RADIO TEST REPORT

Test Report No. 15344394H-A-R1

Customer	**Denso Wave Incorporated**
Description of EUT	**2D Code Handy Terminal**
Model Number of EUT	**BHT-1336QWB**
FCC ID	**PZWBHT1336QWB**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**September 18, 2024**
Remarks	**Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s)**

Representative Test Engineer	**Approved By**
Tomoya Sone Engineer	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.: 15344394H-A

This report is a revised version of 15344394H-A. 15344394H-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15344394H-A	September 11, 2024	-
1	15344394H-A-R1	September 18, 2024	Addition of the following to Clause 4.2; - Item D and E - Cable 4, 5 and 6
1	15344394H-A-R1	September 18, 2024	Deletion of "Average" from Maximum Peak Output Power (Detector) in Section 7.
1	15344394H-A-R1	September 18, 2024	Deletion of the Average Output Power data.
1	15344394H-A-R1	September 18, 2024	Change the number of significant figures for Maximum Peak Output Power data (page 27 to 30). from two digit to three digit

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 Wave Incorporated
Address	1 Yoshiike, Kusagi, Agui-cho, Chita-gun, Aichi 470-2297 Japan
Telephone Number	+81-569-49-5339
Contact Person	Takehiko Koshino

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	2D Code Handy Terminal
Model Number	BHT-1336QWB
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	June 6, 2024
Test Date	June 6 to 23, 2024

2.2 Product Description

General Specification

Rating	DC 3.7 V
Operating temperature	-20 deg. C to 50 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)]	0.626 dBi

Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BR / EDR: GFSK, π/4 DQPSK, 8 DPSK Low Energy: GFSK
Antenna Gain[a)]	0.626 dBi

* WLAN and Bluetooth do not transmit simultaneously.

2.3 Variant model(s)

Tested model: BHT-1336QWB has a variant model: BHT-1336QWB-D.
The differences of these models are follows;

	BHT-1336QWB (Tested model)	BHT-1336QWB-D (Variant model)
Difference	-	No USB Type-C connector

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	**FCC:** Section 15.207	13.42 dB 3.73435 MHz, AV, Phase N	Complied	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	5.5 dB 7440.0 MHz, Vertical, AV	Complied	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures: 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)
The EUT is a battery-operated device and test was performed with the full-charged battery.
Therefore, this EUT complies with the requirement.

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

3.3 Addition to Standard

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

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

3.4 Uncertainty

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

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

Conducted emission

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	dB	4.7
		Vertical	dB	4.7
	200 MHz to 1000 MHz	Horizontal	dB	4.8
		Vertical	dB	6.0
10 m	30 MHz to 200 MHz	Horizontal	dB	5.2
		Vertical	dB	5.1
	200 MHz to 1000 MHz	Horizontal	dB	5.2
		Vertical	dB	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)

[WLAN]

Mode	Remarks*
IEEE 802.11b (11b)	11 Mbps, PN9
IEEE 802.11g (11g)	36 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 4, 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: 15.5 dBm 11g: 11.0 dBm 11n-20: 11.0 dBm Software: QCARCT Ver 3.0.156.0 (Date: 2015.10.19, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009.	

*The Details of Operating Mode(s)

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

[BT LE]

Mode	Remarks*
Bluetooth Low Energy (BT LE)	Maximum Packet Size, PRBS9

*Power of the EUT was set by the software as follows;
Power Setting: Same as production model
Software: QCARCT Ver 3.0.156.0
(Date: 2015.10.19, Storage location: Driven by connected PC)

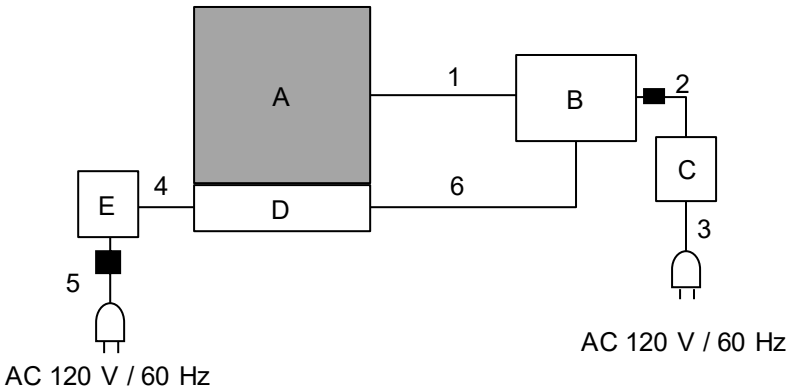
*This setting of software is the worst case.
Any conditions under the normal use do not exceed the condition of setting.
In addition, end users cannot change the settings of the output power of the product.

*The Details of Operating Mode(s)

Test Item	Operating Mode	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz)	Tx BT LE *1)	2480 MHz
Radiated Spurious Emission (Above 1 GHz), Maximum Peak Output Power, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx BT LE	2402 MHz 2440 MHz 2480 MHz

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

4.2 Configuration and Peripherals



■ : Standard Ferrite Core

* 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	2D Code Handy Terminal	BHT-1336QWB	4969005110400600 *1) 4969005110400598 *2) 4969005110400597 *3)	Denso Wave Incorporated	EUT
B	Laptop PC	X1 Carbon	R9-OH8OBW 15/9	LENOVO	-
C	AC Adapter	ADXL45NCC2A	11S45N0299Z1ZS944B6KBR	LENOVO	-
D	Battery Charger	CU-1321	496320-2253	Denso Wave Incorporated	*4)
E	AC Adapter	AWW050150	496460-1730	Denso Wave Incorporated	*4)

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB Cable	3.0	Shielded	Shielded	-
2	DC Cable	1.7	Unshielded	Unshielded	-
3	AC Cable	1.0	Unshielded	Unshielded	-
4	DC Cable	1.3	Unshielded	Unshielded	*4)
5	AC Cable	1.8	Unshielded	Unshielded	*4)
6	USB Cable	1.4	Shielded	Shielded	*4)

*1) Used for Antenna Terminal conducted tests
*2) Used for Conducted Emission and Radiated Emission tests (for WLAN)
*3) Used for Conducted Emission and Radiated Emission tests (for BT LE)
*4) Used for With Battery Charger test

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 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

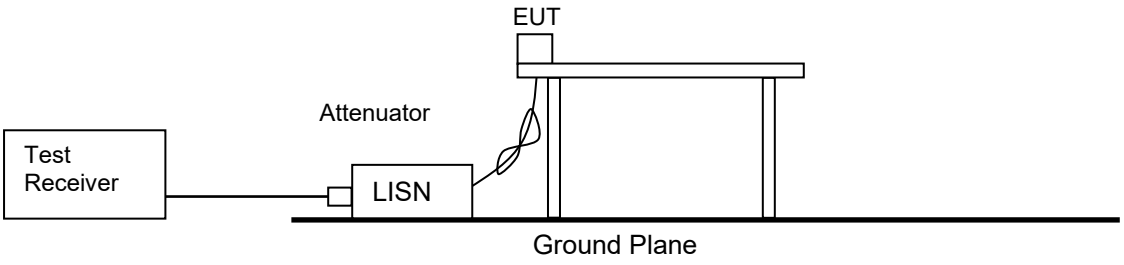
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (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 (Via AC adapter).
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

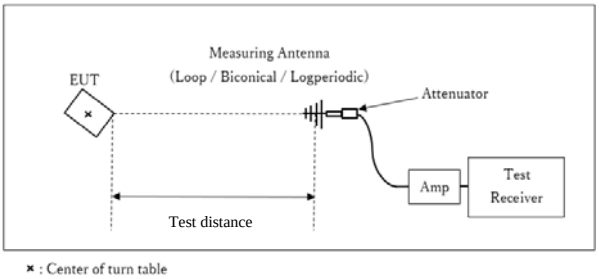
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired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

