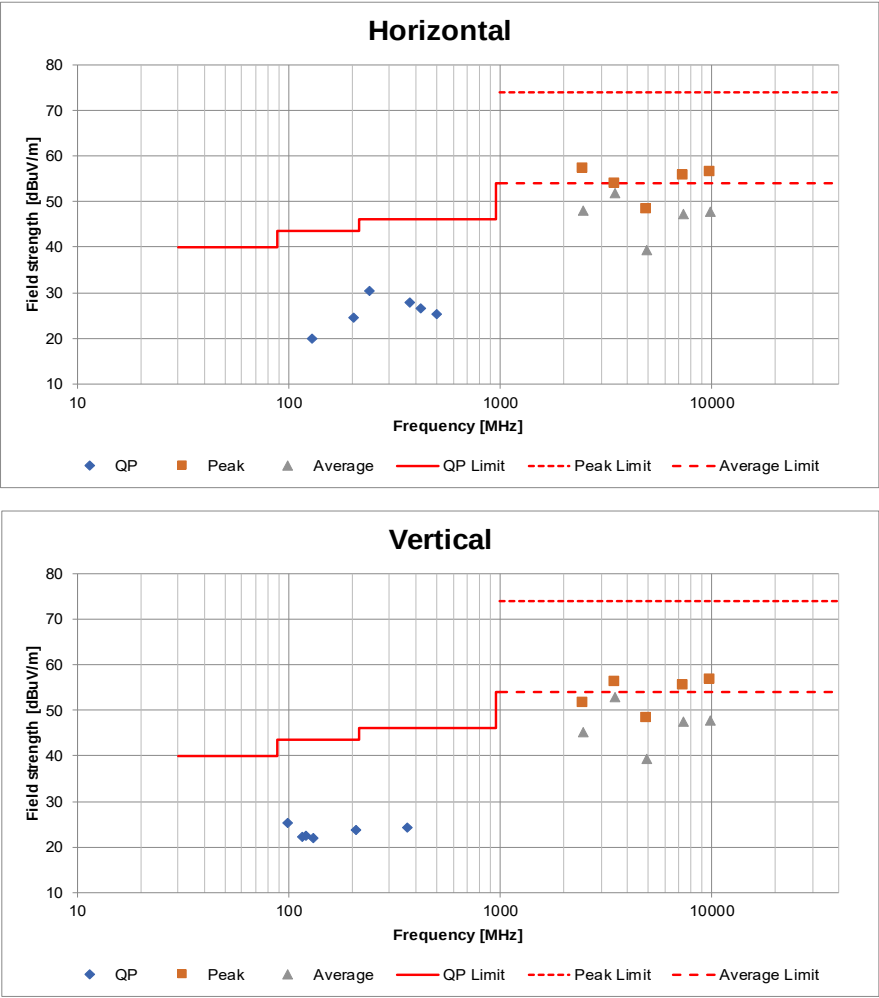
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.3
Date	June 5, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Nachi Konegawa
	(1 GHz to 6 GHz)
Mode	Tx 11n-20 2462 MHz



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

Radiated Spurious Emission
(Plot data, Worst case mode for Maximum Peak Output Power)

Test place	Ise EMC Lab.	No.4	No.3
Semi Anechoic Chamber	No.3	June 10, 2024	June 12, 2024
Date	June 5, 2024	24 deg. C / 55 % RH	21 deg. C / 59 % RH
Temperature / Humidity	23 deg. C / 53 % RH	Junki Nagatomi	Hiroyuki Furutaka
Engineer	Nachi Konegawa (1 GHz to 6 GHz)	(10 GHz to 26.5 GHz)	(6 GHz to 10 GHz) (Below 1 GHz)
Mode	Tx 11n-20 2462 MHz		

