

RADIO TEST REPORT

Test Report No. 15247953H-A-R1

Customer	Silex Technology, Inc.
Description of EUT	Low Latency Wireless Device
Model Number of EUT	LLW-4250
FCC ID	N6C-LLW4250
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	August 26, 2024
Remarks	-

Representative Test EngineerTomoya Sone
Engineer**Approved By**Satofumi Matsuyama
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.: 15247953H-A

This report is a revised version of 15247953H-A. 15247953H-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15247953H-A	August 8, 2024	-
1	15247953H-A-R1	August 26, 2024	p.6, 11 Modified Antenna numbers: Antenna 0, 1, 2, 3 → Antenna 1, 2, 3, 4
1	15247953H-A-R1	August 26, 2024	p.18 Added "observed" to complete the descriptive text
1	15247953H-A-R1	August 26, 2024	p.38 Modified Limit: 68.2 → 73.9
1	15247953H-A-R1	August 26, 2024	p.57 -Deletion of *1) for LIMS ID 141949. -Correction of Last Calibration Date for LIMS ID 141949. 05/17/2023 → 06/05/2024

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	Silex Technology, Inc.
Address	2-3-1 Hikaridai, Seika-cho, Soraku-gun, Kyoto 619-0237, Japan
Telephone Number	+81-774-98-3878
Contact Person	Keisuke Ishiro

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	Low Latency Wireless Device
Model Number	LLW-4250
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	April 22, 2024
Test Date	April 23 to May 28, 2024

2.2 Product Description

General Specification

Rating	DC 12 V (AC Adapter Input), DC 24 V (DC Power Input), DC 48 V (PoE Input)
Operating temperature	0 deg. C to 40 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)}	1.5 dBi (Antenna 1, 2, 3, 4)

WLAN (IEEE802.11a/11n-20)

Equipment Type	Transceiver		
Frequency of Operation	5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5700 MHz 5745 MHz to 5825 MHz		
Type of Modulation	OFDM		
Antenna Gain ^{a)}	1.6 dBi	5180 MHz to 5240 MHz	(Antenna 1, 2, 3, 4)
	1.7 dBi	5260 MHz to 5320 MHz	(Antenna 1, 2, 3, 4)
	1.7 dBi	5500 MHz to 5700 MHz	(Antenna 1, 2, 3, 4)
	1.6 dBi	5745 MHz to 5825 MHz	(Antenna 1, 2, 3, 4)

*The Antenna 3 and 4 are only used to detect DFS Radar signals and not to transmit them.

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

* Also the EUT complies with FCC Part 15 Subpart B.

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	6.48 dB, 0.49788 MHz, L	Complied	-
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	0.6 dB 68.4 MHz, QP, Vertical	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
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) 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 part regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

The EUT has a unique coupling/antenna connector (Revers SMA). Therefore the equipment complies with the requirement of 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

Item	Frequency range	Unit	Calculated Uncertainty (+/-)
AMN (LISN)	0.15 MHz to 30 MHz	dB	3.3

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	-	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 3.0 m for No.1, No.2, No.3, No.4, and No.5 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

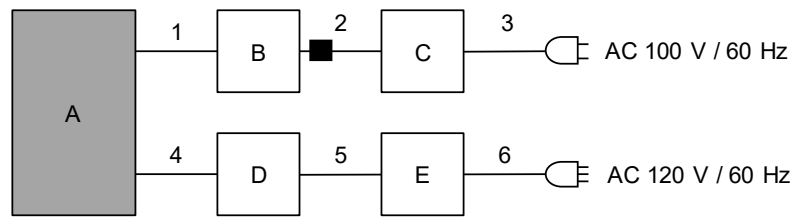
Mode	Remarks*
IEEE 802.11b (11b)	2 Mbps (Short Preamble), PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 8, PN9
*Transmitting duty was 100 % on all tests. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel) *Power of the EUT was set by the software as follows; Power Setting: 11b 2412 MHz:15.5 dBm 2417 MHz:17.5 dBm 2437 MHz:17.5 dBm 2457 MHz:16.5 dBm 2462 MHz:13.5 dBm 11g 2412 MHz:15.5 dBm 2417 MHz:19 dBm 2437 MHz:19 dBm 2457 MHz:18.5 dBm 2462 MHz:13.5 dBm 11n-20 2412 MHz:13.5 dBm 2417 MHz:17.5 dBm 2437 MHz:17.5 dBm 2457 MHz:17 dBm 2462 MHz:12 dBm Software: Tera Term Version: 4.106 (Date: 2024.04.11, 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 power setting above is adjusted for testing so that the maximum power of EUT's product specification will be outputted. Therefore, the above power is different from the production model.	

*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Antenna	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz), Conducted Spurious Emission	Tx 11n-20 *1)	1 to 2 (Simultaneously)	2437 MHz
Maximum Peak Output Power	Tx 11b Tx 11g	2	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
	Tx 11n-20	1 to 2 (Simultaneously)	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
Radiated Spurious Emission (Above 1 GHz)	Tx 11b	2	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
	Tx 11n-20	1 to 2 (Simultaneously)	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
6 dB Bandwidth, 99 % Occupied Bandwidth	Tx 11b Tx 11n-20	2	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
Power Density	Tx 11b	2	2412 MHz 2417 MHz 2437 MHz 2457 MHz 2462 MHz
	Tx 11n-20	1 to 2 (Simultaneously)	2412 MHz 2417 MHz 2437 MHz 2457 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

Conducted emission



■ : Standard Ferrite Core

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

* The power supply for the following three systems and pre-checked as follows.

- (1) Power supply using AC adapter (120 V)
- (2) Power supply using AC adapter (240 V)
- (3) DC 24 V power supply (via regulated power supply (120 V))
- (4) PoE power supply from LAN Hub (120 V)

From the result of pre-check, the test configuration for this test is as above.

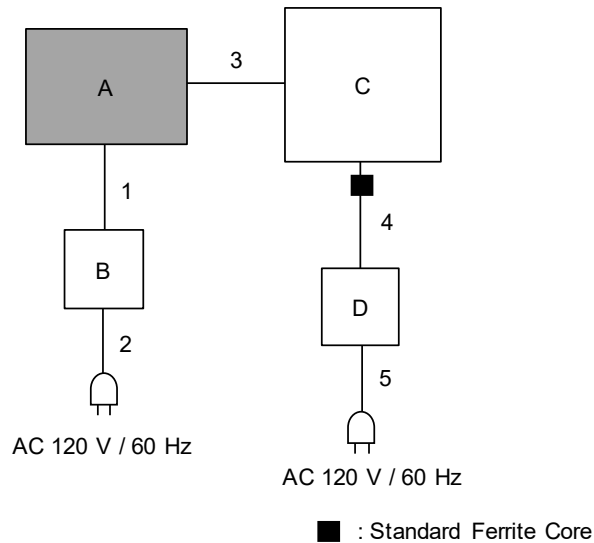
Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Low Latency Wireless Device	LLW-4250	84253FED6E78	Silex Technology, Inc.	EUT
B	Laptop PC	CF-SV8RDCVS	0FKSC24469	Panasonic Corporation	-
C	AC Adapter	CF-AA6532A M1	6532AM120422507A	Panasonic Corporation	-
D	5-Port Gigabit Desktop Switch with 4-Port PoE+	TL-SG1005P	22150D7003448	tp-link	-
E	AC Adapter	T535131-2-DT	200037-15	tp-link	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	LAN Cable	1.6	Unshielded	Unshielded	-
2	DC Cable	0.9	Unshielded	Unshielded	-
3	AC Cable	0.8	Unshielded	Unshielded	-
4	LAN Cable	1.6	Unshielded	Unshielded	-
5	DC Cable	1.2	Unshielded	Unshielded	-
6	AC Cable	1.0	Unshielded	Unshielded	-

Antenna Terminal Conducted tests



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

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Low Latency Wireless Device	LLW-4250	84253FED6E78	Silex Technology, Inc.	EUT
B	AC Adapter	ATS036T-A120	151273-11	Adapter Technology Co., Ltd.	-
C	Laptop PC	CF-SV8RDCVS	0HKSC51454	Panasonic Corporation	-
D	AC Adapter	CF-AA6532A M1	6532AM120720658A	Panasonic Corporation	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.5	Unshielded	Unshielded	-
2	AC Cable	0.9	Unshielded	Unshielded	-
3	LAN Cable	1.5	Unshielded	Unshielded	-
4	DC Cable	0.9	Unshielded	Unshielded	-
5	AC Cable	0.8	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Semi Anechoic Chamber.

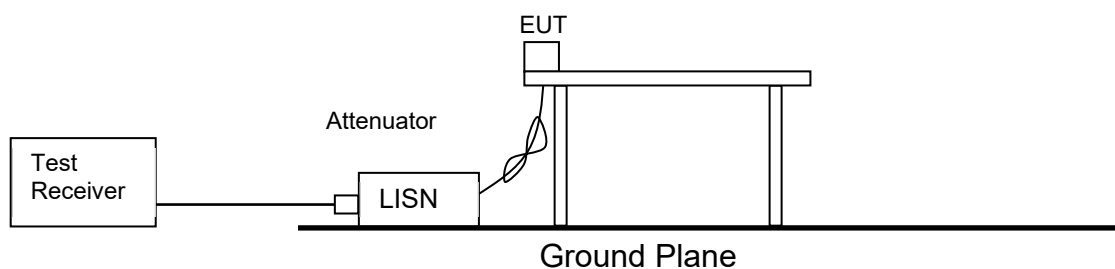
The EUT was connected to a LISN (AMN) via AC adapter and PoE HUB.

An overview sweep with peak detection has been performed.

Test results are rounded off and limit are rounded down, so some differences might be observed.

Detector	: QP and CISPR AV
Measurement Range	: 0.15 MHz to 30 MHz
Test Data	: APPENDIX
Test Result	: Pass

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

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

[For below 1 GHz]

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

[For above 1 GHz]

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

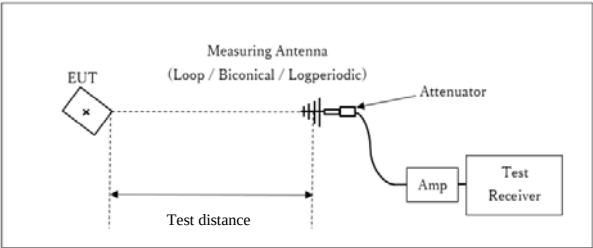
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired 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	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

Figure 2: Test Setup

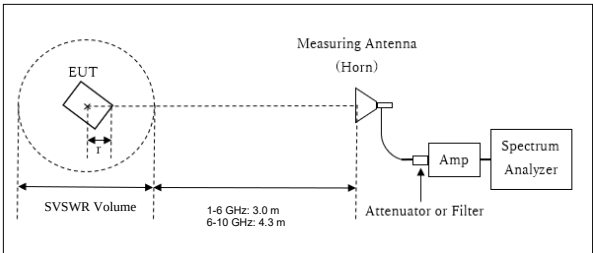
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz



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

[1 GHz to 6 GHz]

Distance Factor: $20 \times \log (3.75 \text{ m} / 3.0 \text{ m}) = 1.94 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.75 \text{ m}$

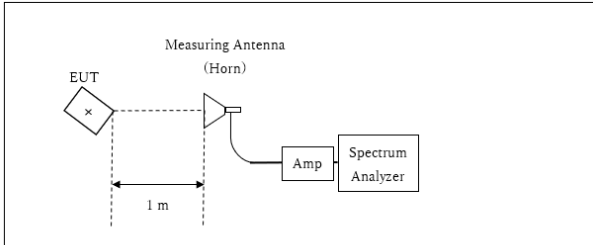
SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.25 \text{ m}$

[6 GHz to 10 GHz]

Distance Factor: $20 \times \log (4.75 \text{ m} / 3.0 \text{ m}) = 4.00 \text{ dB}$
* Test Distance: $(4.3 + \text{SVSWR Volume} / 2) - r = 4.75 \text{ m}$

SVSWR Volume : 1.4 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.25 \text{ m}$

10 GHz to 26.5 GHz



x : Center of turn table

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

The 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.

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 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument Used
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)	9 kHz to 150 kHz 150 kHz to 30 MHz	200 Hz 10 kHz	620 Hz 30 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*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)

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.

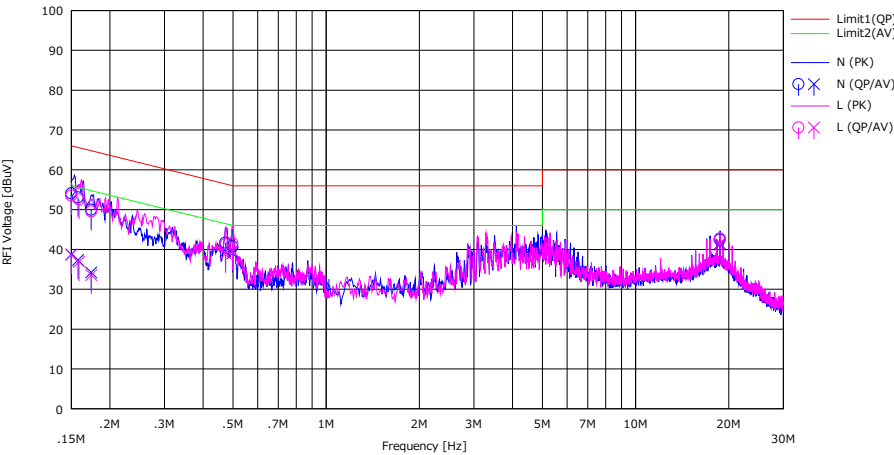
Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

Test place Ise EMC Lab. No.4 Semi Anechoic Chamber
Date May 28, 2024
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Yuichiro Yamazaki
Mode Tx 11n-20 2437 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq. [MHz]	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
		[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	40.80	25.50	0.06	13.18	54.04	38.74	66.00	56.00	11.96	17.26	N	
2	0.15773	39.80	24.10	0.06	13.18	53.04	37.34	65.58	55.58	12.54	18.24	N	
3	0.17386	36.70	21.00	0.06	13.18	49.94	34.24	64.77	54.77	14.83	20.53	N	
4	0.47238	28.40	26.20	0.06	13.22	41.68	39.48	56.47	46.47	14.79	6.99	N	
5	0.49811	27.40	25.80	0.06	13.22	40.68	39.08	56.03	46.03	15.35	6.95	N	
6	18.72384	28.20	27.00	0.37	13.85	42.42	41.22	60.00	50.00	17.58	8.78	N	
7	0.15000	40.30	25.50	0.03	13.18	53.51	38.71	66.00	56.00	12.49	17.29	L	
8	0.15881	39.30	23.70	0.03	13.18	52.51	36.91	65.53	55.53	13.02	18.62	L	
9	0.17414	36.30	20.40	0.03	13.18	49.51	33.61	64.76	54.76	15.25	21.15	L	
10	0.47341	28.00	25.70	0.04	13.22	41.26	38.96	56.45	46.45	15.19	7.49	L	
11	0.49788	28.30	26.30	0.04	13.22	41.56	39.56	56.04	46.04	14.48	6.48	L	
12	18.72479	28.50	27.30	0.40	13.85	42.75	41.55	60.00	50.00	17.25	8.45	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