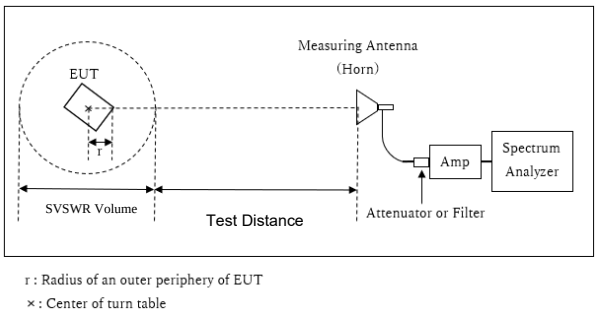
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz to 10 GHz



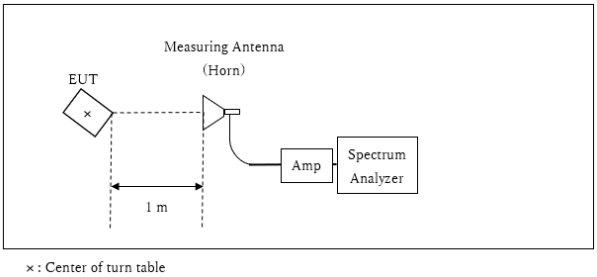
[1 GHz to 6 GHz]
Distance Factor: 20 x log (3.9 m / 3.0 m) = 2.28 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.9 m

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

[6 GHz to 10 GHz]
Distance Factor: 20 x log (3.65 m / 3.0 m) = 1.71 dB
* Test Distance: (3.25 + SVSWR Volume /2) - r = 3.65 m

SVSWR Volume : 1.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.1 m

10 GHz to 26.5 GHz



Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.5 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	-	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 *2)
Conducted Spurious Emission *3) *4)	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) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was low enough as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz).
*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 - 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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**

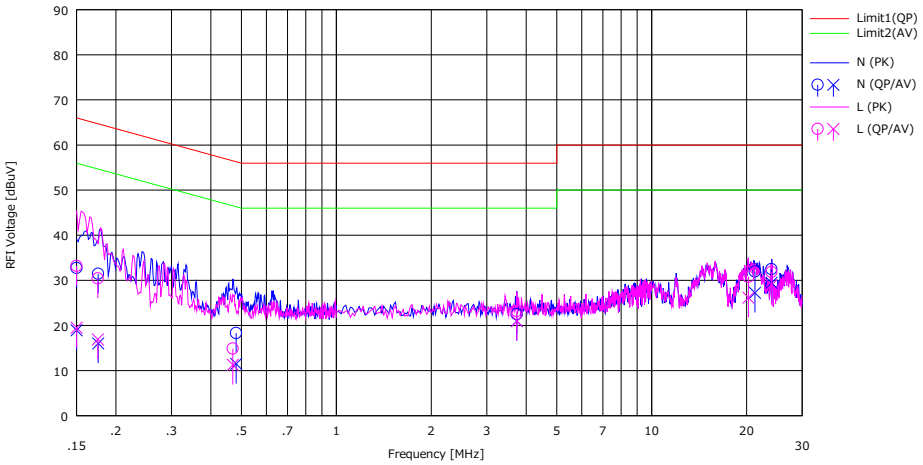
APPENDIX 1: Test Data

Conducted Emission

(With Battery charger)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	June 23, 2024
Temperature / Humidity	24 deg. C / 64 % RH
Engineer	Tetsuro Yoshida
Mode	Tx 11n-20 2462 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	19.50	5.70	0.06	13.16	32.72	18.92	66.00	56.00	33.28	37.08	N	
2	0.17562	18.20	2.80	0.06	13.17	31.43	16.03	64.69	54.69	33.26	38.66	N	
3	0.48125	5.00	-1.80	0.06	13.23	18.29	11.49	56.32	46.32	38.03	34.83	N	
4	3.73611	8.80	7.30	0.11	13.57	22.48	20.98	56.00	46.00	33.52	25.02	N	
5	21.27000	17.10	12.40	0.48	14.36	31.94	27.24	60.00	50.00	28.06	22.76	N	
6	24.00000	17.50	14.50	0.52	14.44	32.46	29.46	60.00	50.00	27.54	20.54	N	
7	0.15000	20.00	6.30	0.03	13.16	33.19	19.49	66.00	56.00	32.81	36.51	L	
8	0.17526	17.20	3.70	0.04	13.17	30.41	16.91	64.71	54.71	34.30	37.80	L	
9	0.46960	1.60	-2.00	0.04	13.22	14.86	11.26	56.52	46.52	41.66	35.26	L	
10	3.73527	9.50	7.30	0.10	13.57	23.17	20.97	56.00	46.00	32.83	25.03	L	
11	20.29000	16.00	11.40	0.42	14.33	30.75	26.15	60.00	50.00	29.25	23.85	L	
12	24.00000	16.90	14.00	0.49	14.44	31.83	28.93	60.00	50.00	28.17	21.07	L	

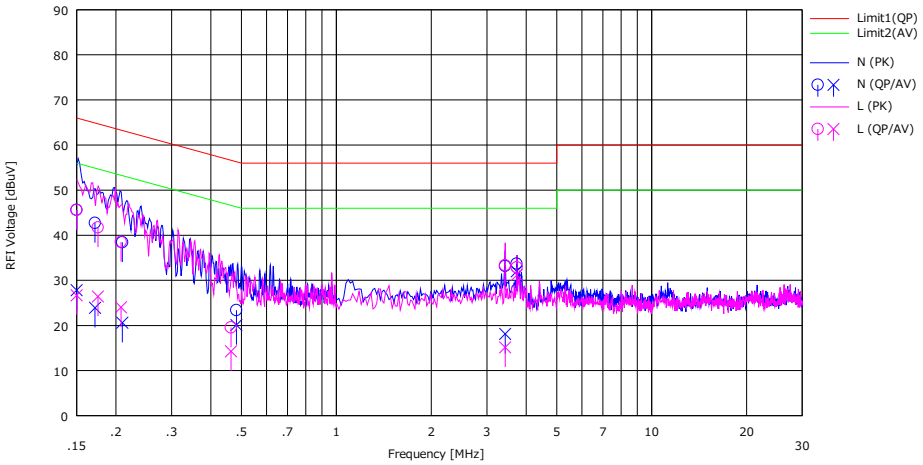
CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Conducted Emission

(Without Battery charger)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	June 23, 2024
Temperature / Humidity	24 deg. C / 64 % RH
Engineer	Tetsuro Yoshida
Mode	Tx 11n-20 2462 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	32.40	14.60	0.06	13.16	45.62	27.82	66.00	56.00	20.38	28.18	N	
2	0.17153	29.50	10.70	0.06	13.16	42.72	23.92	64.89	54.89	22.17	30.97	N	
3	0.20946	25.20	7.40	0.06	13.17	38.43	20.63	63.23	53.23	24.80	32.60	N	
4	0.48176	10.10	6.80	0.06	13.23	23.39	20.09	56.31	46.31	32.92	26.22	N	
5	3.42918	19.50	4.50	0.11	13.54	33.15	18.15	56.00	46.00	22.85	27.85	N	
6	3.73135	20.00	18.30	0.11	13.57	33.68	31.98	56.00	46.00	22.32	14.02	N	
7	0.15000	32.40	13.50	0.03	13.16	45.59	26.69	66.00	56.00	20.41	29.31	L	
8	0.17524	28.50	13.20	0.04	13.17	41.71	26.41	64.71	54.71	23.00	28.30	L	
9	0.20735	25.30	10.80	0.04	13.17	38.51	24.01	63.31	53.31	24.80	29.30	L	
10	0.46323	6.30	1.00	0.04	13.22	19.56	14.26	56.63	46.63	37.07	32.37	L	
11	3.42857	19.70	1.50	0.09	13.54	33.33	15.13	56.00	46.00	22.67	30.87	L	
12	3.73635	19.20	17.50	0.10	13.57	32.87	31.17	56.00	46.00	23.13	14.83	L	