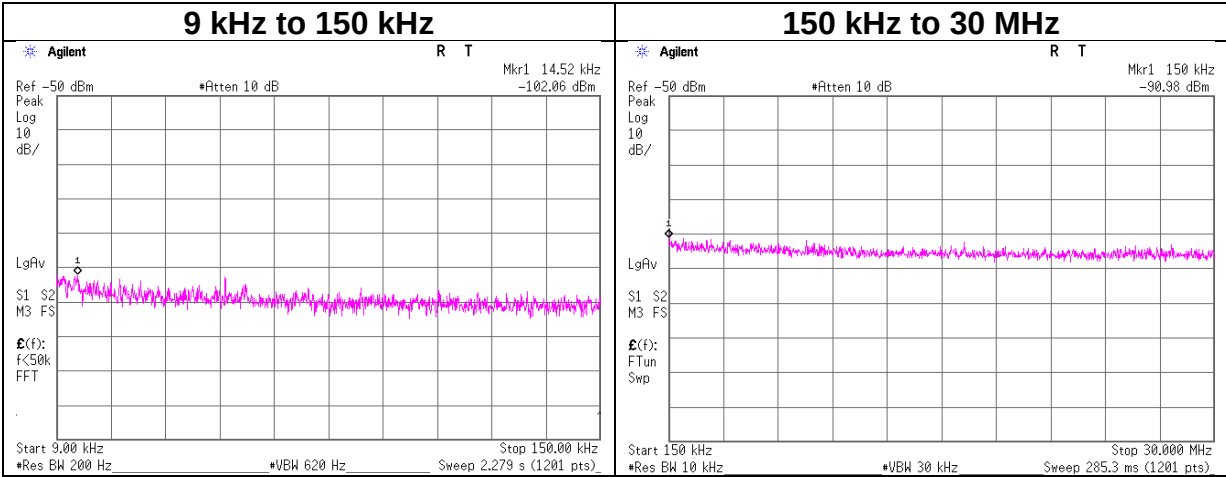


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.4 Measurement Room
June 6, 2024
22 deg. C / 60 % RH
Hiroki Numata
Tx 11n-20 2462 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N	EIRP	Distance	Ground bounce	E	Limit	Margin	Remark
[kHz]	[dBm]	[dB]	[dB]	[dBi]	(Number of Output)	[dBm]	[m]	[dB]	(field strength) [dBuV/m]	[dBuV/m]	[dB]	
14.52	-102.1	1.53	9.8	2.0	2	-85.7	300	6.0	-24.4	44.3	68.7	
150.00	-91.0	1.53	9.9	2.0	2	-74.6	300	6.0	-13.3	24.0	37.3	

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
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.4 Measurement Room
June 6, 2024
22 deg. C / 60 % RH
Hiroki Numata
Tx

11b Antenna 0

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-8.66	2.53	10.03	3.90	8.00	4.10
2437	-7.79	2.54	10.03	4.78	8.00	3.22
2462	-5.77	2.54	10.03	6.80	8.00	1.20