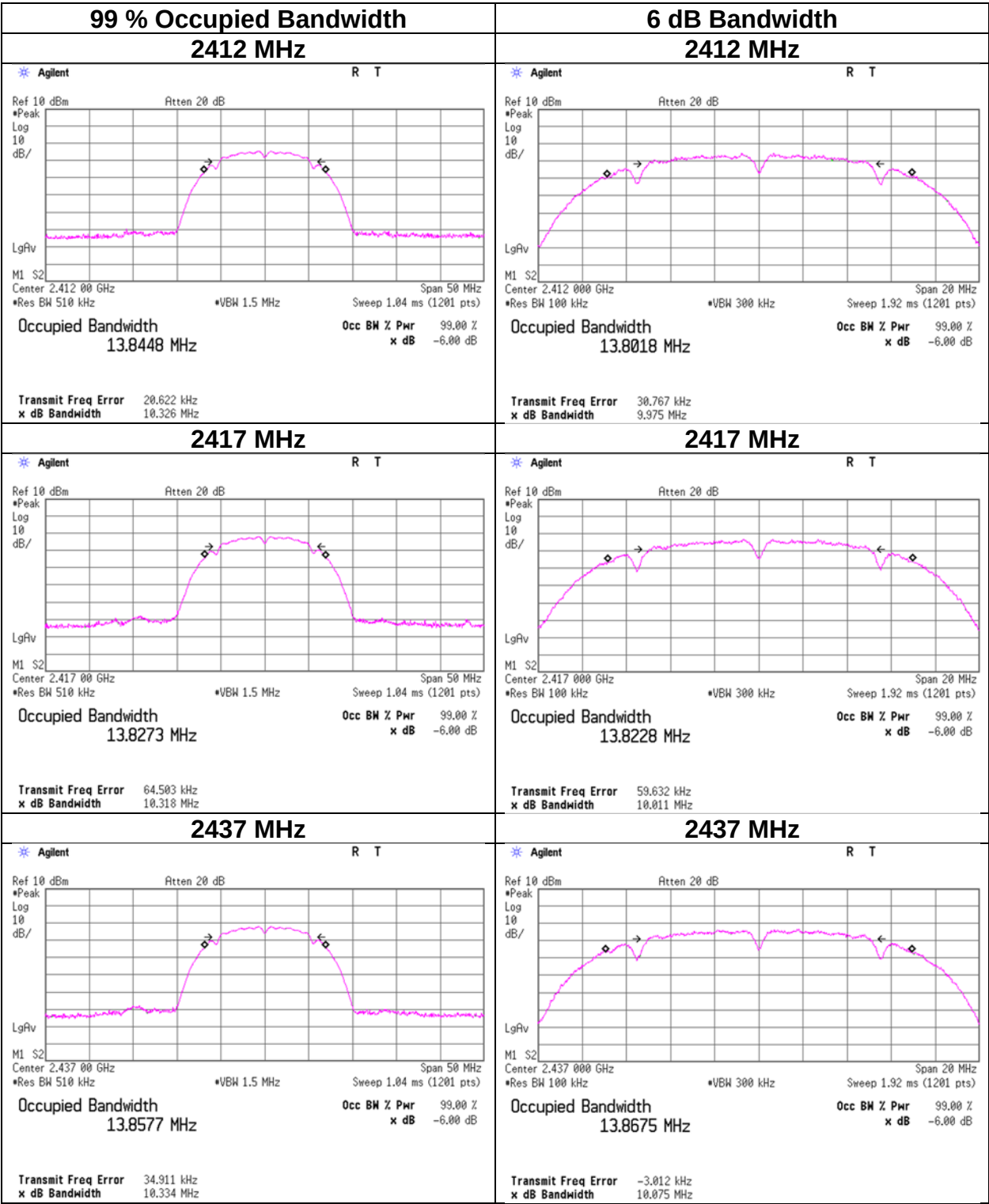
99 % Occupied Bandwidth and 6 dB Bandwidth

Test place Ise EMC Lab. No.8 Measurement Room
Date May 22, 2024
Temperature / Humidity 27 deg. C / 48 % RH
Engineer Shousei Hamaguchi
Mode Tx

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	13844.9	9.975	> 0.5000
	2417	13827.3	10.011	> 0.5000
	2437	13857.7	10.075	> 0.5000
	2457	13794.5	10.039	> 0.5000
	2462	13799.3	9.903	> 0.5000
11n-20	2412	18160.8	17.701	> 0.5000
	2417	18351.7	17.754	> 0.5000
	2437	18314.0	17.723	> 0.5000
	2457	18327.9	17.744	> 0.5000
	2462	18163.2	17.694	> 0.5000

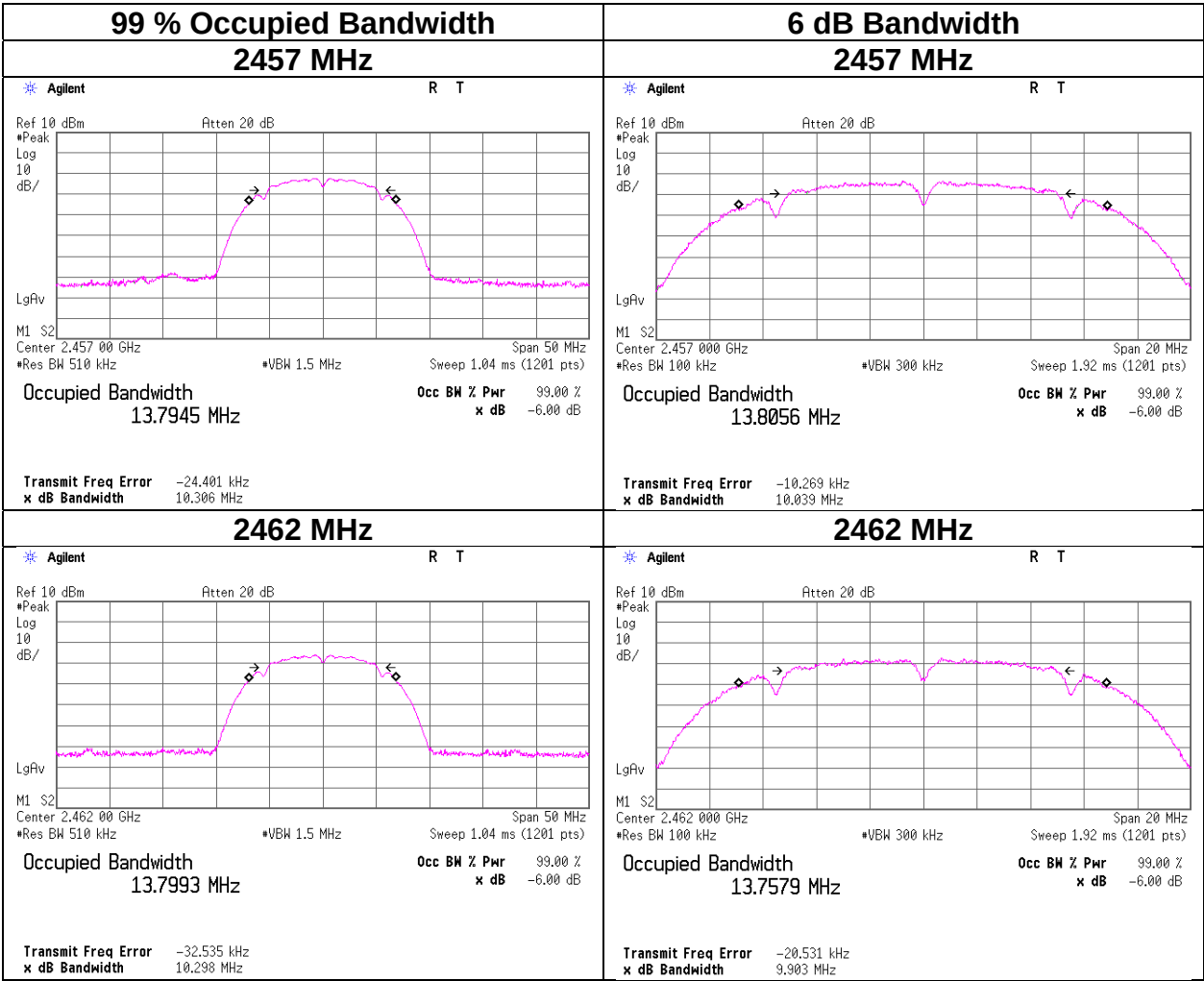
99 % Occupied Bandwidth and 6 dB Bandwidth

11b



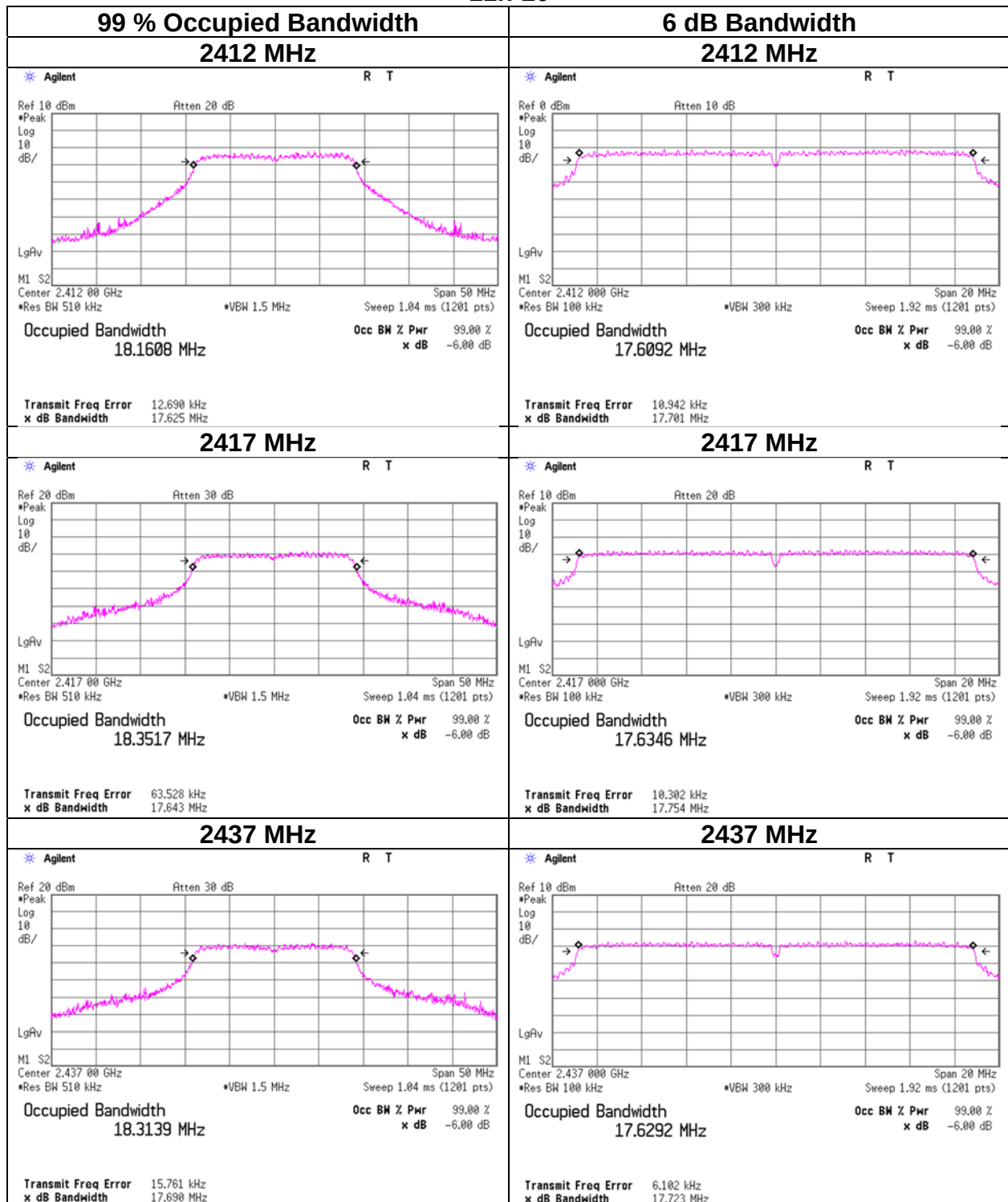
99 % Occupied Bandwidth and 6 dB Bandwidth

11b



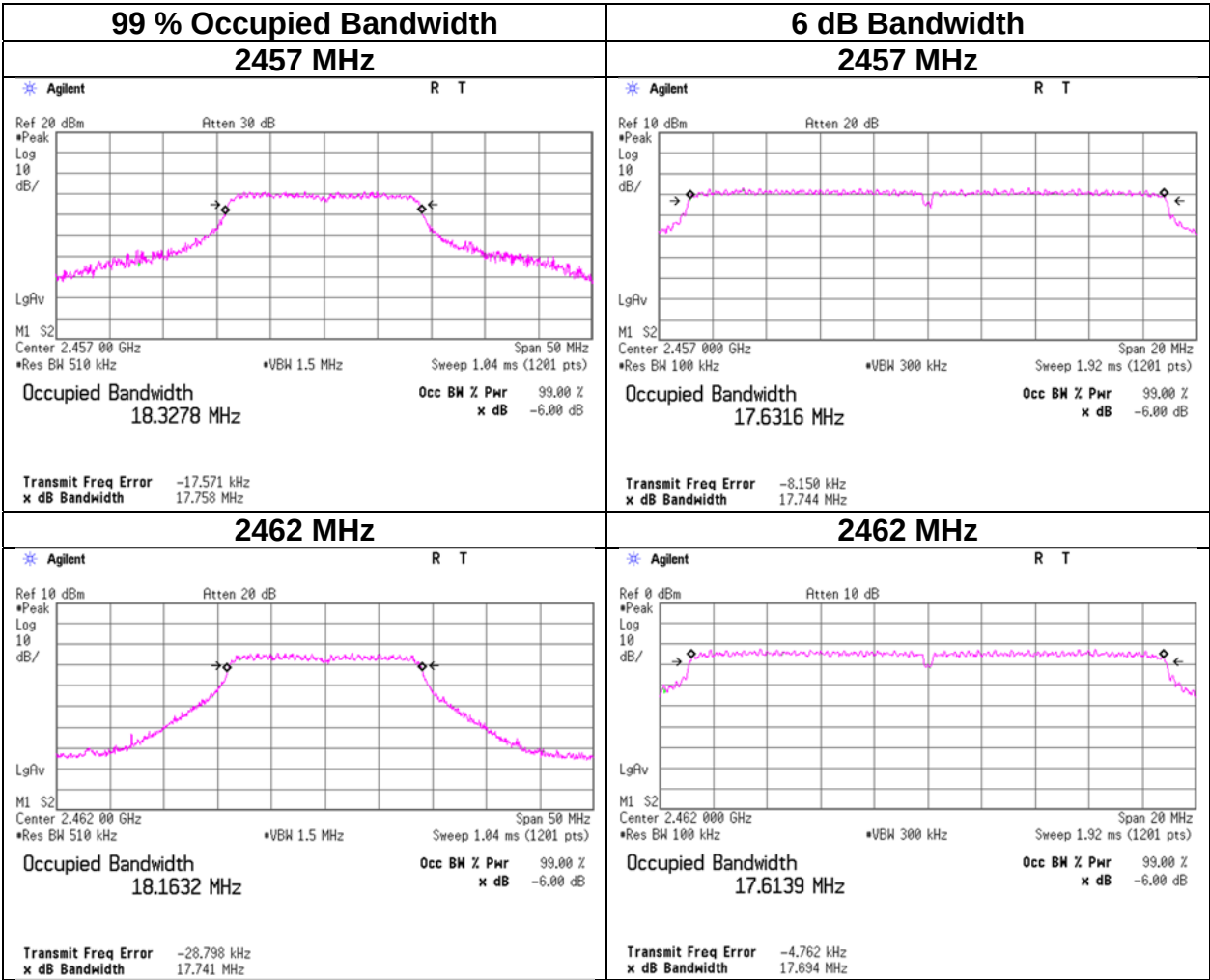
99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20



99 % Occupied Bandwidth and 6 dB Bandwidth

11n-20



Maximum Peak Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Date April 23, 2024 April 24, 2024
Temperature / Humidity 22 deg. C / 35 % RH 21 deg. C / 50 % RH
Engineer Junki Nagatomi Junki Nagatomi
Mode Tx 11b

Antenna 2				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	-4.87	1.37	20.10	16.60	45.71	30.00	1000	13.40	1.50	18.10	64.57	36.02	4000	17.92
2417	-2.31	1.37	20.10	19.16	82.41	30.00	1000	10.84	1.50	20.66	116.41	36.02	4000	15.36
2437	-2.48	1.37	20.10	18.99	79.25	30.00	1000	11.01	1.50	20.49	111.94	36.02	4000	15.53
2457	-2.24	1.38	20.10	19.24	83.95	30.00	1000	10.76	1.50	20.74	118.58	36.02	4000	15.28
2462	-5.51	1.38	20.10	15.97	39.54	30.00	1000	14.03	1.50	17.47	55.85	36.02	4000	18.55

Sample Calculation:

Result = Reading + Cable Loss + 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.