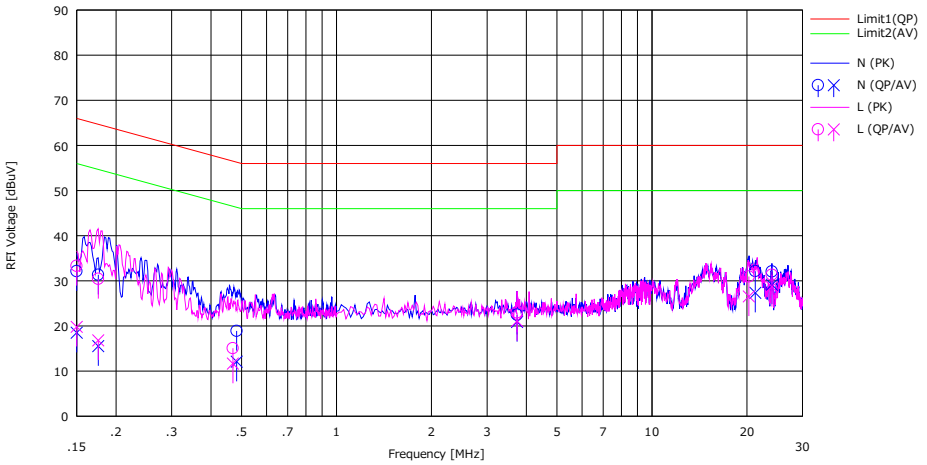
CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Conducted Emission

(With Battery charger)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	June 23, 2024
Temperature / Humidity	24 deg. C / 64 % RH
Engineer	Tetsuro Yoshida
Mode	Tx BT LE 2480 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	18.90	5.30	0.06	13.16	32.12	18.52	66.00	56.00	33.88	37.48	N	
2	0.17573	18.10	2.30	0.06	13.17	31.33	15.53	64.69	54.69	33.36	39.16	N	
3	0.48245	5.60	-1.20	0.06	13.23	18.89	12.09	56.30	46.30	37.41	34.21	N	
4	3.73675	8.80	7.20	0.11	13.57	22.48	20.88	56.00	46.00	33.52	25.12	N	
5	21.27000	17.30	12.50	0.48	14.36	32.14	27.34	60.00	50.00	27.86	22.66	N	
6	24.00000	17.10	14.20	0.52	14.44	32.06	29.16	60.00	50.00	27.94	20.84	N	
7	0.15000	20.10	6.60	0.03	13.16	33.29	19.79	66.00	56.00	32.71	36.21	L	
8	0.17564	17.20	3.60	0.04	13.17	30.41	16.81	64.69	54.69	34.28	37.88	L	
9	0.46946	1.80	-1.60	0.04	13.22	15.06	11.66	56.52	46.52	41.46	34.86	L	
10	3.73525	9.30	7.40	0.10	13.57	22.97	21.07	56.00	46.00	33.03	24.93	L	
11	20.29000	16.20	11.80	0.42	14.33	30.95	26.55	60.00	50.00	29.05	23.45	L	
12	24.00000	16.40	13.70	0.49	14.44	31.33	28.63	60.00	50.00	28.67	21.37	L	

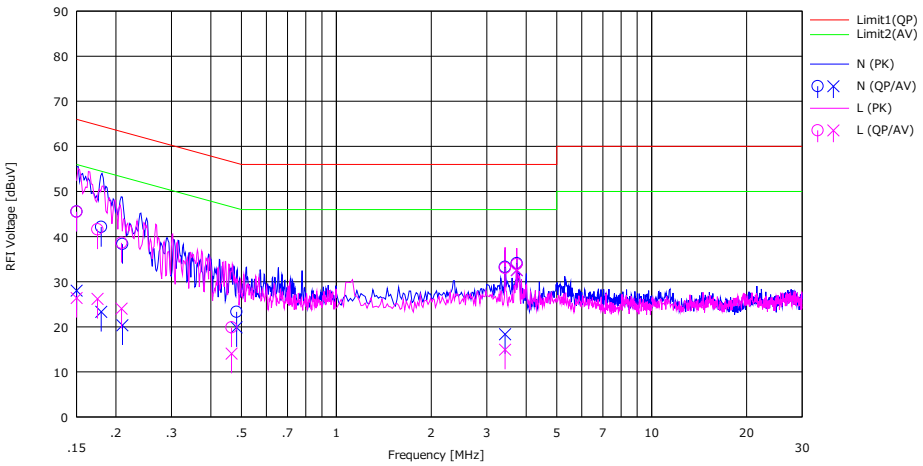
CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Conducted Emission

(Without Battery charger)

Test place	Ise EMC Lab. No.2 Semi Anechoic Chamber
Date	June 23, 2024
Temperature / Humidity	24 deg. C / 64 % RH
Engineer	Tetsuro Yoshida
Mode	Tx BT LE 2480 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		(QP)	(AV)			(QP)	(AV)	(QP)	(AV)	(QP)	(AV)		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	32.30	14.80	0.06	13.16	45.52	28.02	66.00	56.00	20.48	27.98	N	
2	0.17957	28.90	10.10	0.06	13.17	42.13	23.33	64.51	54.51	22.38	31.18	N	
3	0.20970	25.10	7.10	0.06	13.17	38.33	20.33	63.22	53.22	24.89	32.89	N	
4	0.48255	10.00	6.60	0.06	13.23	23.29	19.89	56.30	46.30	33.01	26.41	N	
5	3.42934	19.60	4.70	0.11	13.54	33.25	18.35	56.00	46.00	22.75	27.65	N	
6	3.73435	20.40	18.90	0.11	13.57	34.08	32.58	56.00	46.00	21.92	13.42	N	
7	0.15000	32.30	13.20	0.03	13.16	45.49	26.39	66.00	56.00	20.51	29.61	L	
8	0.17476	28.40	13.00	0.03	13.16	41.59	26.19	64.73	54.73	23.14	28.54	L	
9	0.20834	25.40	10.80	0.04	13.17	38.61	24.01	63.27	53.27	24.66	29.26	L	
10	0.46537	6.60	0.80	0.04	13.22	19.86	14.06	56.60	46.60	36.74	32.54	L	
11	3.42974	19.40	1.30	0.09	13.54	33.03	14.93	56.00	46.00	22.97	31.07	L	
12	3.73435	20.20	18.90	0.10	13.57	33.87	32.57	56.00	46.00	22.13	13.43	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.