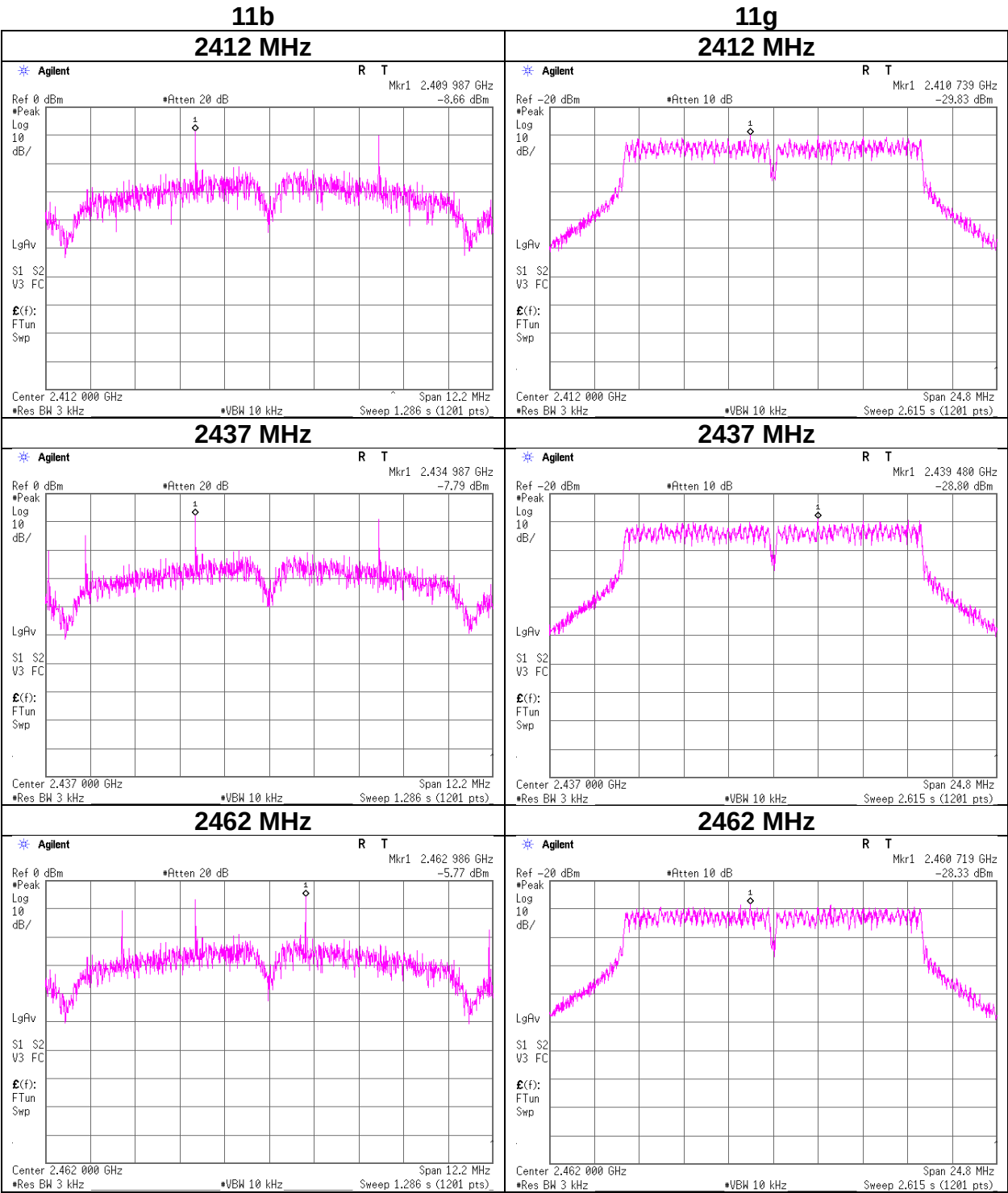
11g Antenna 0

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-29.83	2.53	10.03	-17.27	8.00	25.27
2437	-28.80	2.54	10.03	-16.23	8.00	24.23
2462	-28.33	2.54	10.03	-15.76	8.00	23.76

Sample Calculation:

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

Power Density



Power Density

Test place Ise EMC Lab. No.4 Measurement Room
Date June 6, 2024
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Hiroki Numata
Mode Tx

Antenna 0 +1

Freq. [MHz]	Antenna 1 Result	Antenna 2 Result	Result		Limit	Margin
	[mW / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	0.029	0.025	-12.65	0.054	8.00	20.65
2437	0.030	0.021	-12.93	0.051	8.00	20.93
2462	0.032	0.036	-11.69	0.068	8.00	19.69

Sample Calculation:

Result = Antenna 0 + 1

Antenna 0

Freq. [MHz]	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-27.95	2.53	10.03	-15.39	0.029	8.00	23.39
2437	-27.78	2.54	10.03	-15.21	0.030	8.00	23.21
2462	-27.51	2.54	10.03	-14.94	0.032	8.00	22.94

Antenna 1

Freq. [MHz]	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-28.51	2.53	10.03	-15.95	0.025	8.00	23.95
2437	-29.40	2.54	10.03	-16.83	0.021	8.00	24.83
2462	-27.05	2.54	10.03	-14.48	0.036	8.00	22.48

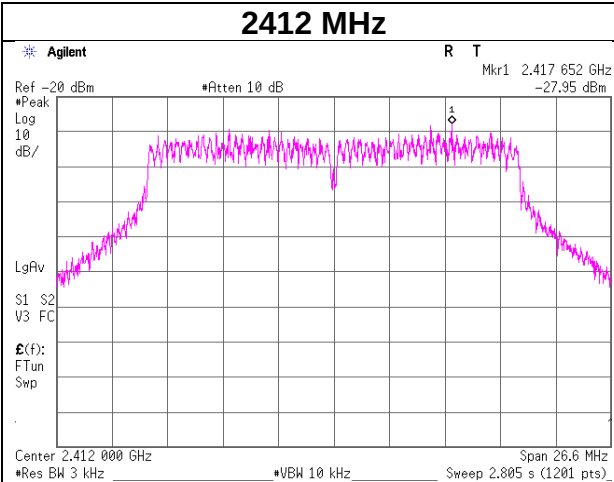
Sample Calculation:

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

Power Density

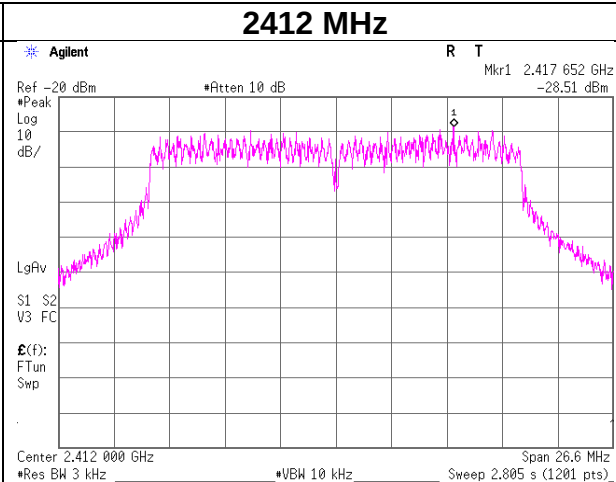
11n-20 Antenna 0

2412 MHz

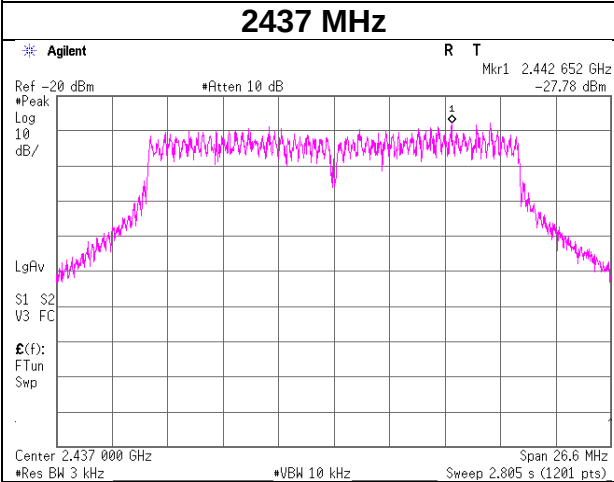


11n-20 Antenna 1

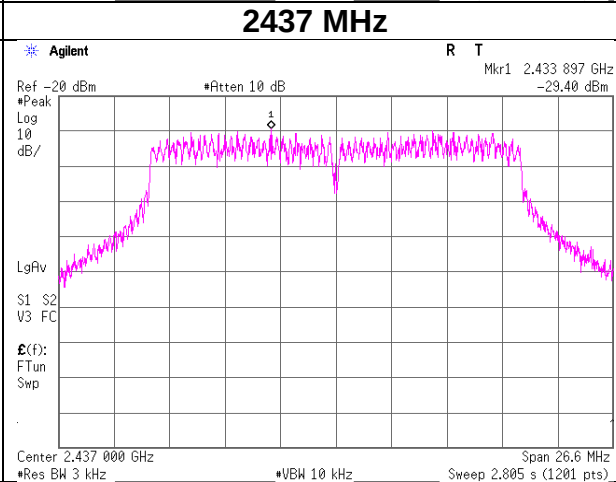
2412 MHz



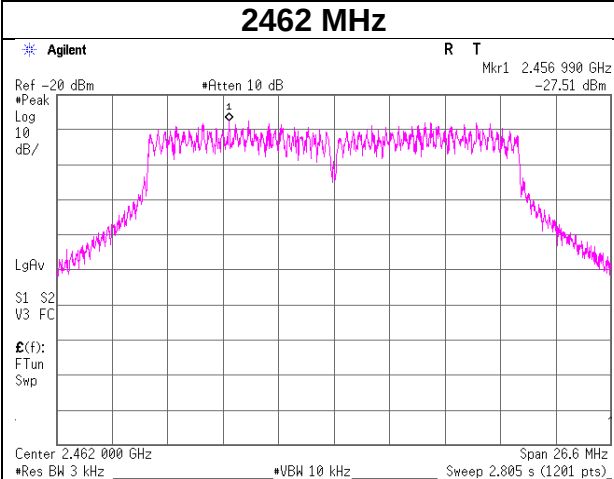
2437 MHz



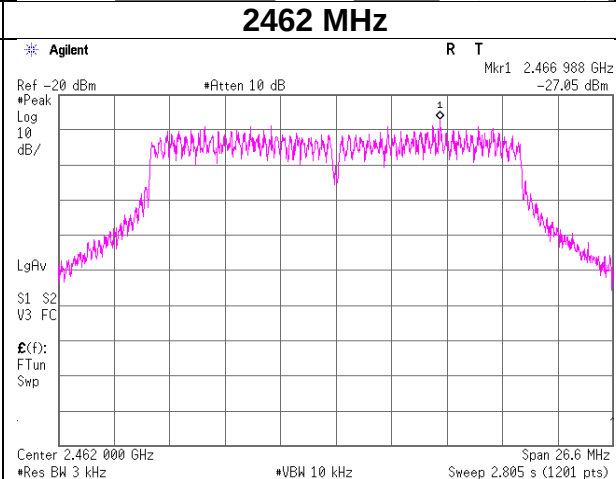
2437 MHz



2462 MHz



2462 MHz



APPENDIX 2: Test Instruments

Test Equipment (1/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	141232	High Pass Filter 3.5-18.0GHz	UL-ISE	HPF SELECTOR	001	09/13/2024	12
RE	141266	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-191	08/23/2024	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL-ISE	HPF SELECTOR	002	09/11/2024	12
RE	141323	Coaxial cable	UL-ISE	-	-	09/13/2024	12
RE	141424	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	1915	03/15/2024	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	08/07/2024	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/11/2024	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	557	05/17/2024	12
RE	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
RE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
RE	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/08/2024	12
RE	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	00650	10/30/2024	12
RE	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/17/2024	12
RE	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	05/09/2024	12
RE	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/26/2024	12
RE	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/11/2023	24
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2023	24
RE	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/14/2023	24
RE	142037	Horn Antenna	Custom Microwave Inc.	HO6R	-	09/03/2024	12
RE	142183	Measure	KOMELON	KMC-36	-	10/21/2024	12
RE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142314	Attenuator	Pasternack Enterprises	PE7390-6	D/C 1504	06/06/2024	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	213780	EMI Test Receiver	Rohde & Schwarz	ESW8	103079	01/30/2024	12