Antenna 1, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	-2.96	
2 *1)	-2.57	
2 *2)	-2.55	
5.5 *1)	-3.18	
5.5 *2)	-3.28	
11 *1)	-3.07	
11 *2)	-3.25	

Antenna 2, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
2 *2)	-1.87	*

*: Worst Rate

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

*1) Long Preamble

*2) Short Preamble

Maximum Peak Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Date April 23, 2024 April 24, 2024
Temperature / Humidity 22 deg. C / 35 % RH 21 deg. C / 50 % RH
Engineer Junki Nagatomi Junki Nagatomi
Mode Tx 11g

Antenna 2				Conducted Power					e.i.r.p. for RSS-247					
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
				[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
2412	2.41	1.37	20.10	23.88	244.34	30.00	1000	6.12	1.50	25.38	345.14	36.02	4000	10.64
2417	3.40	1.37	20.10	24.87	306.90	30.00	1000	5.13	1.50	26.37	433.51	36.02	4000	9.65
2437	3.37	1.37	20.10	24.84	304.79	30.00	1000	5.16	1.50	26.34	430.53	36.02	4000	9.68
2457	3.40	1.38	20.10	24.88	307.61	30.00	1000	5.12	1.50	26.38	434.51	36.02	4000	9.64
2462	1.99	1.38	20.10	23.47	222.33	30.00	1000	6.53	1.50	24.97	314.05	36.02	4000	11.05

Sample Calculation:
Result = Reading + Cable Loss + 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.

Antenna 1, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	2.92	
9	2.76	
12	2.72	
18	2.73	
24	2.74	
36	2.69	
48	2.70	
54	2.68	

Antenna 2, 2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	3.10	*

Maximum Peak Output Power

Test place Ise EMC Lab. No.4 Measurement Room
Date April 23, 2024 April 24, 2024
Temperature / Humidity 22 deg. C / 35 % RH 21 deg. C / 50 % RH
Engineer Junki Nagatomi Junki Nagatomi
Mode Tx 11n-20 MIMO

Antenna 1 + Antenna 2			Conducted Power					e.i.r.p. for RSS-247					
Freq.	Antenna 1 Result	Antenna 2 Result	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[mW]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	195.88	192.75	25.90	388.64	30.00	1000	4.10	1.50	27.40	548.96	36.02	4000.00	8.63
2417	268.53	295.80	27.52	564.34	30.00	1000	2.48	1.50	29.02	797.15	36.02	4000.00	7.01
2437	287.08	292.42	27.63	579.49	30.00	1000	2.37	1.50	29.13	818.56	36.02	4000.00	6.89
2457	290.40	289.07	27.63	579.47	30.00	1000	2.37	1.50	29.13	818.52	36.02	4000.00	6.89
2462	188.80	148.59	25.28	337.39	30.00	1000	4.72	1.50	26.78	476.58	36.02	4000.00	9.24

Sample Calculation:

Result = Antenna 1 + Antenna 2

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

Antenna 1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
				[dBm]	[mW]
2412	1.45	1.37	20.10	22.92	195.88
2417	2.82	1.37	20.10	24.29	268.53
2437	3.11	1.37	20.10	24.58	287.08
2457	3.15	1.38	20.10	24.63	290.40
2462	1.28	1.38	20.10	22.76	188.80

Antenna 2

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
				[dBm]	[mW]
2412	1.38	1.37	20.10	22.85	192.75
2417	3.24	1.37	20.10	24.71	295.80
2437	3.19	1.37	20.10	24.66	292.42
2457	3.13	1.38	20.10	24.61	289.07
2462	0.24	1.38	20.10	21.72	148.59

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

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

2437 MHz

MCS Number	Antenna 1		Antenna 2		Total		Remark
	Reading Peak [dBm]	Peak [mW]	Reading Peak [dBm]	Peak [mW]	Reading Power [dBm]	Power [mW]	
0	2.63	1.83	2.55	1.80	-	-	
1	2.53	1.79	2.48	1.77	-	-	
2	2.34	1.71	2.33	1.71	-	-	
3	2.36	1.72	2.34	1.71	-	-	
4	2.38	1.73	2.34	1.71	-	-	
5	2.31	1.70	2.27	1.69	-	-	
6	2.48	1.77	2.44	1.75	-	-	
7	2.43	1.75	2.42	1.75	-	-	
8	2.52	1.79	2.67	1.85	5.61	3.64	*
9	2.44	1.75	2.70	1.86	5.58	3.62	
10	2.44	1.75	2.51	1.78	5.49	3.54	
11	2.49	1.77	2.53	1.79	5.52	3.56	
12	2.45	1.76	2.54	1.79	5.51	3.55	
13	2.48	1.77	2.57	1.81	5.54	3.58	
14	2.42	1.75	2.56	1.80	5.50	3.55	
15	2.33	1.71	2.51	1.78	5.43	3.49	

*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.4 Measurement Room
Date	April 24, 2024
Temperature / Humidity	21 deg. C / 50 % RH
Engineer	Junki Nagatomi
Mode	Tx

11b 1 Mbps (Long Preamble)

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]
2412	-6.91	1.37	20.10	0.00	14.56	28.58
2417	-4.94	1.37	20.10	0.00	16.53	44.98
2437	-4.96	1.37	20.10	0.00	16.51	44.77
2457	-4.90	1.38	20.10	0.00	16.58	45.50
2462	-8.31	1.38	20.10	0.00	13.17	20.75

11g 6 Mbps

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Duty factor [dB]	Result (Burst power average)	
					[dBm]	[mW]
2412	-5.71	1.37	20.10	0.00	15.76	37.67
2417	-2.67	1.37	20.10	0.00	18.80	75.86
2437	-2.66	1.37	20.10	0.00	18.81	76.03
2457	-2.56	1.38	20.10	0.00	18.92	77.98
2462	-7.61	1.38	20.10	0.00	13.87	24.38

Sample Calculation:

Result (Time average) = Reading + Cable Loss + 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.

Average Output Power (Reference data for RF Exposure)

Test place Ise EMC Lab. No.4 Measurement Room
Date April 24, 2024
Temperature / Humidity 21 deg. C / 50 % RH
Engineer Junki Nagatomi
Mode Tx

11n-20 (MIMO) MCS 8

Freq. [MHz]	Antenna 1 Result [mW]	Antenna 2 Result [mW]	Result		Duty Factor [dB]	Result	
			[dBm]	[mW]		Burst power average [dBm]	[mW]
2412	22.96	21.78	16.51	44.74	0.00	16.51	44.74
2417	54.70	65.92	20.81	120.62	0.00	20.81	120.62
2437	55.72	61.66	20.70	117.38	0.00	20.70	117.38
2457	59.43	60.39	20.79	119.82	0.00	20.79	119.82
2462	18.75	16.37	15.46	35.12	0.00	15.46	35.12

Sample Calculation:

Result = Antenna 1 + Antenna 2

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

Antenna 1

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
				[dBm]	[mW]
2412	-7.86	1.37	20.10	13.61	22.96
2417	-4.09	1.37	20.10	17.38	54.70
2437	-4.01	1.37	20.10	17.46	55.72
2457	-3.74	1.38	20.10	17.74	59.43
2462	-8.75	1.38	20.10	12.73	18.75

Antenna 2

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result	
				[dBm]	[mW]
2412	-8.09	1.37	20.10	13.38	21.78
2417	-3.28	1.37	20.10	18.19	65.92
2437	-3.57	1.37	20.10	17.90	61.66
2457	-3.67	1.38	20.10	17.81	60.39
2462	-9.34	1.38	20.10	12.14	16.37

Sample Calculation:

Result = Reading + Cable Loss + Attenuator Loss

Result (Time average) = Reading + Cable Loss + Attenuator Loss

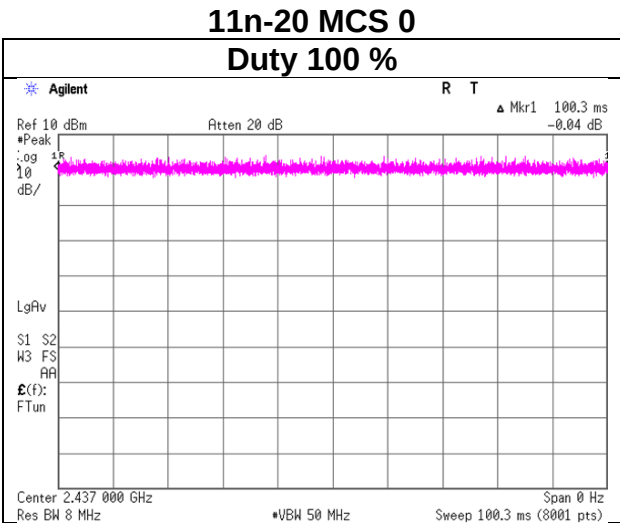
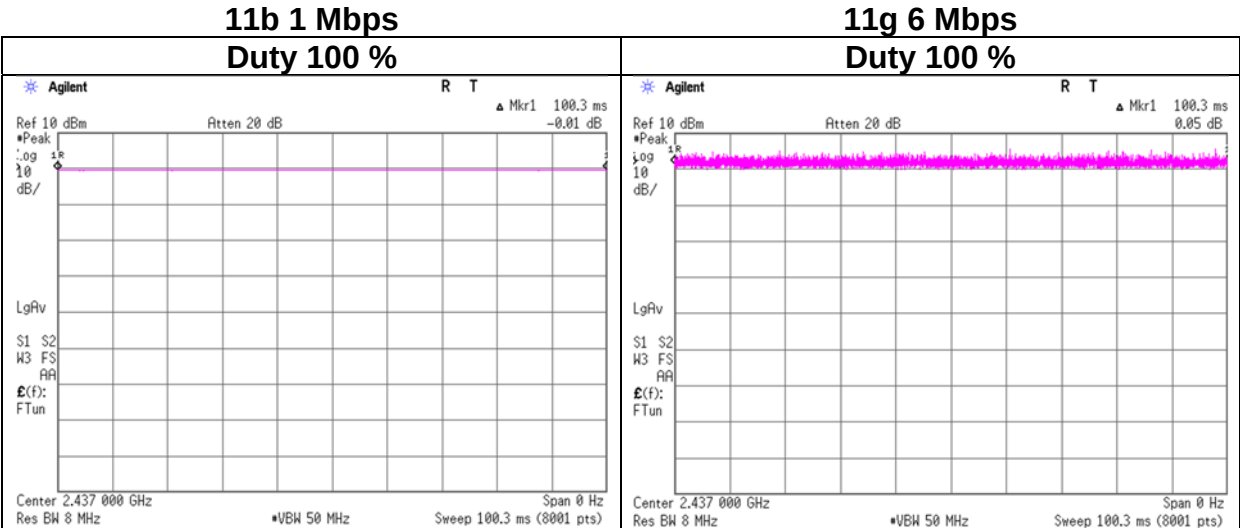
Result (Burst power average) = Time average + Duty factor

*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	Ise EMC Lab. No.8 Measurement Room
Date	May 22, 2024
Temperature / Humidity	27 deg. C / 48 % RH
Engineer	Shousei Hamaguchi
Mode	Tx



* 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.
Semi Anechoic Chambe No.4
Date May 13, 2024 No.4 May 14, 2024 No.4 May 17, 2024 No.4 May 19, 2024
Temperature / Humidity 22 deg. C / 56 % RH 22 deg. C / 41 % RH 20 deg. C / 46 % RH 23 deg. C / 48 % RH
Engineer Tomoya Sone Takumi Nishida Tomoya Sone Tomoya Sone
 (1 GHz to 6 GHz) (6 GHz to 10 GHz) (10 GHz to 18 GHz) (Above 18 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.	2200.6	46.0	37.5	28.3	5.1	31.9	-	47.5	39.1	73.9	53.9	26.4	14.8	
Hori.	2288.0	52.8	47.5	28.1	5.2	31.9	-	54.2	48.9	73.9	53.9	19.7	5.0	
Hori.	2390.0	52.6	42.0	27.7	5.2	31.8	-	53.7	43.1	73.9	53.9	20.2	10.8	
Hori.	4824.0	41.9	32.6	31.6	7.5	30.8	-	50.2	40.8	73.9	53.9	23.7	13.1	Floor noise
Hori.	7236.0	42.5	33.0	35.6	10.9	32.1	-	56.9	47.4	73.9	53.9	17.0	6.5	Floor noise
Hori.	9648.0	40.8	32.1	35.8	12.0	32.3	-	56.2	47.5	73.9	53.9	17.7	6.4	Floor noise
Vert.	2200.6	48.8	40.4	28.3	5.1	31.9	-	50.3	42.0	73.9	53.9	23.6	11.9	
Vert.	2288.0	49.7	39.5	28.1	5.2	31.9	-	51.2	41.0	73.9	53.9	22.7	12.9	
Vert.	2390.0	52.8	42.7	27.7	5.2	31.8	-	53.9	43.8	73.9	53.9	20.0	10.2	
Vert.	4824.0	41.9	32.4	31.6	7.5	30.8	-	50.1	40.7	73.9	53.9	23.8	13.2	Floor noise
Vert.	7236.0	42.5	33.0	35.6	10.9	32.1	-	56.9	47.4	73.9	53.9	17.0	6.5	Floor noise
Vert.	9648.0	40.8	32.1	35.8	12.0	32.3	-	56.2	47.5	73.9	53.9	17.7	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.