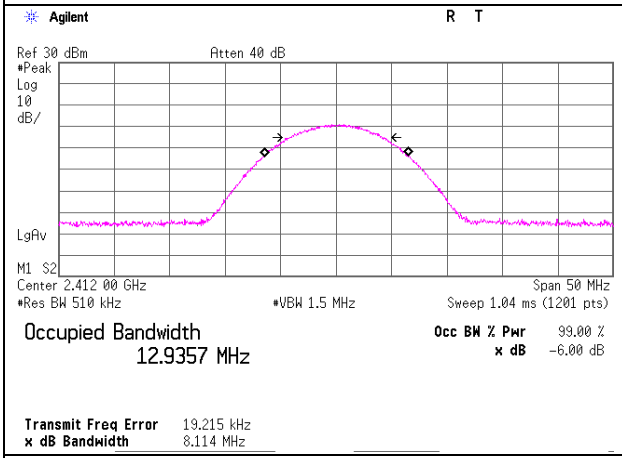
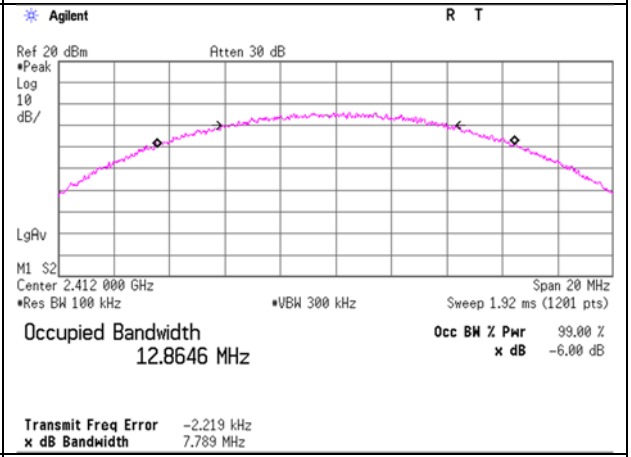
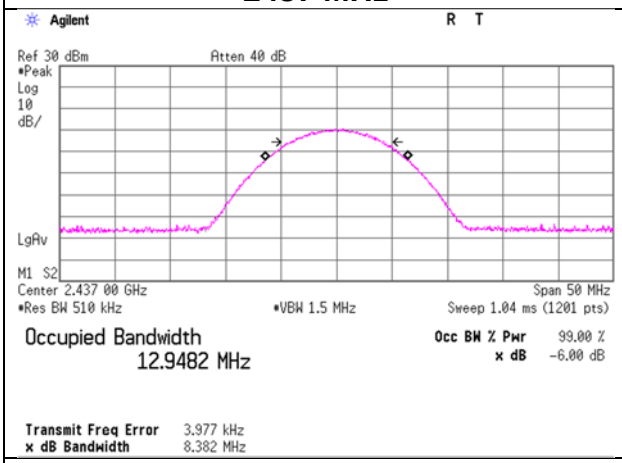
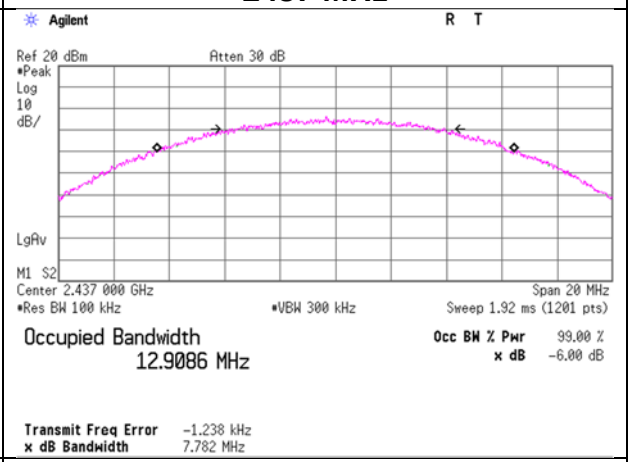
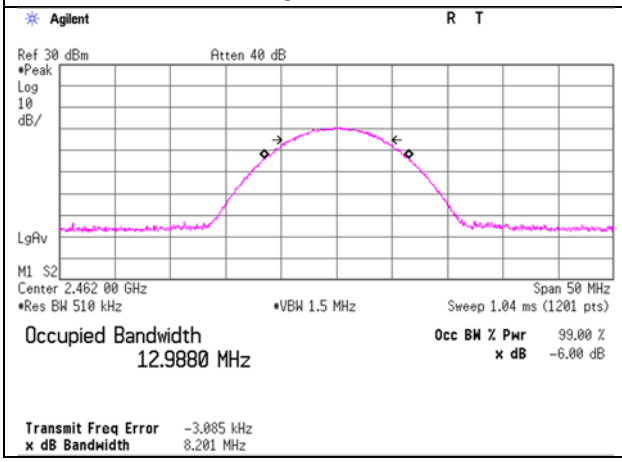
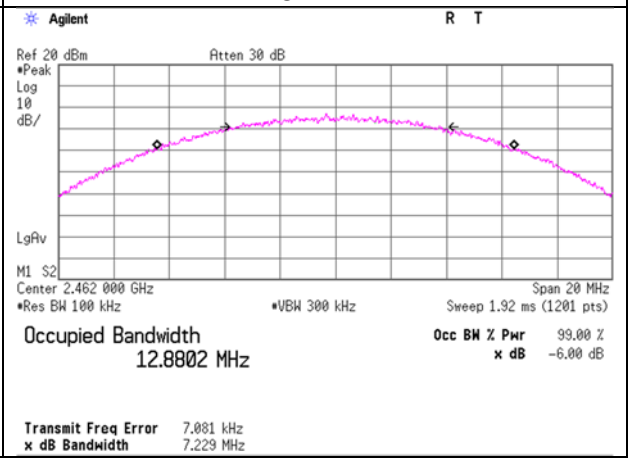
99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Ise EMC Lab. No.8 Measurement Room	
Date	June 18, 2024	June 19, 2024
Temperature / Humidity	23 deg. C / 59 % RH	21 deg. C / 58 % RH
Engineer	Tomoya Sone	Tomoya Sone
Mode	Tx	

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	12935.7	7.789	> 0.5000
	2437	12948.2	7.782	> 0.5000
	2462	***12988.0***	7.229	> 0.5000
11g	2412	17126.7	16.474	> 0.5000
	2437	***17161.0***	16.501	> 0.5000
	2462	17155.9	16.439	> 0.5000
11n-20	2412	18234.1	17.688	> 0.5000
	2437	***18289.4***	17.650	> 0.5000
	2462	18269.2	17.650	> 0.5000
BT LE	2402	***1062.4***	0.673	> 0.5000
	2440	1062.3	0.669	> 0.5000
	2480	1062.2	0.672	> 0.5000

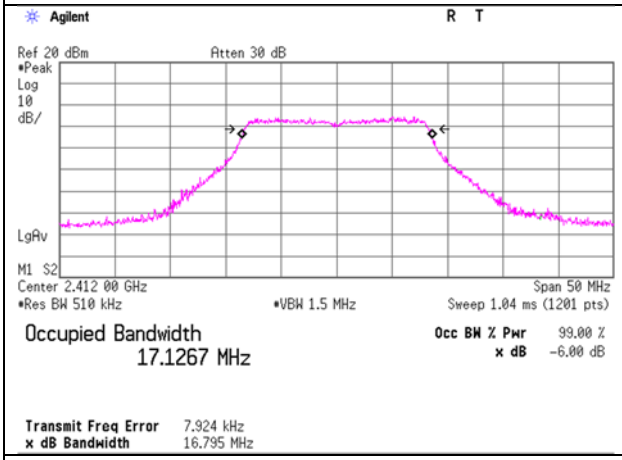
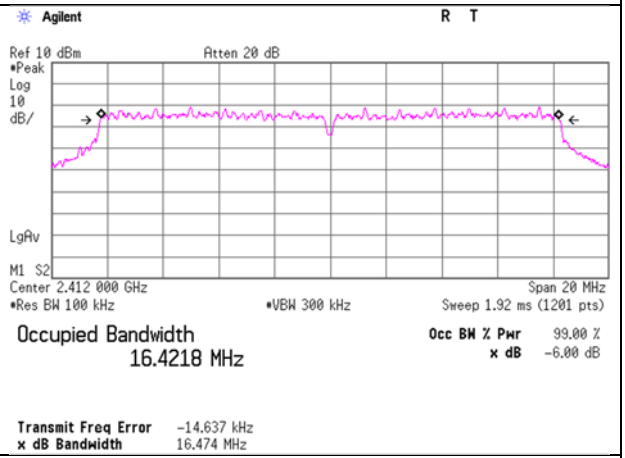
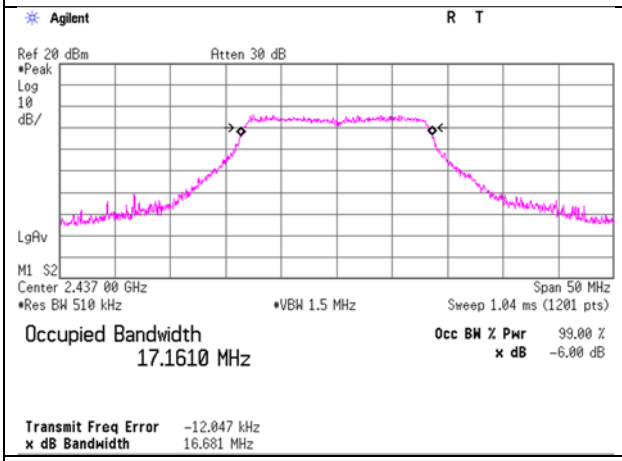
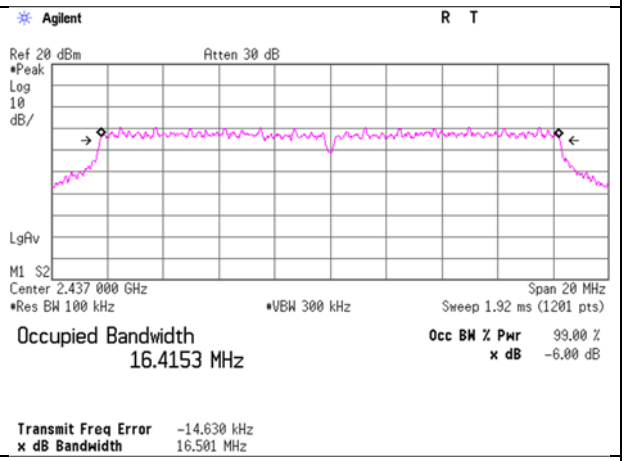
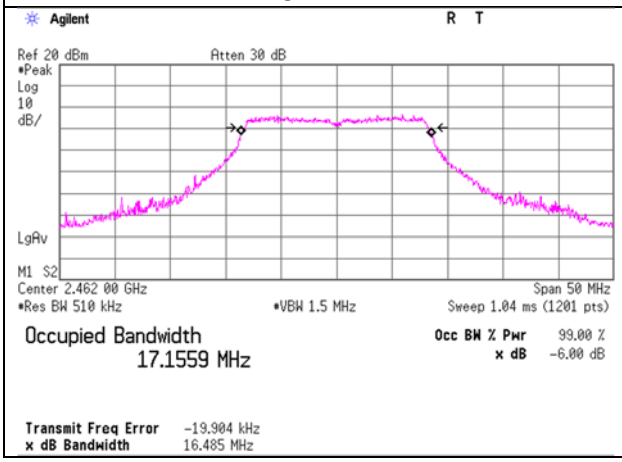
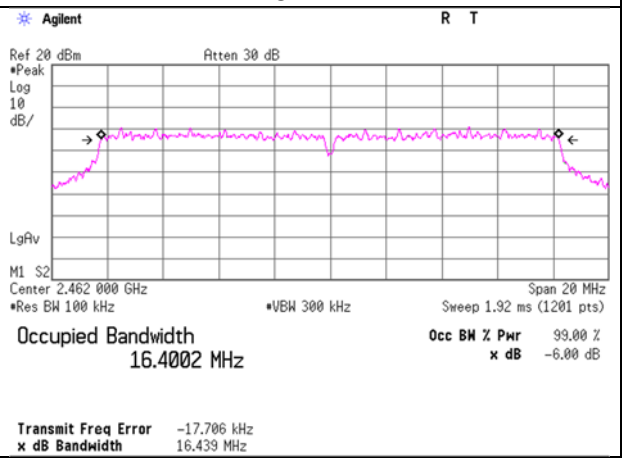
99 % Occupied Bandwidth and 6 dB Bandwidth