RE	234602	Microwave Cable	Huber+Suhner	SF126E/11PC35/11PC35/1000M, 5000M	537063/126E / 537074/126E	03/08/2024	12
RE	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
RE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	245787	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	689	03/06/2024	12
RE	245788	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	690	03/06/2024	12
RE	246001	Microwave Cable	Huber+Suhner	SF103/11PC35/11PC35/1000mm / SF126E/5000mm	800673(1m) / 610204(5m)	03/06/2024	12

Test Equipment (2/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	141156	Attenuator(10dB)	Weinschel Corp	2	BL1173	11/11/2024	12
AT	141172	Attenuator(6dB) (above1GHz)	HIROSE ELECTRIC CO.,LTD.	AT-106	-	12/02/2024	12
AT	141327	Coaxial Cable	UL-ISE	-	-	02/09/2024	12
AT	141328	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28636/2	04/01/2024	12
AT	141333	Attenuator(10dB)	Suhner	6810.19.A	-	12/02/2024	12
AT	141395	Coaxial Cable	UL-ISE	-	-	11/21/2023	12
AT	141558	Digital Tester(TRUE RMS MULTIMETER)	Fluke Corporation	115	17930030	05/17/2024	12
AT	141805	Power Meter	Anritsu Corporation	ML2495A	6K00003338	08/22/2024	12
AT	141810	Power Meter	Anritsu Corporation	ML2495A	824014	12/12/2023	12
AT	141830	Power sensor	Anritsu Corporation	MA2411B	738285	05/22/2024	12
AT	141832	Power sensor	Anritsu Corporation	MA2411B	738174	12/12/2023	12
AT	141840	Power sensor	Anritsu Corporation	MA2411B	011737	08/22/2024	12
AT	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/26/2024	12
AT	141978	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180899	05/09/2024	12
AT	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/ 11PC35/2000MM	536999/126E	03/19/2024	12
AT	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
AT	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
AT	244712	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202106	01/25/2024	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