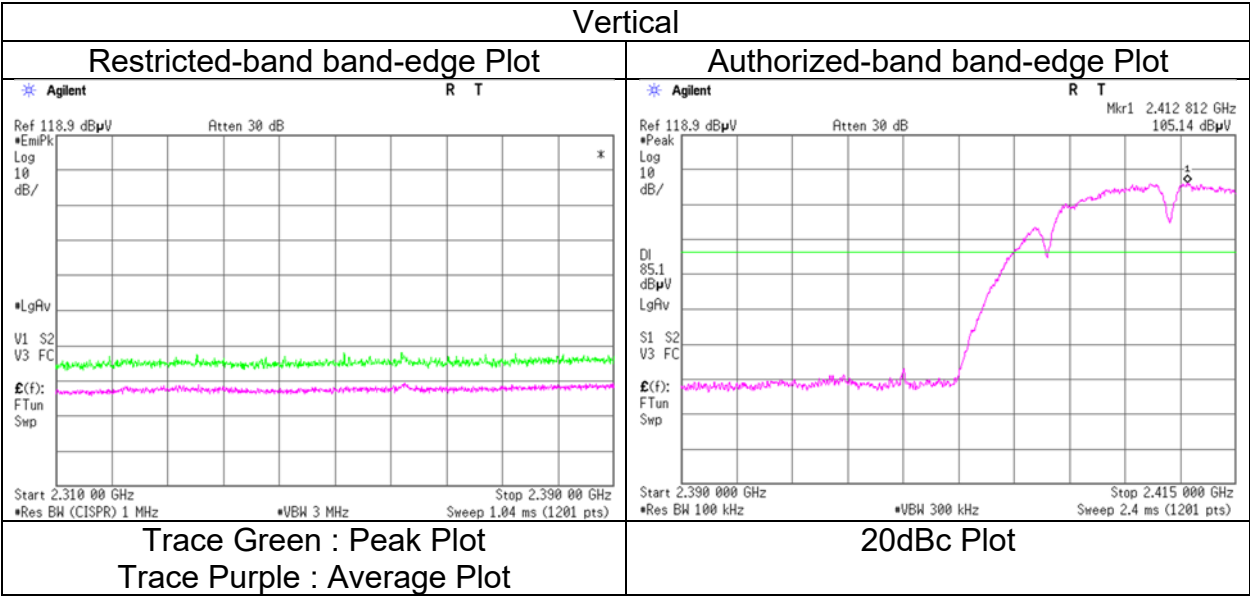
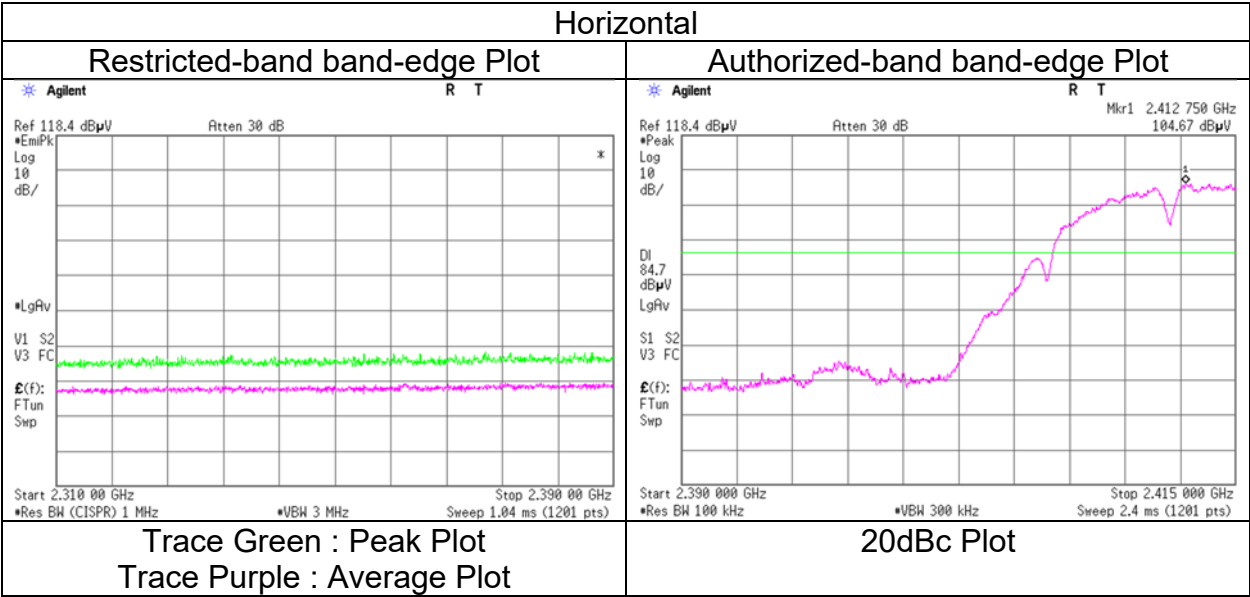
20dBc Data Sheet

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	104.7	27.6	5.3	31.8	105.8	-	-	Carrier
Hori.	1936.0	41.1	25.9	4.9	32.2	39.8	85.8	46.0	
Hori.	2112.0	44.8	27.7	5.0	32.0	45.5	85.8	40.2	
Hori.	2400.0	50.3	27.6	5.3	31.8	51.4	85.8	34.4	
Hori.	2520.0	42.6	27.5	5.3	31.7	43.7	85.8	42.1	
Vert.	2412.0	105.1	27.6	5.3	31.8	106.2	-	-	Carrier
Vert.	1936.0	45.1	25.9	4.9	32.2	43.8	86.2	42.5	
Vert.	2112.0	42.7	27.7	5.0	32.0	43.5	86.2	42.8	
Vert.	2400.0	50.7	27.6	5.3	31.8	51.8	86.2	34.5	
Vert.	2520.0	43.3	27.5	5.3	31.7	44.4	86.2	41.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
 6 GHz - 10 GHz 20log (4.75 m / 3.0 m) = 4 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.4
Date	May 13, 2024
Temperature / Humidity	22 deg. C / 56 % RH
Engineer	Tomoya Sone
	(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.4
Date May 14, 2024
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Takumi Nishida
 (1 GHz to 6 GHz)
Mode Tx 11b 2417 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	51.8	43.3	27.7	5.2	31.8	-	52.9	44.4	73.9	53.9	21.1	9.5	
Vert.	2390.0	53.1	44.8	27.7	5.2	31.8	-	54.2	45.9	73.9	53.9	19.7	8.0	

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.

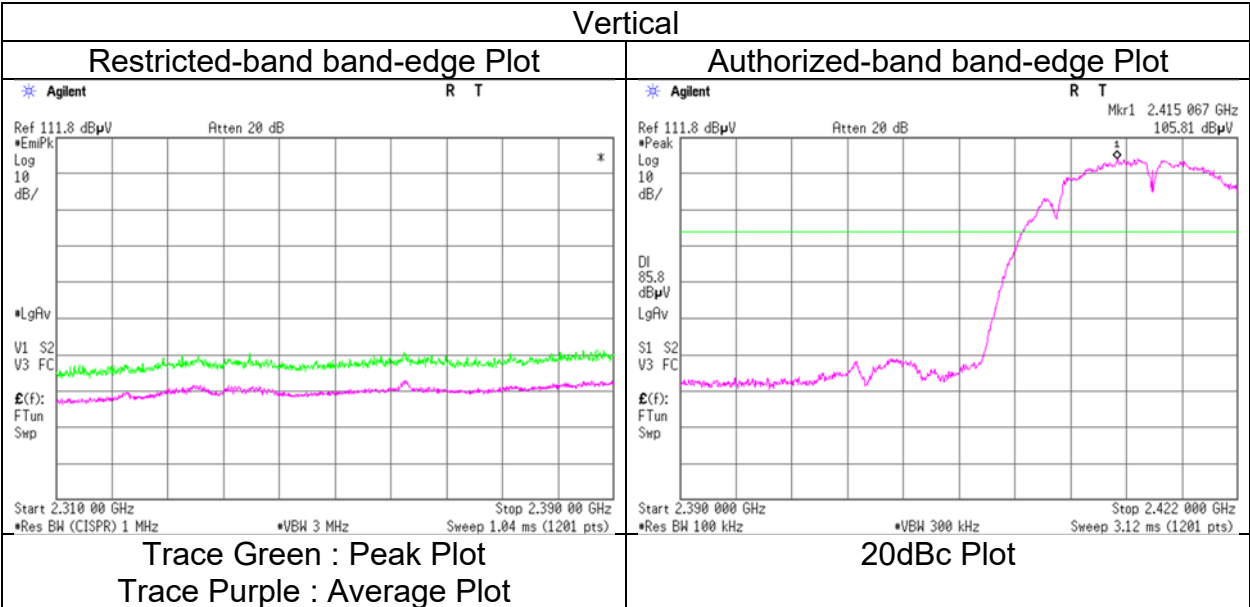
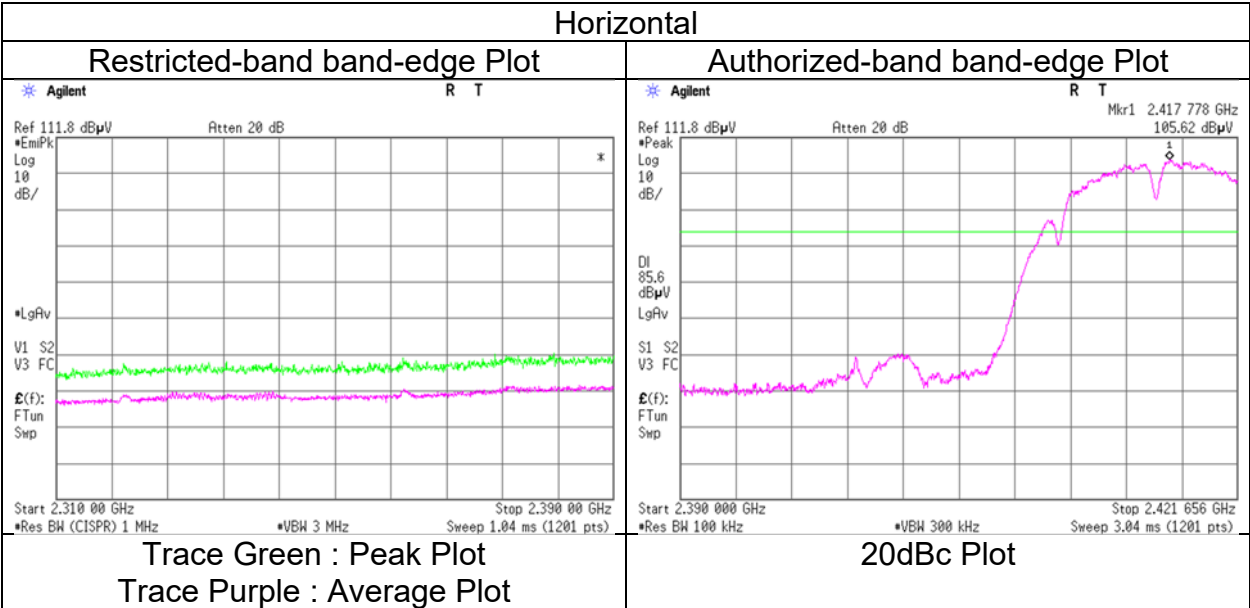
20dBc Data Sheet

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.	2417.0	105.6	27.6	5.3	31.8	106.7	-	-	Carrier
Hori.	2400.0	52.2	27.6	5.3	31.8	53.3	86.7	33.4	
Vert.	2417.0	105.8	27.6	5.3	31.8	106.9	-	-	Carrier
Vert.	2400.0	51.6	27.6	5.3	31.8	52.6	86.9	34.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	May 14, 2024
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Takumi Nishida
	(1 GHz to 6 GHz)
Mode	Tx 11b 2417 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.4	No.4	No.4
Date	May 14, 2024	May 17, 2024	May 19, 2024
Temperature / Humidity	22 deg. C / 41 % RH	20 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Takumi Nishida	Tomoya Sone	Tomoya Sone
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)
Mode	Tx 11b 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.	2200.6	46.3	37.5	28.3	5.1	31.9	-	47.9	39.1	73.9	53.9	26.1	14.8	
Hori.	2288.0	52.1	47.0	28.1	5.2	31.9	-	53.6	48.5	73.9	53.9	20.3	5.4	
Hori.	4874.0	41.6	35.3	31.6	7.5	30.8	-	49.9	43.6	73.9	53.9	24.0	10.3	Floor noise
Hori.	7311.0	42.8	33.3	35.5	10.9	32.1	-	57.2	47.7	73.9	53.9	16.7	6.2	Floor noise
Hori.	9748.0	43.0	31.8	36.0	12.0	32.4	-	58.6	47.4	73.9	53.9	15.3	6.5	Floor noise
Vert.	2200.6	48.3	40.6	28.3	5.1	31.9	-	49.9	42.1	73.9	53.9	24.0	11.8	
Vert.	2288.0	50.0	39.7	28.1	5.2	31.9	-	51.4	41.1	73.9	53.9	22.5	12.8	
Vert.	4874.0	42.0	34.4	31.6	7.5	30.8	-	50.3	42.7	73.9	53.9	23.6	11.2	Floor noise
Vert.	7311.0	42.8	33.3	35.5	10.9	32.1	-	57.2	47.7	73.9	53.9	16.7	6.2	Floor noise
Vert.	9748.0	42.0	31.8	36.0	12.0	32.4	-	57.6	47.4	73.9	53.9	16.3	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.

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.	2437.0	105.1	27.6	5.3	31.8	106.2	-	-	Carrier
Hori.	1936.0	46.5	25.9	4.9	32.2	45.2	86.2	41.0	
Hori.	2112.0	48.4	27.7	5.0	32.0	49.1	86.2	37.1	
Hori.	2520.0	49.4	27.5	5.3	31.7	50.6	86.2	35.6	
Vert.	2437.0	106.7	27.6	5.3	31.8	107.8	-	-	Carrier
Vert.	1936.0	48.8	25.9	4.9	32.2	47.4	87.8	40.3	
Vert.	2112.0	47.2	27.7	5.0	32.0	48.0	87.8	39.8	
Vert.	2520.0	51.1	27.5	5.3	31.7	52.3	87.8	35.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
6 GHz - 10 GHz 20log (4.75 m / 3.0 m) = 4 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.4
Date	May 14, 2024
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Takumi Nishida
	(1 GHz to 6 GHz)
Mode	Tx 11b 2457 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)
[Hori/Vert]	[MHz]	[dBuV]	[dBuV]	[dBm]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]
Hori.	2483.5	52.4	44.1	27.5	5.3	31.7	-	53.4	45.2	73.9	53.9	20.5	8.7
Vert.	2483.5	52.3	43.6	27.5	5.3	31.7	-	53.4	44.6	73.9	53.9	20.5	9.3

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

$$\text{Result (AV)} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz))} - \text{Gain(Amplifier)} + \text{Duty factor}$$

*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.