11b

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

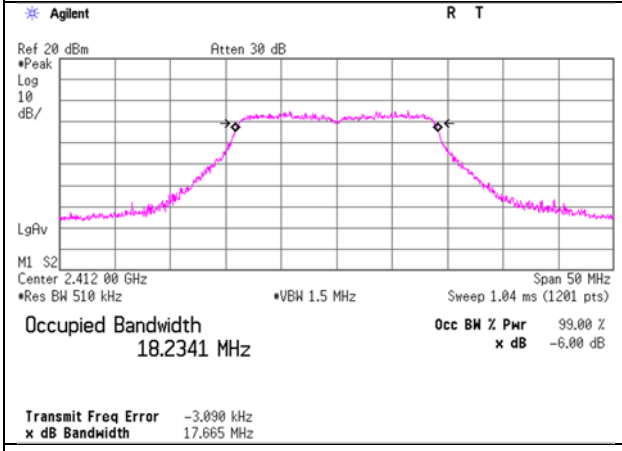
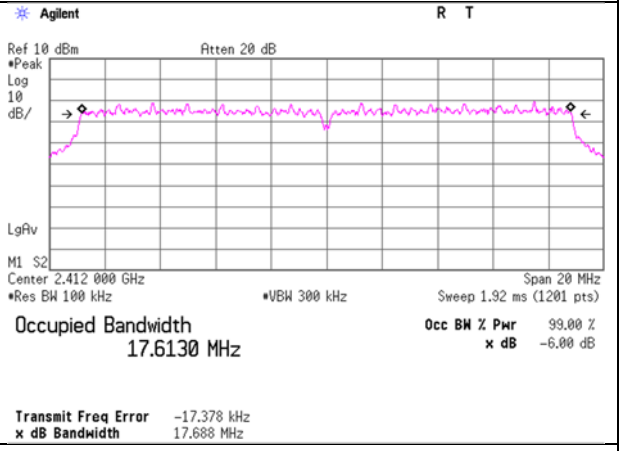
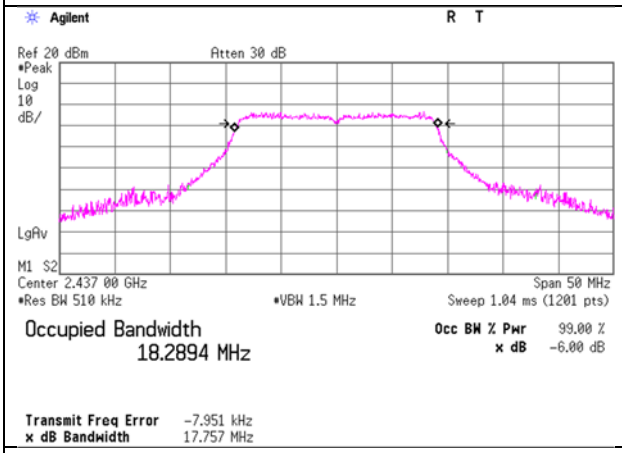
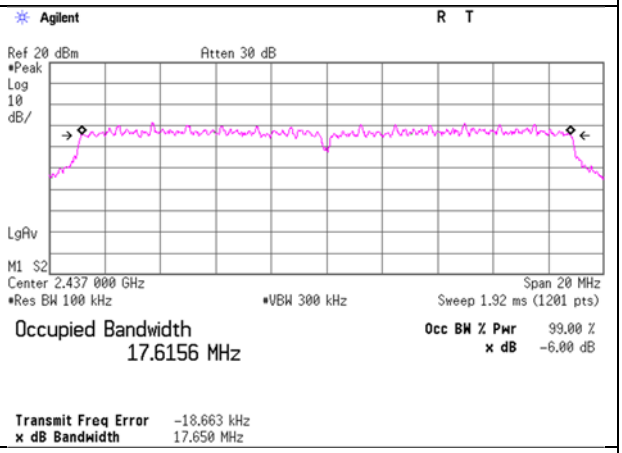
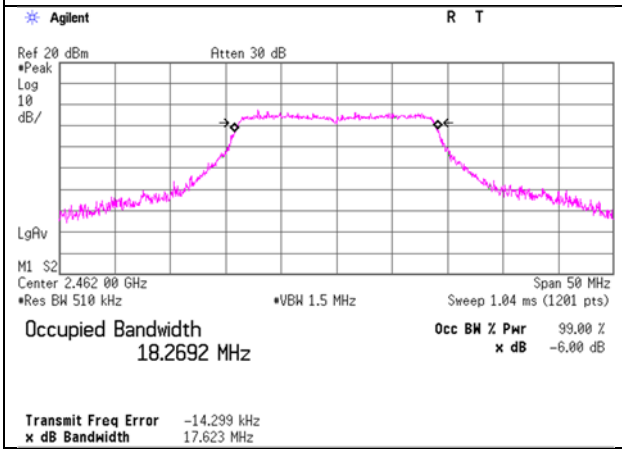
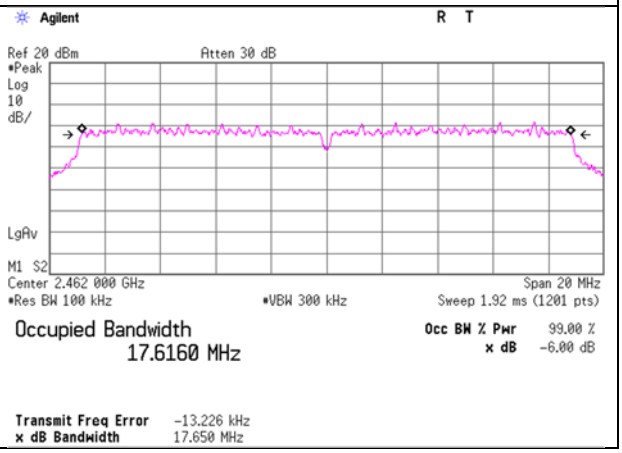
99 % Occupied Bandwidth and 6 dB Bandwidth

11g

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

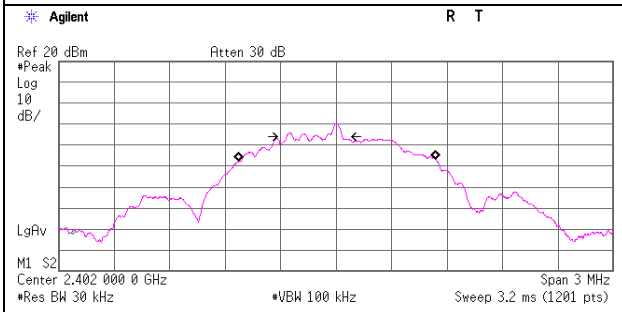
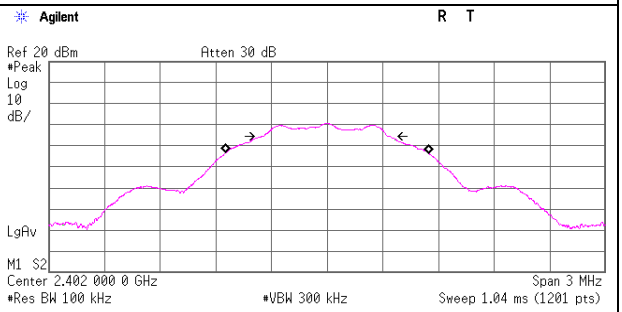
99 % Occupied Bandwidth and 6 dB Bandwidth

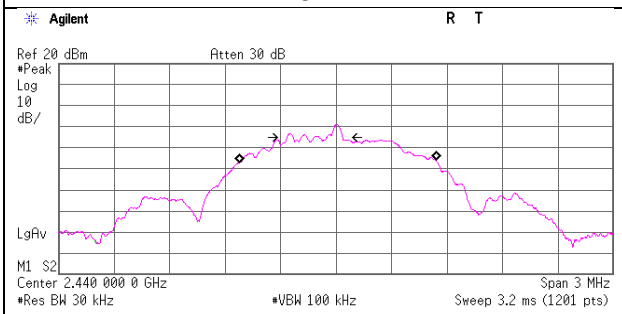
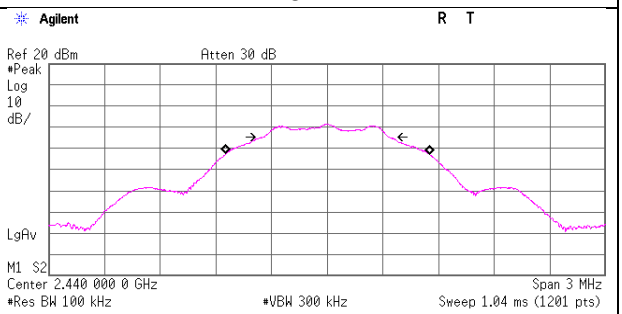
11n-20

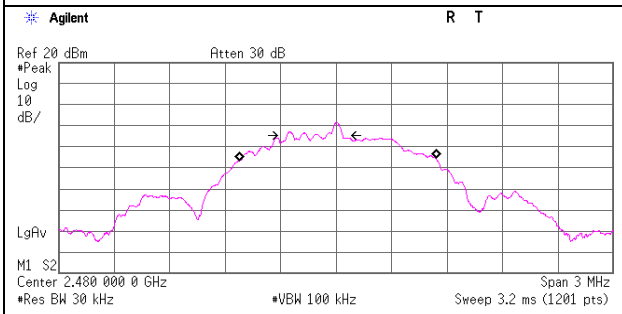
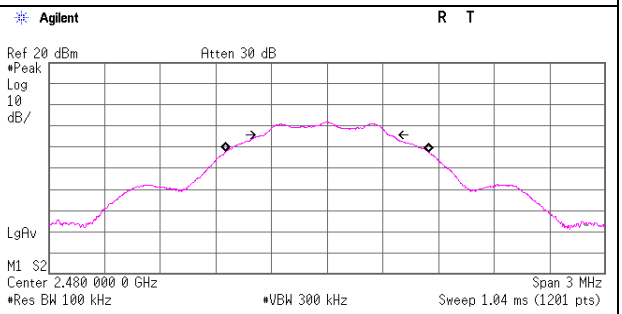
99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

99 % Occupied Bandwidth and 6 dB Bandwidth

BT LE

99 % Occupied Bandwidth	6 dB Bandwidth
2402 MHz	**2402 MHz**
	

| **2440 MHz** | **2440 MHz** |
|  |  |

| **2480 MHz** | **2480 MHz** |
|  |  |

Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Date	June 6, 2024
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Nachi Konegawa
Mode	Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	6.60	1.50	9.52	17.62	57.81	30.00	1000	12.38	0.626	18.246	66.773	36.021	4000	17.775
2437	6.41	1.51	9.52	17.44	55.46	30.00	1000	12.56	0.626	18.066	64.062	36.021	4000	17.955
2462	6.87	1.51	9.52	***17.90***	***61.66***	30.00	1000	12.10	0.626	***18.526***	***71.220***	36.021	4000	17.495

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 [Mbps]	Reading [dBm]	Remark
1	6.18	
2	6.21	
5.5	6.32	
11	6.41	*

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Date	June 6, 2024
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Nachi Konegawa
Mode	Tx 11g

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	11.08	1.50	9.52	22.10	162.18	30.00	1000	7.90	0.626	22.726	187.327	36.021	4000	13.295
2437	11.53	1.51	9.52	22.56	180.30	30.00	1000	7.44	0.626	23.186	208.257	36.021	4000	12.835
2462	11.84	1.51	9.52	***22.87***	***193.64***	30.00	1000	7.13	0.626	***23.496***	***223.666***	36.021	4000	12.525

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 [Mbps]	Reading [dBm]	Remark
6	7.56	
9	7.22	
12	7.51	
18	7.28	
24	11.21	
36	11.53	*
48	11.33	
54	11.32	

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Date	June 6, 2024
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Nachi Konegawa
Mode	Tx 11n-20

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	10.80	1.50	9.52	21.82	152.05	30.00	1000	8.18	0.626	22.446	175.631	36.021	4000	13.575
2437	11.48	1.51	9.52	22.51	178.24	30.00	1000	7.49	0.626	23.136	205.873	36.021	4000	12.885
2462	12.03	1.51	9.52	***23.06***	***202.30***	30.00	1000	6.94	0.626	***23.686***	***233.668***	36.021	4000	12.335

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

MCS Number	Reading [dBm]	Remark
0	7.28	
1	7.29	
2	7.21	
3	11.00	
4	11.48	*
5	10.86	
6	10.89	
7	10.62	

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

Maximum Peak Output Power

Test place	Ise EMC Lab. No.3 Measurement Room
Date	June 6, 2024
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Nachi Konegawa
Mode	Tx BT LE

				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]
2402	-10.01	1.50	9.52	1.01	1.26	30.00	1000	28.99	0.626	1.636	1.457	36.021	4000	34.385
2440	-9.17	1.51	9.52	1.86	1.53	30.00	1000	28.14	0.626	2.486	1.773	36.021	4000	33.535
2480	-8.72	1.52	9.52	***2.32***	***1.71***	30.00	1000	27.68	0.626	***2.946***	***1.971***	36.021	4000	33.075