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.	2457.0	105.6	27.5	5.3	31.8	106.7	-	-	Carrier
Vert.	2457.0	105.4	27.5	5.3	31.8	106.5	-	-	Carrier

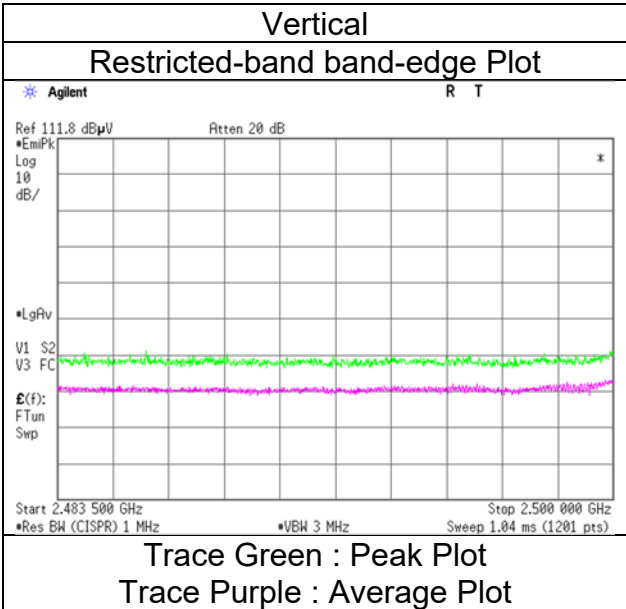
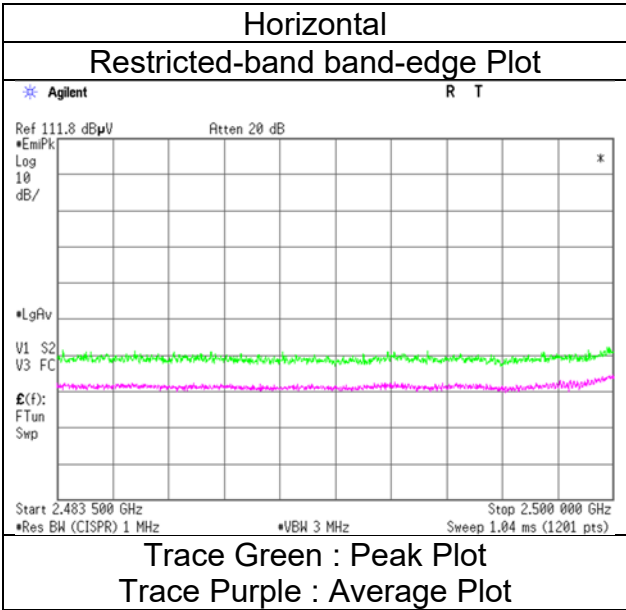
$$\text{Result} = \text{Reading} + \text{Ant Factor} + \text{Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz))} - \text{Gain(Amplifier)}$$
Distance factor: 1 GHz - 6 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
May 14, 2024
22 deg. C / 41 % RH
Takumi Nishida
(1 GHz to 6 GHz)
Tx 11b 2457 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.	No.4	No.4
Semi Anechoic Chamber	No.4	No.4	No.4
Date	May 14, 2024	May 17, 2024	May 19, 2024
Temperature / Humidity	22 deg. C / 41 % RH	20 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Takumi Nishida	Tomoya Sone	Tomoya Sone
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)
Mode	Tx 11b 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.	2200.6	46.0	36.9	28.3	5.1	31.9	-	47.6	38.4	73.9	53.9	26.4	15.5	
Hori.	2288.0	51.8	46.7	28.1	5.2	31.9	-	53.3	48.1	73.9	53.9	20.6	5.8	
Hori.	2483.5	52.5	44.7	27.5	5.3	31.7	-	53.5	45.7	73.9	53.9	20.4	8.2	
Hori.	4924.0	42.0	35.8	31.7	7.5	30.8	-	50.4	44.2	73.9	53.9	23.5	9.7	Floor noise
Hori.	7386.0	42.9	33.5	35.5	11.0	32.1	-	57.2	47.8	73.9	53.9	16.7	6.1	Floor noise
Hori.	9848.0	43.3	32.0	36.1	12.1	32.4	-	59.1	47.8	73.9	53.9	14.8	6.1	Floor noise
Vert.	2200.6	48.6	41.0	28.3	5.1	31.9	-	50.2	42.6	73.9	53.9	23.7	11.3	
Vert.	2288.0	49.7	39.8	28.1	5.2	31.9	-	51.1	41.3	73.9	53.9	22.8	12.6	
Vert.	2483.5	52.6	44.1	27.5	5.3	31.7	-	53.7	45.2	73.9	53.9	20.2	8.7	
Vert.	4924.0	42.2	34.8	31.7	7.5	30.8	-	50.6	43.2	73.9	53.9	23.3	10.7	Floor noise
Vert.	7386.0	42.9	33.5	35.5	11.0	32.1	-	57.2	47.8	73.9	53.9	16.7	6.1	Floor noise
Vert.	9848.0	43.3	32.0	36.1	12.1	32.4	-	59.1	47.8	73.9	53.9	14.8	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.

Distance factor:

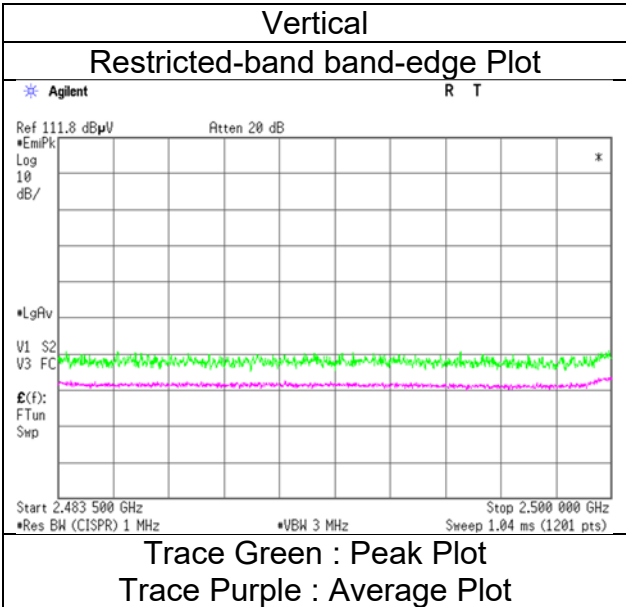
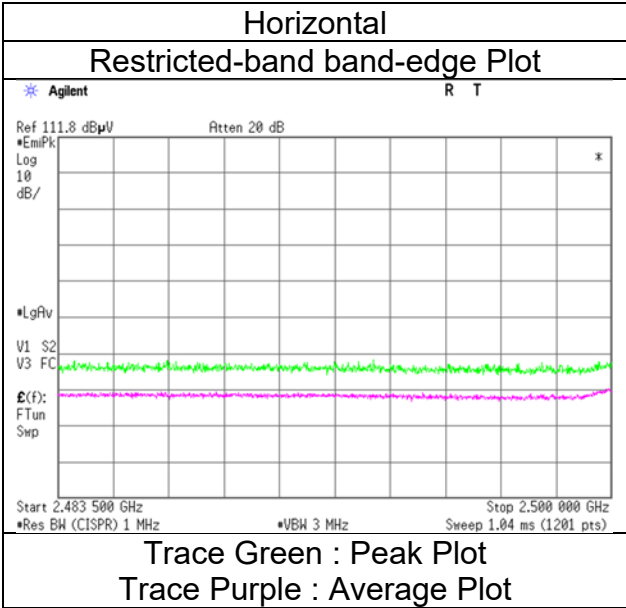
1 GHz - 6 GHz	$20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$
6 GHz - 10 GHz	$20\log(4.75\text{ m} / 3.0\text{ m}) = 4\text{ dB}$
10 GHz - 26.5 GHz	$20\log(1.0\text{ m} / 3.0\text{ m}) = -9.5\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
May 14, 2024
22 deg. C / 41 % RH
Takumi Nishida
(1 GHz to 10 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.	No.4	No.4	No.4	No.4
Semi Anechoic Chamber	No.4	No.4	No.4	No.4	No.4
Date	May 14, 2024	May 14, 2024	May 17, 2024	May 19, 2024	May 19, 2024
Temperature / Humidity	20 deg. C / 55 % RH	22 deg. C / 41 % RH	20 deg. C / 46 % RH	23 deg. C / 48 % RH	23 deg. C / 48 % RH
Engineer	Tomoya Sone	Takumi Nishida	Tomoya Sone	Tomoya Sone	Tomoya Sone
	(1 GHz to 6 GHz)	(6 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)	(Above 18 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.	2200.6	46.9	38.0	28.3	5.1	31.9	-	48.5	39.6	73.9	53.9	25.4	14.3	
Hori.	2288.0	51.7	45.2	28.1	5.2	31.9	-	53.1	46.6	73.9	53.9	20.8	7.3	
Hori.	2390.0	56.9	44.2	27.7	5.2	31.8	-	58.0	45.3	73.9	53.9	15.9	8.6	
Hori.	4824.0	40.5	31.9	31.6	7.5	30.8	-	48.7	40.1	73.9	53.9	25.2	13.8	Floor noise
Hori.	7236.0	42.3	32.9	35.6	10.9	32.1	-	56.7	47.3	73.9	53.9	17.2	6.6	Floor noise
Hori.	9648.0	40.9	32.2	35.8	12.0	32.3	-	56.3	47.6	73.9	53.9	17.6	6.3	Floor noise
Vert.	2200.6	48.1	39.4	28.3	5.1	31.9	-	49.7	40.9	73.9	53.9	24.2	13.0	
Vert.	2288.0	51.7	43.8	28.1	5.2	31.9	-	53.1	45.2	73.9	53.9	20.8	8.7	
Vert.	2390.0	59.3	44.9	27.7	5.2	31.8	-	60.4	46.0	73.9	53.9	13.5	7.9	
Vert.	4824.0	41.1	31.8	31.6	7.5	30.8	-	49.4	40.1	73.9	53.9	24.5	13.8	Floor noise
Vert.	7236.0	42.3	32.9	35.6	10.9	32.1	-	56.7	47.3	73.9	53.9	17.2	6.6	Floor noise
Vert.	9648.0	40.9	32.2	35.8	12.0	32.3	-	56.3	47.6	73.9	53.9	17.6	6.3	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.

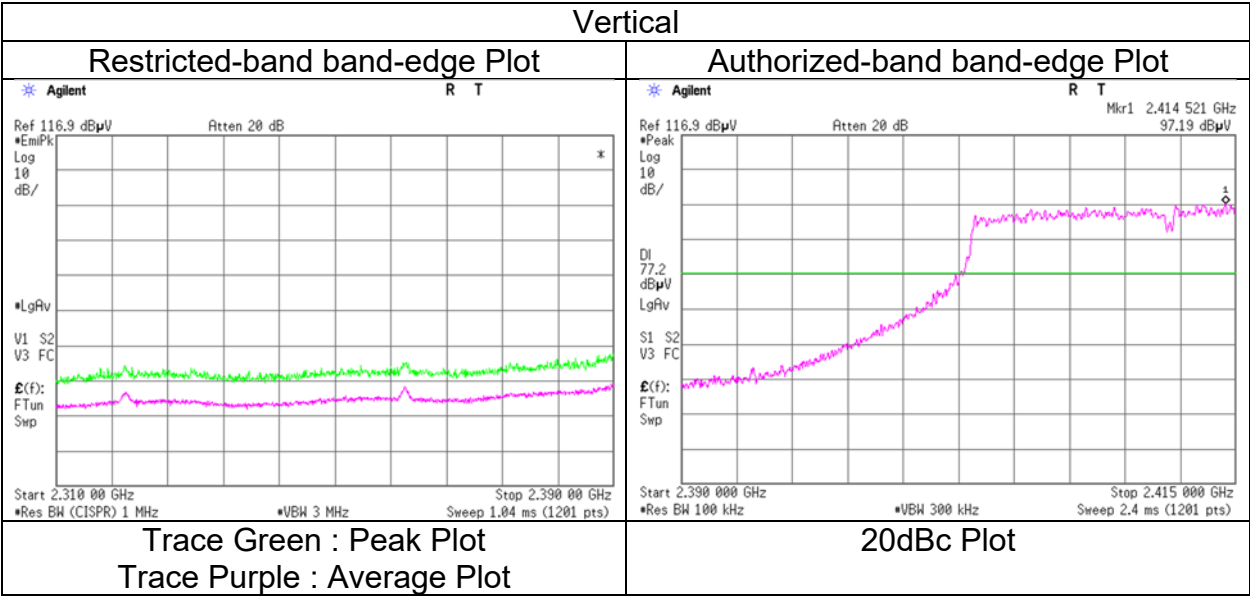
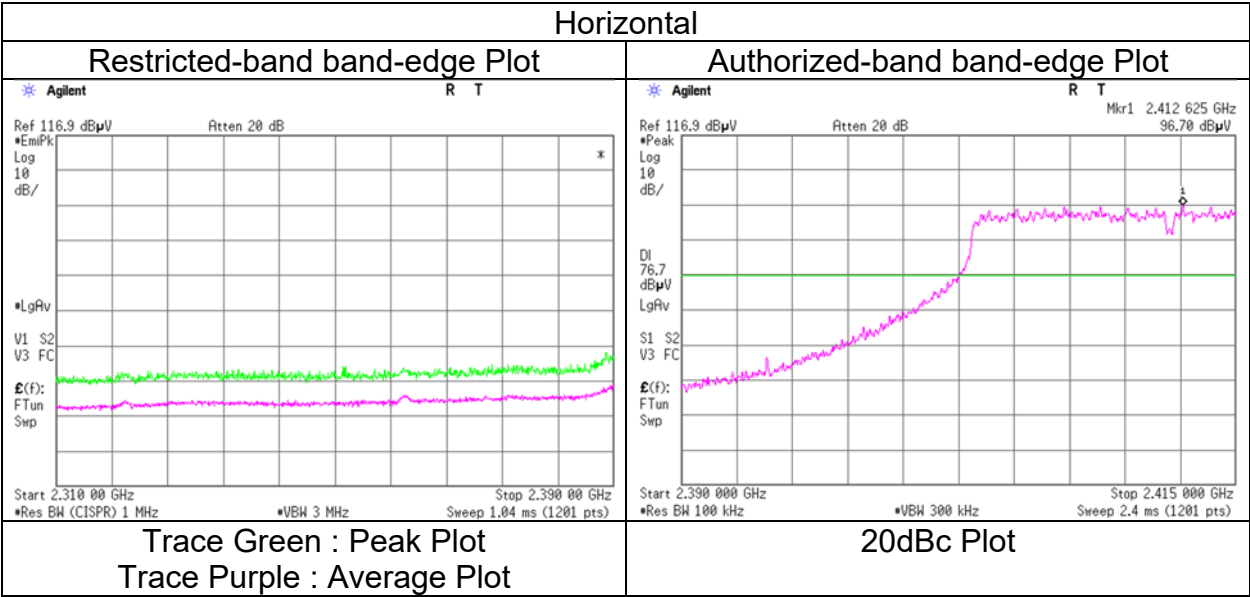
20dBc Data Sheet

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	96.7	27.6	5.3	31.8	97.8	-	-	Carrier
Hori.	1936.0	39.8	25.9	4.9	32.2	38.4	77.8	39.4	
Hori.	2112.0	42.5	27.7	5.0	32.0	43.3	77.8	34.5	
Hori.	2400.0	68.3	27.6	5.3	31.8	69.4	77.8	8.4	
Hori.	2520.0	42.4	27.5	5.3	31.7	43.6	77.8	34.2	
Vert.	2412.0	97.2	27.6	5.3	31.8	98.3	-	-	Carrier
Vert.	1936.0	40.8	25.9	4.9	32.2	39.4	78.3	38.8	
Vert.	2112.0	39.9	27.7	5.0	32.0	40.6	78.3	37.7	
Vert.	2400.0	65.4	27.6	5.3	31.8	66.5	78.3	11.8	
Vert.	2520.0	44.0	27.5	5.3	31.7	45.1	78.3	33.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
6 GHz - 10 GHz 20log (4.75 m / 3.0 m) = 4 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.4
Date	May 14, 2024
Temperature / Humidity	20 deg. C / 55 % RH
Engineer	Tomoya Sone
	(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 Ise EMC Lab.
Semi Anechoic Chamber No.4
Date May 14, 2024
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Takumi Nishida
 (1 GHz to 6 GHz)
Mode Tx 11n-20 2417 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	64.8	51.6	27.7	5.2	31.8	-	65.9	52.7	73.9	53.9	8.0	1.2	
Vert.	2390.0	63.6	50.8	27.7	5.2	31.8	-	64.7	51.9	73.9	53.9	9.2	2.1	

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

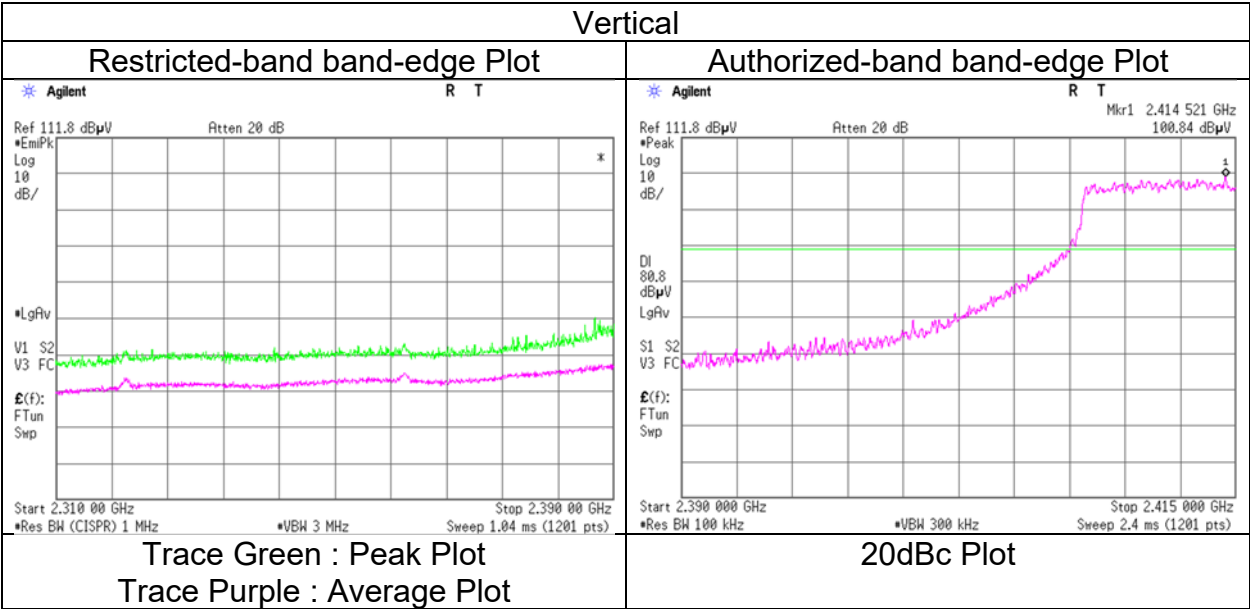
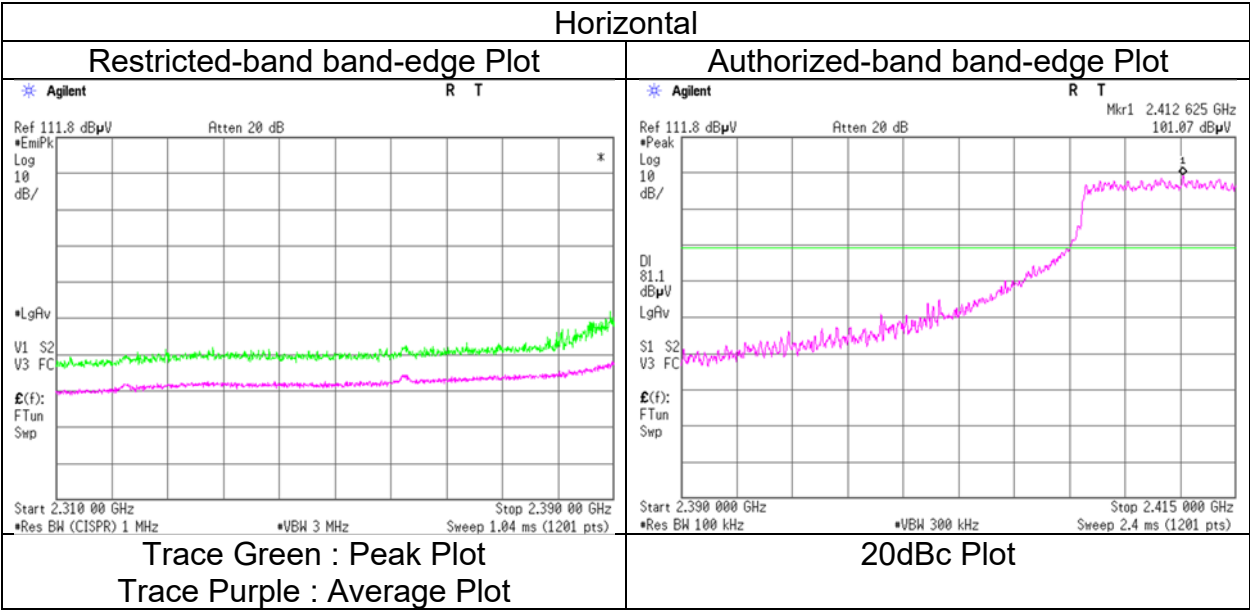
20dBc Data Sheet

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.	2417.0	101.1	27.6	5.3	31.8	102.2	-	-	Carrier
Hori.	2400.0	62.1	27.6	5.3	31.8	63.2	82.2	18.9	
Vert.	2417.0	100.8	27.6	5.3	31.8	101.9	-	-	Carrier
Vert.	2400.0	58.8	27.6	5.3	31.8	59.8	81.9	22.1	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	May 14, 2024
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Takumi Nishida
	(1 GHz to 6 GHz)
Mode	Tx 11n-20 2417 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.4 No.4 No.4 No.4 No.4
Date May 14, 2024 May 14, 2024 May 17, 2024 May 19, 2024 May 19, 2024
Temperature / 20 deg. C / 22 deg. C / 20 deg. C / 23 deg. C / 22 deg. C /
Humidity 55 % RH 41 % RH 46 % RH 48 % RH 57 % RH
Engineer Tomoya Sone Takumi Nishida Tomoya Sone Tomoya Sone Yuichiro Yamazaki
 (1 GHz to 6 GHz) (6 GHz to 10 GHz) (10 GHz to 18 GHz) (Above 18 GHz) (Below 1 GHz)
Mode Tx 11n-20 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.	68.4	44.7	-	6.5	7.5	32.1	-	26.6	-	40.0	-	13.4	-	
Hori.	140.6	34.1	-	14.6	8.2	32.0	-	24.8	-	43.5	-	18.7	-	
Hori.	163.5	34.1	-	15.6	8.4	32.0	-	26.1	-	43.5	-	17.4	-	
Hori.	300.0	43.8	-	13.7	9.6	32.0	-	35.0	-	46.0	-	11.0	-	
Hori.	625.0	34.7	-	19.4	11.4	32.3	-	33.2	-	46.0	-	12.8	-	
Hori.	875.0	30.7	-	21.9	12.2	31.3	-	33.5	-	46.0	-	12.5	-	
Hori.	2200.6	46.1	38.3	28.3	5.1	31.9	-	47.7	39.8	73.9	53.9	26.2	14.1	
Hori.	2288.0	50.7	44.2	28.1	5.2	31.9	-	52.2	45.7	73.9	53.9	21.8	8.2	
Hori.	4874.0	39.9	31.8	31.6	7.5	30.8	-	48.2	40.2	73.9	53.9	25.7	13.7	Floor noise
Hori.	7311.0	42.5	33.4	35.5	10.9	32.1	-	56.9	47.8	73.9	53.9	17.0	6.1	Floor noise
Hori.	9748.0	43.2	31.7	36.0	12.0	32.4	-	58.8	47.3	73.9	53.9	15.1	6.6	Floor noise
Vert.	38.6	45.0	-	15.4	7.2	32.1	-	35.5	-	40.0	-	4.5	-	
Vert.	50.2	49.2	-	11.1	7.3	32.1	-	35.5	-	40.0	-	4.5	-	
Vert.	68.4	57.5	-	6.5	7.5	32.1	-	39.4	-	40.0	-	0.6	-	
Vert.	125.0	41.1	-	13.4	8.1	32.1	-	30.5	-	43.5	-	13.0	-	
Vert.	140.6	38.2	-	14.6	8.2	32.0	-	28.9	-	43.5	-	14.6	-	
Vert.	163.5	39.4	-	15.6	8.4	32.0	-	31.4	-	43.5	-	12.1	-	
Vert.	2200.6	48.6	40.9	28.3	5.1	31.9	-	50.1	42.5	73.9	53.9	23.8	11.4	
Vert.	2288.0	52.4	45.6	28.1	5.2	31.9	-	53.9	47.1	73.9	53.9	20.1	6.8	
Vert.	4874.0	40.0	31.9	31.6	7.5	30.8	-	48.3	40.2	73.9	53.9	25.6	13.7	Floor noise
Vert.	7311.0	42.5	33.4	35.5	10.9	32.1	-	56.9	47.8	73.9	53.9	17.0	6.1	Floor noise
Vert.	9748.0	43.2	31.7	36.0	12.0	32.4	-	58.8	47.3	73.9	53.9	15.1	6.6	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 (3.75 m / 3.0 m) = 1.94 dB
 6 GHz - 10 GHz 20log (4.75 m / 3.0 m) = 4 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.4
Date May 14, 2024
Temperature / Humidity 22 deg. C / 41 % RH
Engineer Takumi Nishida
 (1 GHz to 6 GHz)
Mode Tx 11n-20 2457 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	64.0	50.8	27.5	5.3	31.7	-	65.1	51.9	73.9	53.9	8.8	2.0	
Vert.	2483.5	65.0	51.4	27.5	5.3	31.7	-	66.1	52.5	73.9	53.9	7.8	1.4	

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.

20dBc Data Sheet

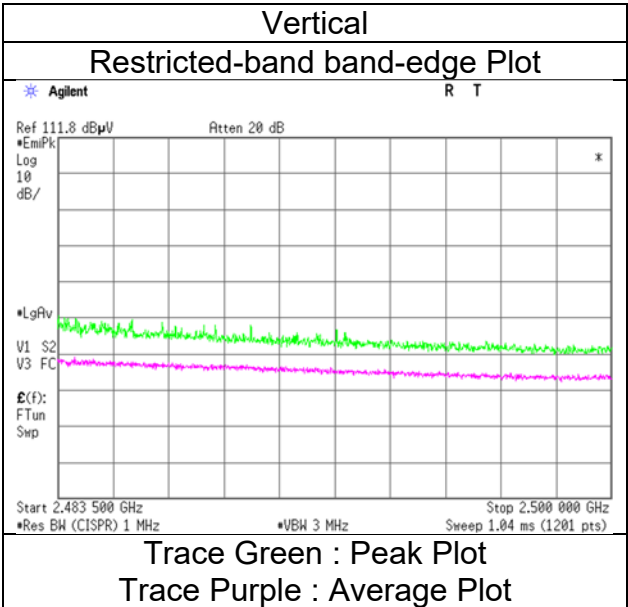
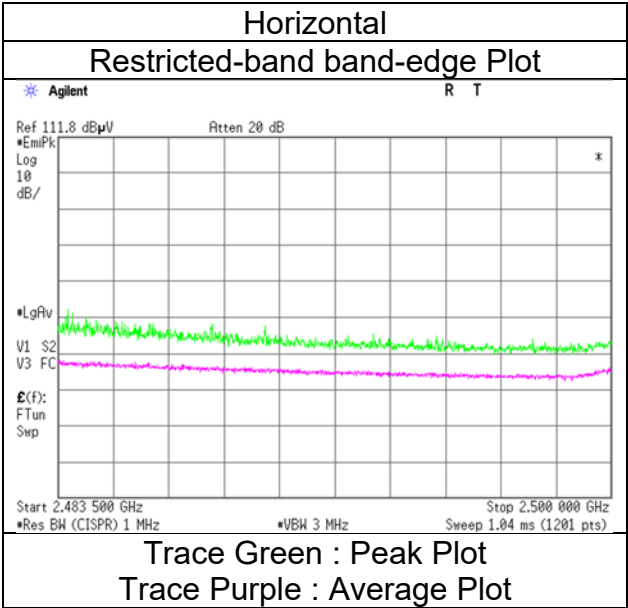
Polarity	Frequency	Reading (PK)	Ant Factor	Loss	Gain	Result	Limit	Margin	Remark
[Hori/Vert]	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	
Hori.	2457.0	99.4	27.5	5.3	31.8	100.4	-	-	Carrier
Vert.	2457.0	100.8	27.5	5.3	31.8	101.9	-	-	Carrier

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

Distance factor: 1 GHz - 6 GHz $20\log(3.75\text{ m} / 3.0\text{ m}) = 1.94\text{ dB}$

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	May 14, 2024
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Takumi Nishida
	(1 GHz to 6 GHz)
Mode	Tx 11n-20 2457 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.	No.4	No.4	No.4
Semi Anechoic Chamber	No.4	No.4	No.4	No.4
Date	May 14, 2024	May 14, 2024	May 17, 2024	May 19, 2024
Temperature / Humidity	20 deg. C / 55 % RH	22 deg. C / 41 % RH	20 deg. C / 46 % RH	23 deg. C / 48 % RH
Engineer	Tomoya Sone	Takumi Nishida	Tomoya Sone	Tomoya Sone
	(1 GHz to 6 GHz)	(6 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)
Mode	Tx 11n-20 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.	2200.0	46.9	37.7	28.3	5.1	31.9	-	48.5	39.3	73.9	53.9	25.4	14.6	
Hori.	2280.0	47.4	38.7	28.2	5.2	31.9	-	48.9	40.2	73.9	53.9	25.0	13.7	
Hori.	2483.5	59.5	43.3	27.5	5.3	31.7	-	60.5	44.4	73.9	53.9	13.4	9.5	
Hori.	2500.0	53.4	45.0	27.5	5.3	31.7	-	54.5	46.1	73.9	53.9	19.4	7.8	
Hori.	4924.0	40.1	31.7	31.7	7.5	30.8	-	48.4	40.0	73.9	53.9	25.5	13.9	Floor noise
Hori.	7386.0	42.8	33.3	35.5	11.0	32.1	-	57.1	47.6	73.9	53.9	16.8	6.3	Floor noise
Hori.	9848.0	43.5	31.9	36.1	12.1	32.4	-	59.3	47.7	73.9	53.9	14.6	6.2	Floor noise
Vert.	2200.0	45.2	32.8	28.3	5.1	31.9	-	46.7	34.4	73.9	53.9	27.2	19.5	
Vert.	2280.0	48.3	39.5	28.2	5.2	31.9	-	49.8	41.0	73.9	53.9	24.1	12.9	
Vert.	2483.5	56.9	43.9	27.5	5.3	31.7	-	58.0	44.9	73.9	53.9	15.9	9.0	
Vert.	2500.0	53.8	45.9	27.5	5.3	31.7	-	54.9	47.0	73.9	53.9	19.0	6.9	
Vert.	4924.0	39.7	31.6	31.7	7.5	30.8	-	48.1	39.9	73.9	53.9	25.8	14.0	Floor noise
Vert.	7386.0	42.8	33.3	35.5	11.0	32.1	-	57.1	47.6	73.9	53.9	16.8	6.3	Floor noise
Vert.	9848.0	43.5	31.9	36.1	12.1	32.4	-	59.3	47.7	73.9	53.9	14.6	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.