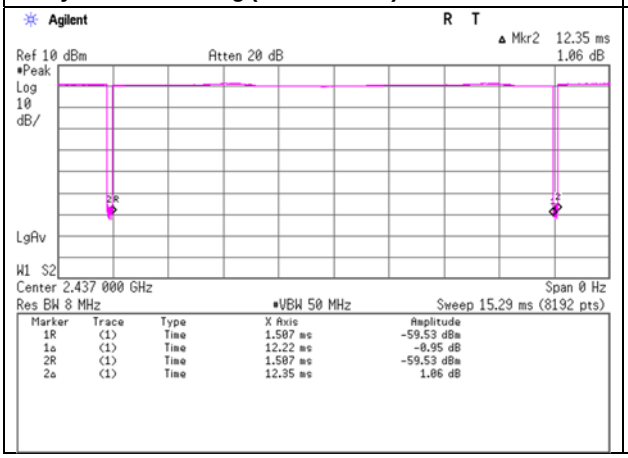
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

Burst rate confirmation

Test place	Ise EMC Lab. No.8 Measurement Room
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 58 % RH
Engineer	Tomoya Sone
Mode	Tx

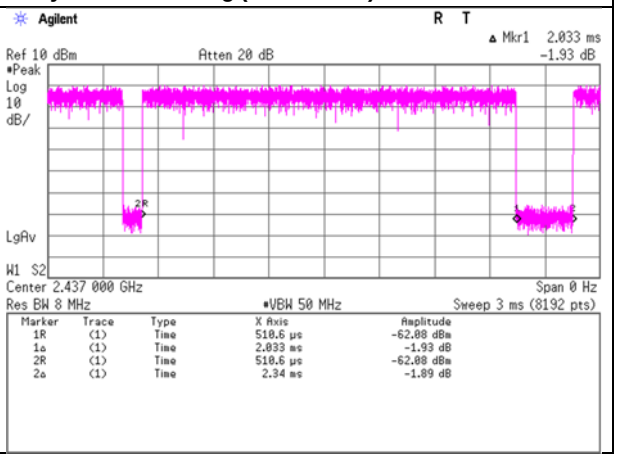
11b 1 Mbps

Tx on / (Tx on + Tx off) =	**0.989**
Tx on / (Tx on + Tx off) * 100 =	**98.9 %**
Duty factor = 10 * log (12.35 / 12.22) =	**0.05 dB**



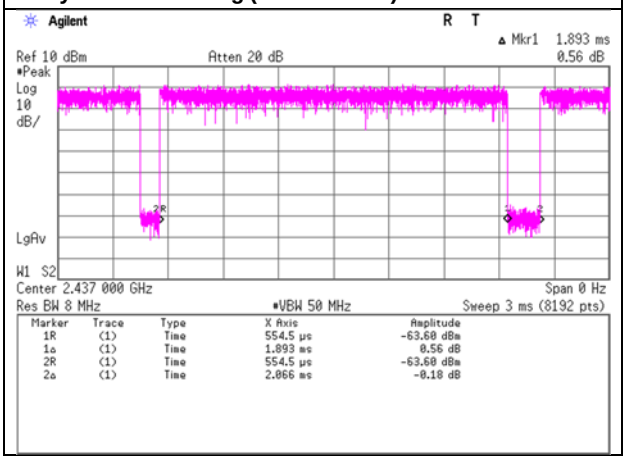
11g 6 Mbps

Tx on / (Tx on + Tx off) =	**0.869**
Tx on / (Tx on + Tx off) * 100 =	**86.9 %**
Duty factor = 10 * log (2.34 / 2.033) =	**0.61 dB**



11n-20 MCS 0

Tx on / (Tx on + Tx off) =	**0.916**
Tx on / (Tx on + Tx off) * 100 =	**91.6 %**
Duty factor = 10 * log (2.066 / 1.893) =	**0.38 dB**



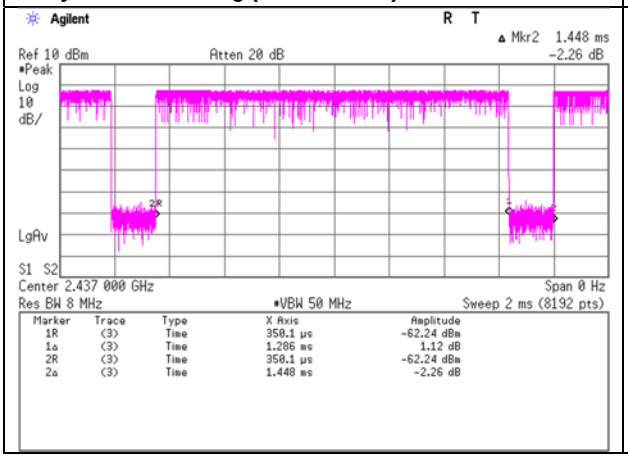
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation

Test place	Ise EMC Lab. No.3 Measurement Room
Date	June 6, 2024
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Nachi Konegawa
Mode	Tx

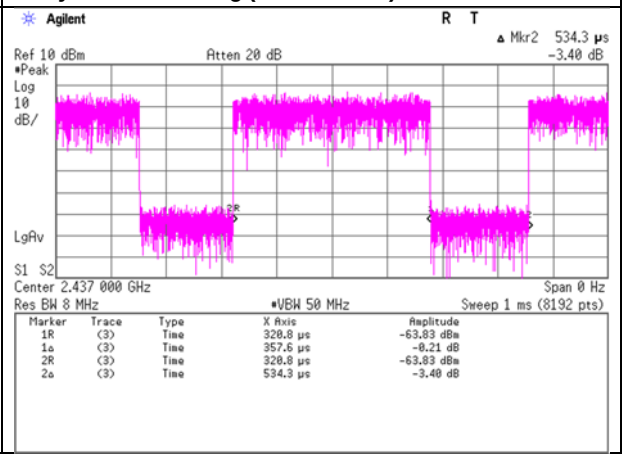
11b 11 Mbps

Tx on / (Tx on + Tx off) =	**0.888**
Tx on / (Tx on + Tx off) * 100 =	**88.8 %**
Duty factor = 10 * log (1.448 / 1.286) =	**0.52 dB**



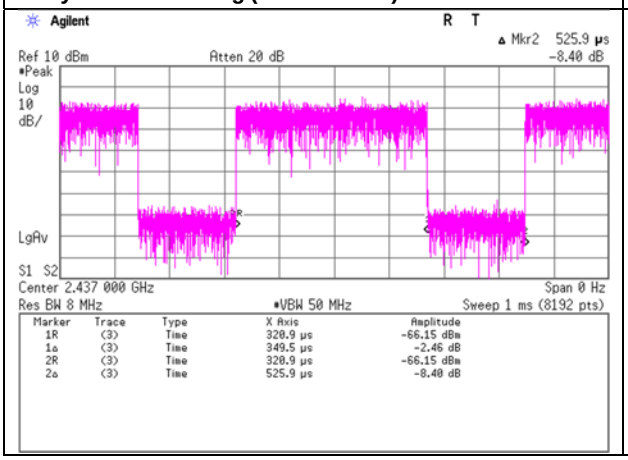
11g 36 Mbps

Tx on / (Tx on + Tx off) =	**0.669**
Tx on / (Tx on + Tx off) * 100 =	**66.9 %**
Duty factor = 10 * log (534.3 / 357.6) =	**1.74 dB**



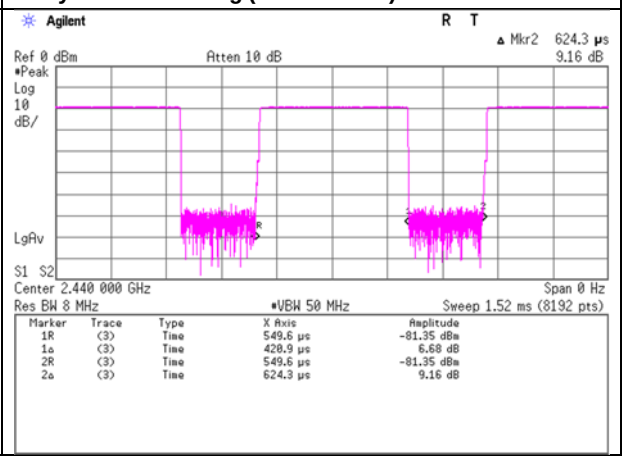
11n-20 MCS 4

Tx on / (Tx on + Tx off) =	**0.665**
Tx on / (Tx on + Tx off) * 100 =	**66.5 %**
Duty factor = 10 * log (525.9 / 349.5) =	**1.77 dB**