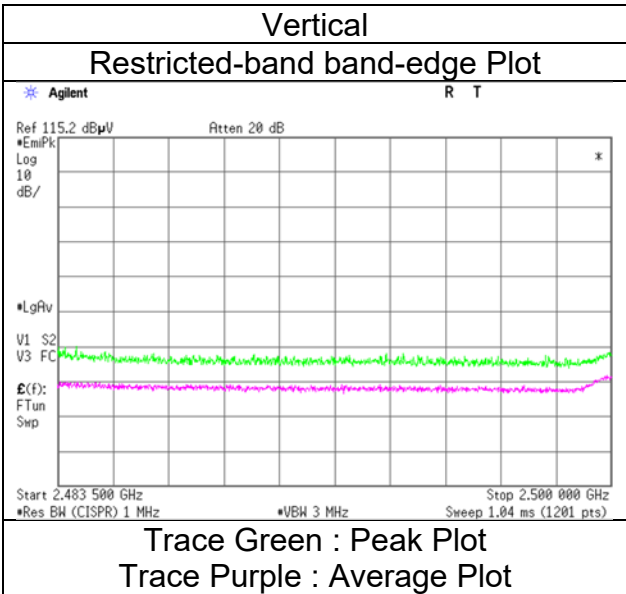
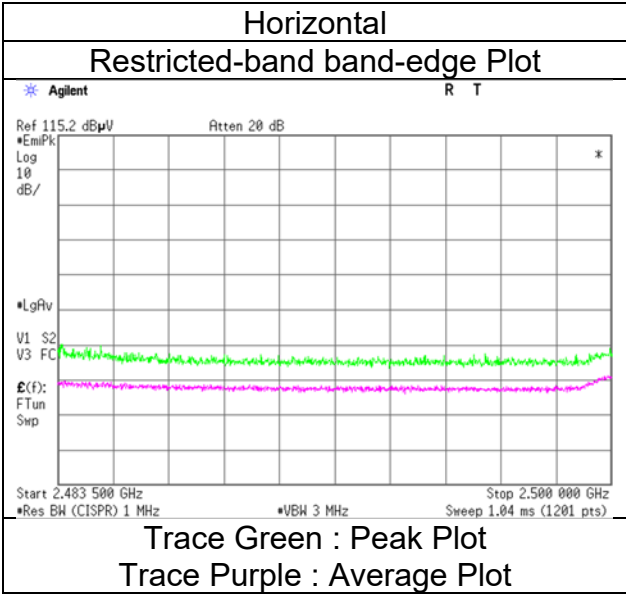
20dBc Data Sheet

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.	2462.0	94.7	27.5	5.3	31.8	95.8	-	-	Carrier
Hori.	1936.0	37.4	25.9	4.9	32.2	36.1	75.8	39.7	
Hori.	2120.0	37.9	27.8	5.1	31.9	38.8	75.8	37.0	
Vert.	2462.0	95.1	27.5	5.3	31.8	96.1	-	-	Carrier
Vert.	1936.0	39.6	25.9	4.9	32.2	38.3	76.1	37.9	
Vert.	2120.0	37.3	27.8	5.1	31.9	38.1	76.1	38.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amplifier)
Distance factor: 1 GHz - 6 GHz 20log (3.75 m / 3.0 m) = 1.94 dB
6 GHz - 10 GHz 20log (4.75 m / 3.0 m) = 4 dB
10 GHz - 26.5 GHz 20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

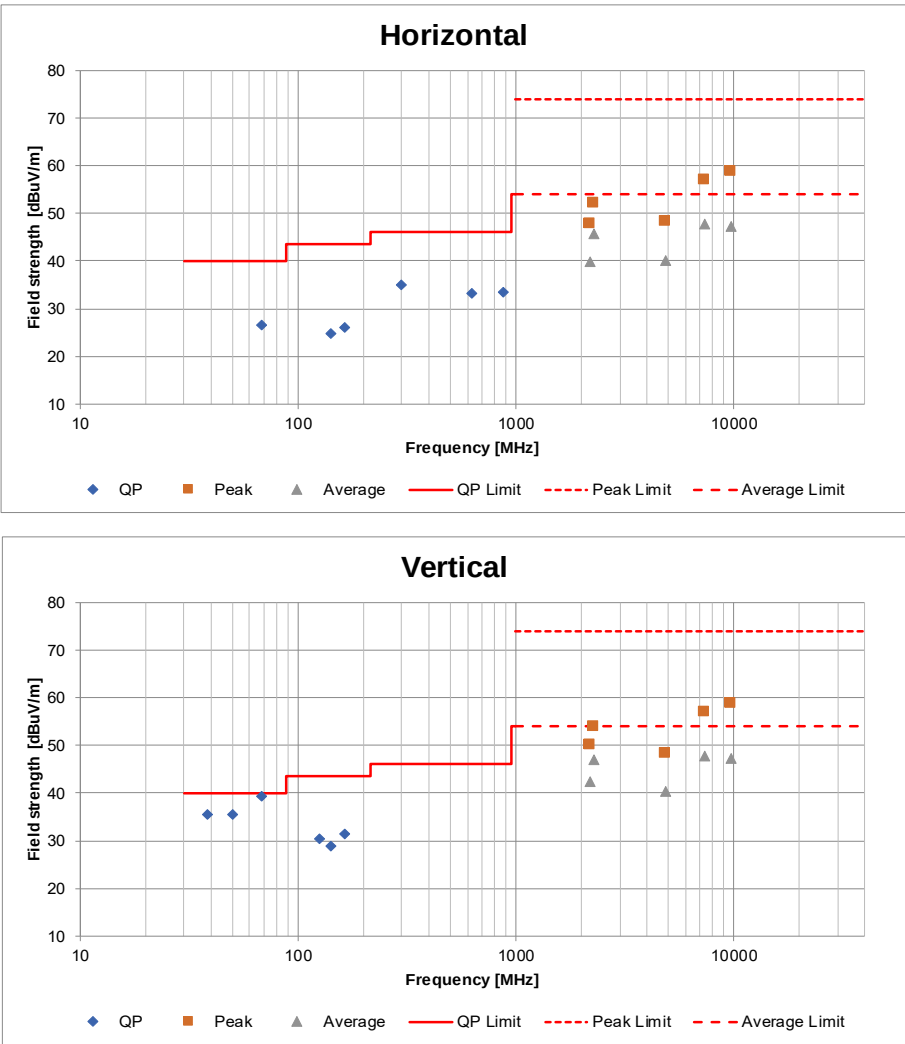
Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	May 14, 2024
Temperature / Humidity	20 deg. C / 55 % RH
Engineer	Tomoya Sone
	(1 GHz to 6 GHz)
Mode	Tx 11n-20 2462 MHz



* 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.				
Semi Anechoic Chamber	No.4	No.4	No.4	No.4	No.4
Date	May 14, 2024	May 14, 2024	May 17, 2024	May 19, 2024	May 19, 2024
Temperature / Humidity	20 deg. C / 55 % RH	22 deg. C / 41 % RH	20 deg. C / 46 % RH	23 deg. C / 48 % RH	22 deg. C / 57 % RH
Engineer	Tomoya Sone	Takumi Nishida	Tomoya Sone	Tomoya Sone	Yuichiro Yamazaki
	(1 GHz to 6 GHz)	(6 GHz to 10 GHz)	(10 GHz to 18 GHz)	(Above 18 GHz)	(Below 1 GHz)
Mode	Tx 11n-20 2437 MHz				

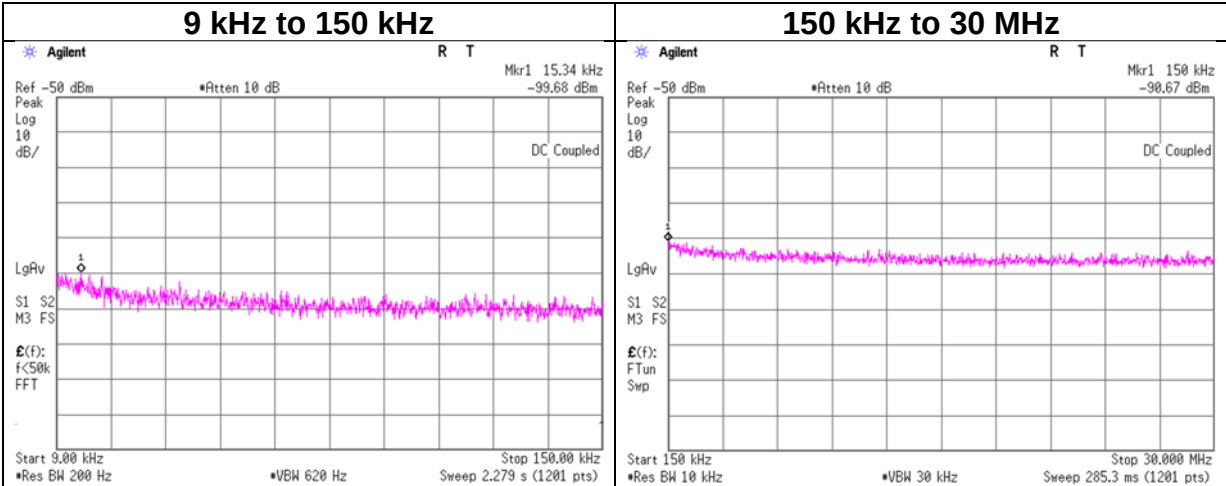


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

Test place
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab. No.8 Measurement Room
May 22, 2024
27 deg. C / 48 % RH
Shousei Hamaguchi
Tx 11n-20 2437 MHz



Frequency	Reading	Cable Loss	Attenuator Loss	Antenna Gain*	N	EIRP	Distance	Ground bounce	E	Limit	Margin
[kHz]	[dBm]	[dB]	[dB]	[dBi]	(Number of Output)	[dBm]	[m]	[dB]	(field strength) [dBuV/m]	[dBuV/m]	[dB]
15.34	-99.7	0.00	19.9	2.0	2	-74.8	300	6.0	-13.6	43.8	57.4
150.00	-90.7	0.01	19.9	2.0	2	-65.8	300	6.0	-4.5	24.0	28.5

$E \text{ [dBuV/m]} = \text{EIRP [dBm]} - 20 \log (\text{Distance [m]}) + \text{Ground bounce [dB]} + 104.8 \text{ [dBuV/m]}$
 $\text{EIRP[dBm]} = \text{Reading [dBm]} + \text{Cable loss [dB]} + \text{Attenuator Loss [dB]} + \text{Antenna gain [dBi]} + 10 * \log (N)$
N: Number of output
*2.0 dBi was applied to the test result based on ANSI C63.10 since antenna gain was less than 2.0 dBi.

Power Density

Test place
Date
Temperature / Humidity
Engineer
Mode

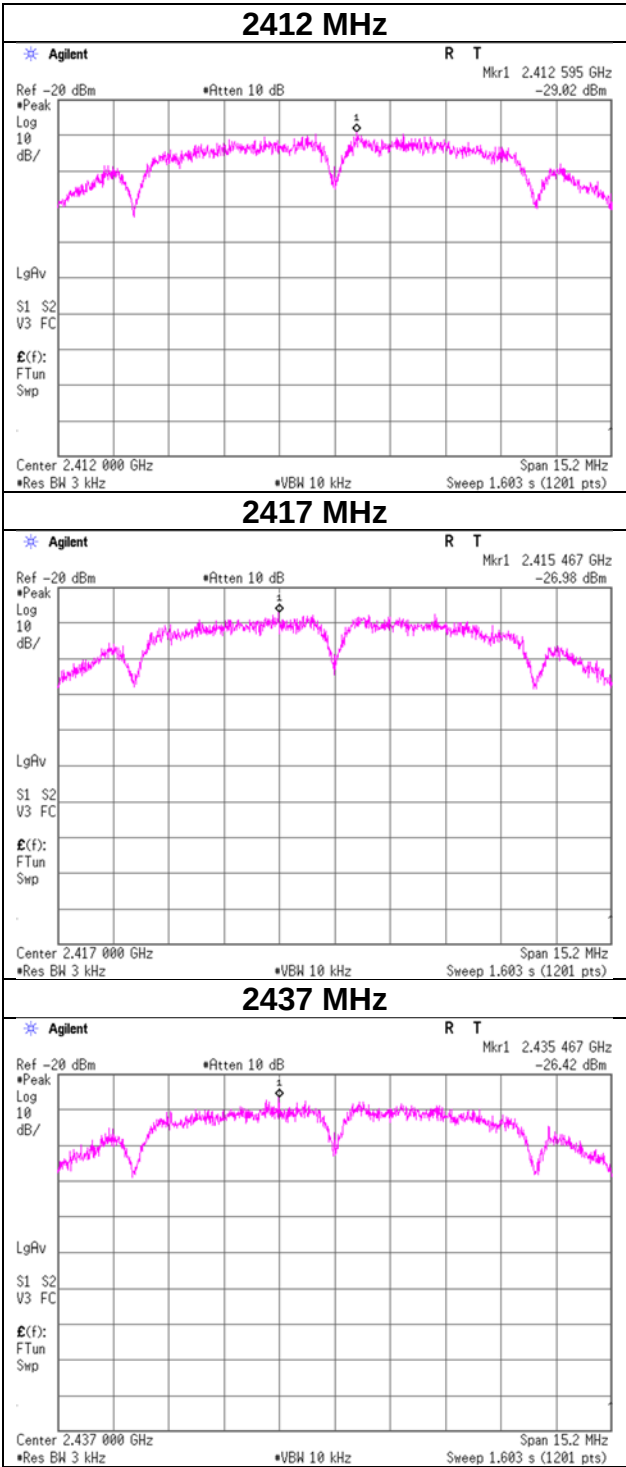
Ise EMC Lab. No.8 Measurement Room
May 22, 2024
27 deg. C / 48 % RH
Shousei Hamaguchi
Tx 11b

11b Antenna 2

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-29.02	1.00	19.87	-8.15	8.00	16.15
2417	-26.98	1.00	19.87	-6.11	8.00	14.11
2437	-26.42	1.01	19.87	-5.54	8.00	13.54
2457	-27.52	1.01	19.87	-6.64	8.00	14.64
2462	-31.02	1.01	19.87	-10.14	8.00	18.14

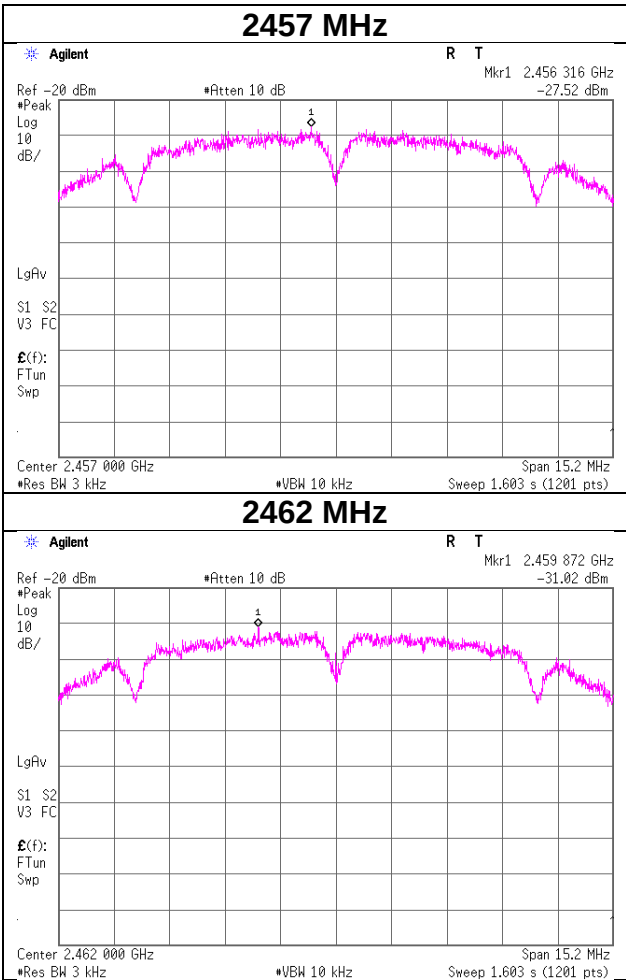
Power Density

11b



Power Density

11b



Power Density

Test place Ise EMC Lab. No.8 Measurement Room
Date May 22, 2024
Temperature / Humidity 27 deg. C / 48 % RH
Engineer Shousei Hamaguchi
Mode Tx 11n-20

Antenna 1 + Antenna 2

Freq.	Antenna 1 Result	Antenna 2 Result	Result		Limit	Margin
[MHz]	[mW / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	0.10	0.07	-7.56	0.18	8.00	15.56
2417	0.12	0.25	-4.34	0.37	8.00	12.34
2437	0.12	0.16	-5.56	0.28	8.00	13.56
2457	0.12	0.15	-5.75	0.27	8.00	13.75
2462	0.04	0.04	-10.61	0.09	8.00	18.61

Antenna 1

Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-30.76	1.00	19.87	-9.89	0.10	8.00	17.89
2417	-30.20	1.00	19.87	-9.33	0.12	8.00	17.33
2437	-30.24	1.01	19.87	-9.36	0.12	8.00	17.36
2457	-30.22	1.01	19.87	-9.34	0.12	8.00	17.34
2462	-34.49	1.01	19.87	-13.61	0.04	8.00	21.61

Antenna 2

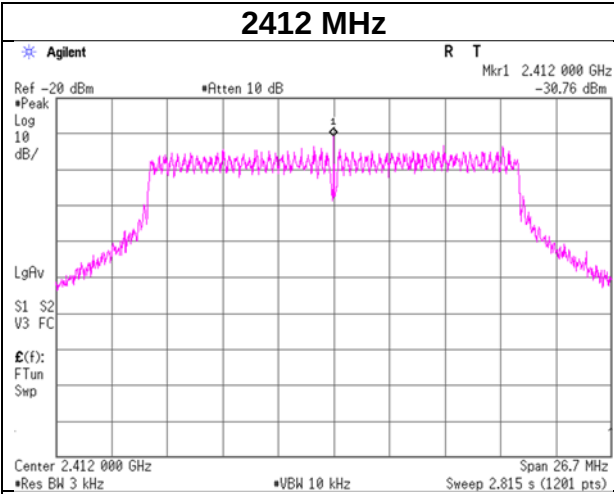
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit	Margin
[MHz]	[dBm / 3 kHz]	[dB]	[dB]	[dBm / 3 kHz]	[mW / 3 kHz]	[dBm / 3 kHz]	[dB]
2412	-32.24	1.00	19.87	-11.37	0.07	8.00	19.37
2417	-26.87	1.00	19.87	-6.00	0.25	8.00	14.00
2437	-28.78	1.01	19.87	-7.90	0.16	8.00	15.90
2457	-29.13	1.01	19.87	-8.25	0.15	8.00	16.25
2462	-34.52	1.01	19.87	-13.64	0.04	8.00	21.64

Sample Calculation:
Result = Reading + Cable Loss + Attenuator Loss

Power Density

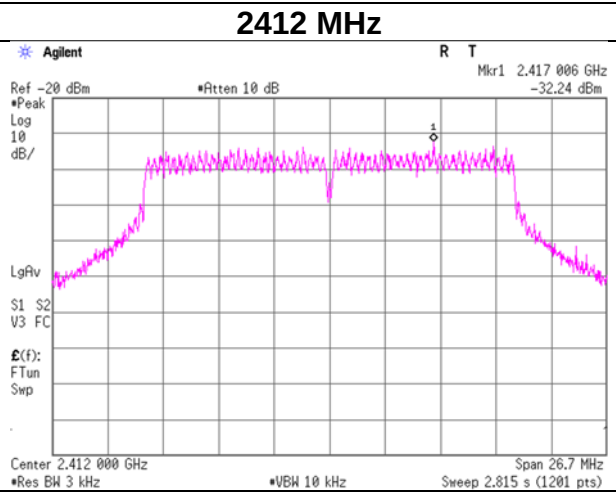
11n-20 Antenna 1

2412 MHz

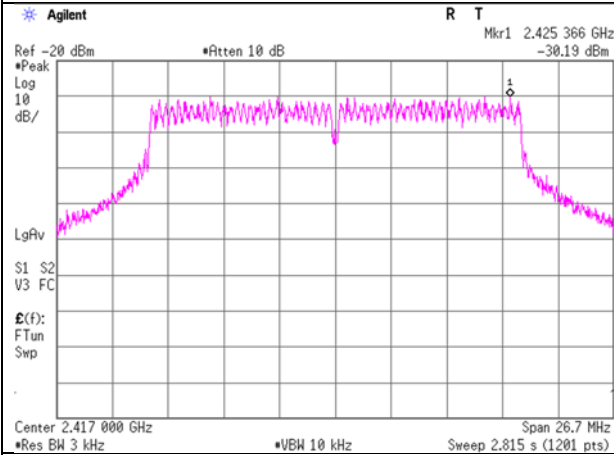


11n-20 Antenna 2

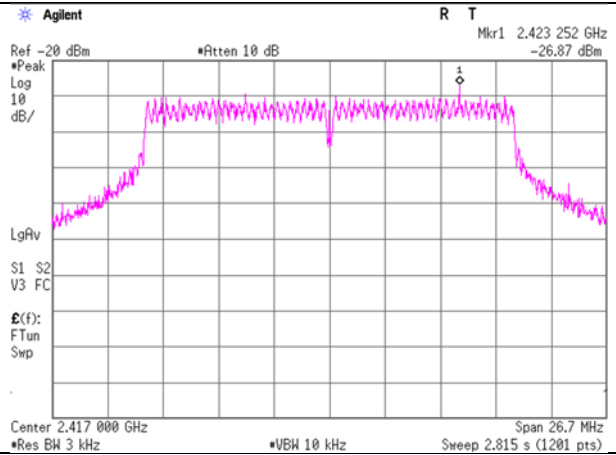
2412 MHz



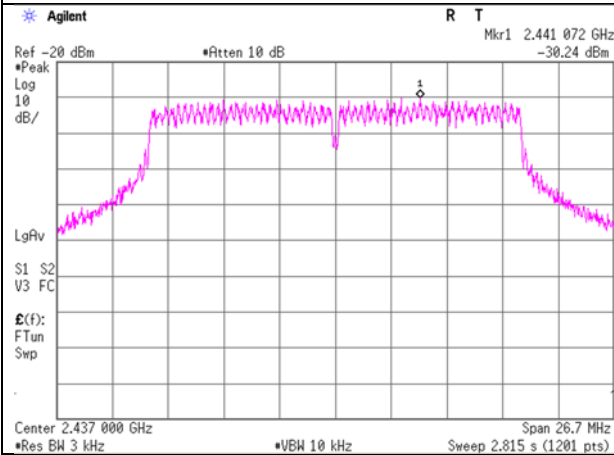
2417 MHz



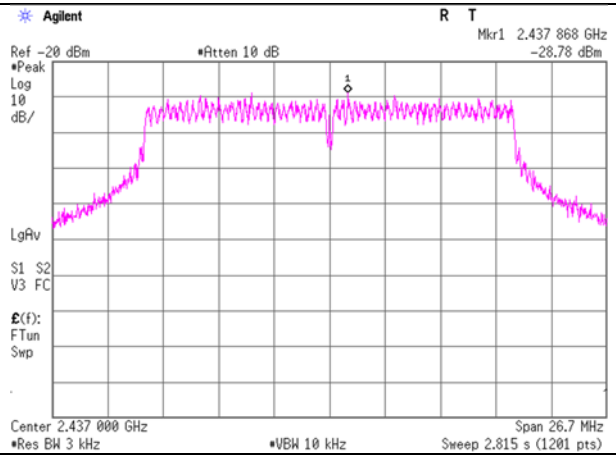
2417 MHz



2437 MHz

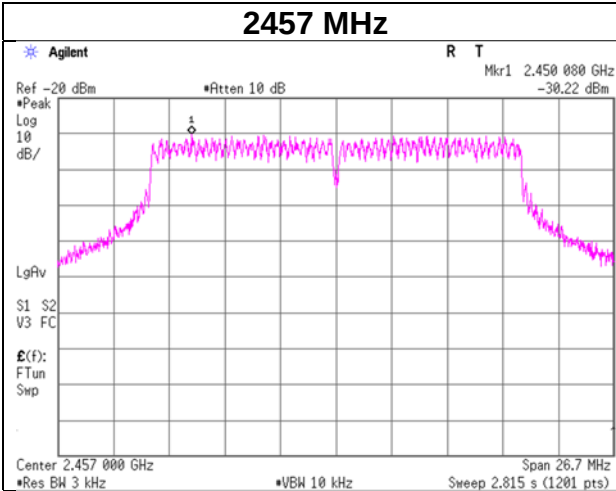


2437 MHz

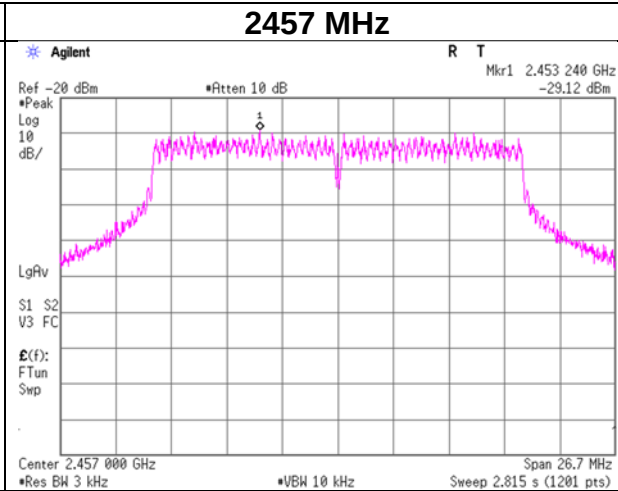


Power Density

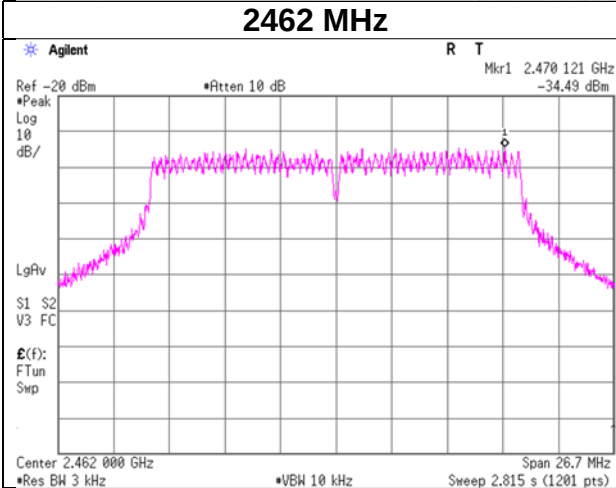
11n-20 Antenna 1
2457 MHz



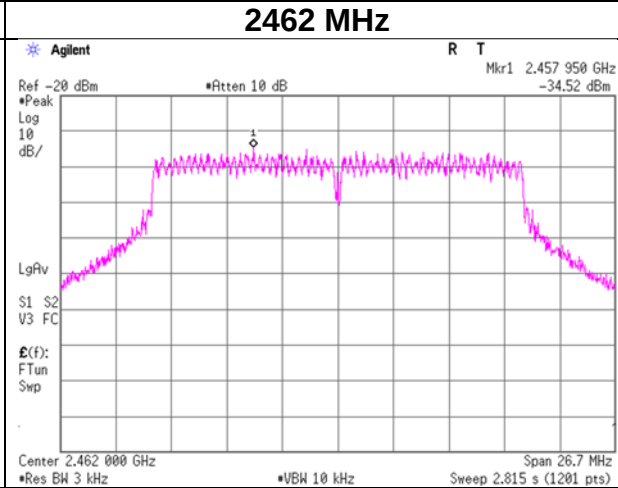
11n-20 Antenna 2
2457 MHz



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
CE	141217	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W/SFM141/421-010/sucoform141-PE/RFM-E121(SW)	-/04178	06/27/2023	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/08/2023	12
CE	141357	LISN (AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-729	07/05/2023	12
CE	141358	LISN (AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-730	07/13/2023	12
CE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
CE	141938	Terminator	TME	CT-01BP	-	12/04/2023	12
CE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	06/05/2024	12
CE	142011	AC4_Semi Anechoic Chamber (NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/13/2023	24
CE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
CE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-192	09/21/2023	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/01/2023	12
RE	141331	Attenuator (6dB)	TME	UFA-01	-	02/17/2024	12
RE	141397	Coaxial Cable	UL Japan	-	-	11/22/2023	12
RE	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+ BBA9106	VHA 91031302	08/10/2023	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	08/09/2023	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	10/17/2023	12
RE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
RE	141581	Microwave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2023	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/04/2024	12
RE	141978	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180899	05/09/2024	12
RE	142011	AC4_Semi Anechoic Chamber (NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/13/2023	24
RE	142017	AC4_Semi Anechoic Chamber (SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/14/2023	24
RE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	234602	Microwave Cable	Huber+Suhner	SF126E/ 11PC35/11PC35/ 1000M,5000M	537063/126E / 537074/126E	03/08/2024	12
RE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	245788	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	690	03/06/2024	12

Test Equipment (2/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	141171	Attenuator(20dB) _ DC-1GHz N	Weinschel Corp	MODEL 1	BG0143	12/06/2023	12
AT	141327	Coaxial Cable	UL Japan	-	-	02/09/2024	12
AT	141329	Microwave Cable 1G-40GHz	Suhner	SUCOFLEX102	28635/2	04/08/2024	12
AT	141333	Attenuator (10dB)	Suhner	6810.19.A	-	12/11/2023	12
AT	141334	Attenuator (10dB)	Suhner	6810.19.A	-	12/12/2023	12
AT	141366	Attenuator	Weinschel Associates	WA56-20	56200213	05/28/2024	12
AT	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
AT	141557	DIGIITAL HiTESTER	HIOKI E.E. CORPORATION	3805	070900530	01/31/2024	12
AT	141810	Power Meter	Anritsu Corporation	ML2495A	824014	12/12/2023	12
AT	141832	Power sensor	Anritsu Corporation	MA2411B	738174	12/12/2023	12
AT	141900	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46185823	06/16/2023	12
AT	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/11PC35/2000MM	536999/126E	03/19/2024	12
AT	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
AT	244711	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202105	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
CE: Conducted Emission
RE: Radiated Emission