BT LE

Tx on / (Tx on + Tx off) =	**0.674**
Tx on / (Tx on + Tx off) * 100 =	**67.4 %**
Duty factor = 10 * log (624.3 / 420.9) =	**1.71 dB**



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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11b 2412 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	51.0	40.9	27.8	5.6	31.8	0.5	52.5	43.0	73.9	53.9	21.4	10.9	*1)
Hori.	4824.0	43.3	33.6	31.5	7.9	30.8	0.5	51.8	42.6	73.9	53.9	22.1	11.3	*2)
Hori.	7236.0	47.4	37.2	35.7	6.7	33.5	0.5	56.3	46.6	73.9	53.9	17.6	7.3	*2)
Hori.	9648.0	42.5	33.0	35.8	7.6	34.1	-	51.9	42.4	73.9	53.9	22.0	11.5	Floor noise
Vert.	2390.0	52.4	42.0	27.8	5.6	31.8	0.5	53.9	44.1	73.9	53.9	20.0	9.8	*1)
Vert.	4824.0	42.9	33.0	31.5	7.9	30.8	0.5	51.4	42.0	73.9	53.9	22.5	11.9	*2)
Vert.	7236.0	47.0	37.0	35.7	6.7	33.5	0.5	55.9	46.4	73.9	53.9	18.0	7.5	*2)
Vert.	9648.0	42.5	33.0	35.8	7.6	34.1	-	51.9	42.4	73.9	53.9	22.0	11.5	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.
*1) Not Out of Band emission(Leakage Power)
*2) Noise synchronized with duty of carrier freqency

20dBc Data Sheet

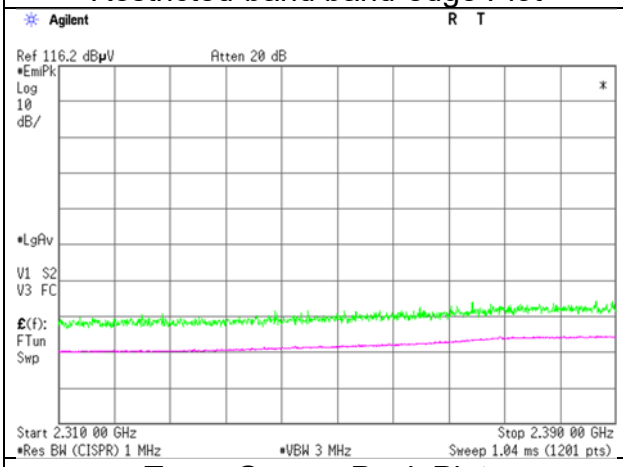
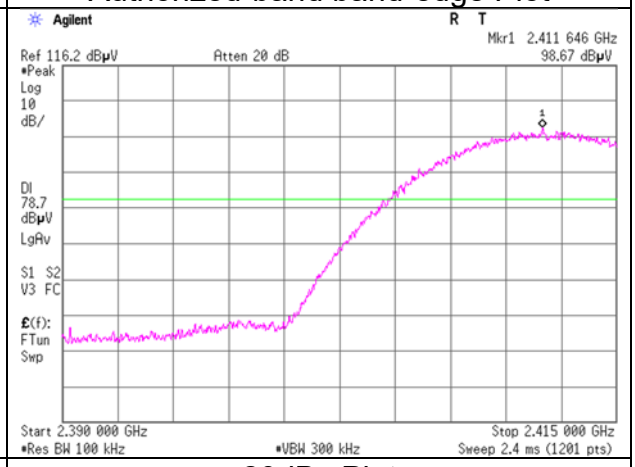
Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.0	98.7	27.7	5.6	31.8	100.2	-	-	Carrier
Hori.	2400.0	46.0	27.8	5.6	31.8	47.6	80.2	32.6	
Vert.	2412.0	99.1	27.7	5.6	31.8	100.6	-	-	Carrier
Vert.	2400.0	47.2	27.8	5.6	31.8	48.8	80.6	31.9	

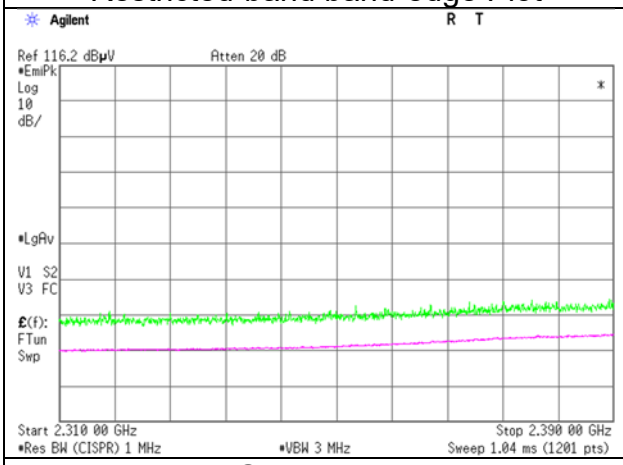
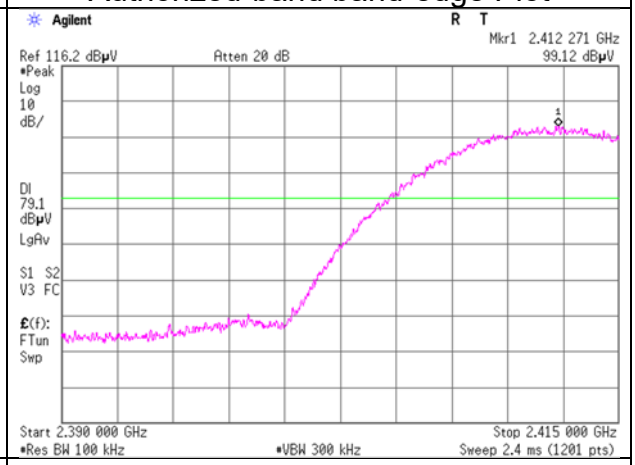
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11b 2412 MHz

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11b 2437 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4874.0	42.5	32.9	31.5	7.9	30.8	0.5	51.1	42.0	73.9	53.9	22.8	11.9	*1)
Hori.	7311.0	46.3	37.2	35.6	6.7	33.5	0.5	55.2	46.6	73.9	53.9	18.7	7.3	*1)
Hori.	9748.0	42.7	33.5	36.0	7.7	34.1	-	52.3	43.1	73.9	53.9	21.6	10.8	Floor noise
Vert.	4874.0	42.0	32.4	31.5	7.9	30.8	0.5	50.6	41.5	73.9	53.9	23.3	12.4	*1)
Vert.	7311.0	45.6	36.1	35.6	6.7	33.5	0.5	54.5	45.5	73.9	53.9	19.4	8.4	*1)
Vert.	9748.0	42.7	33.5	36.0	7.7	34.1	-	52.3	43.1	73.9	53.9	21.6	10.8	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) Noise synchronized with duty of carrier freqency

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11b 2462 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2483.5	50.6	41.3	27.7	5.7	31.7	0.5	52.2	43.4	73.9	53.9	21.7	10.5	*1)
Hori.	4924.0	43.6	34.2	31.6	7.9	30.8	0.5	52.3	43.4	73.9	53.9	21.6	10.5	*2)
Hori.	7386.0	47.2	37.2	35.6	6.7	33.5	0.5	56.0	46.5	73.9	53.9	17.9	7.4	*2)
Hori.	9848.0	43.1	34.2	36.2	7.7	34.1	-	52.9	44.0	73.9	53.9	21.0	9.9	Floor noise
Vert.	2483.5	50.7	41.5	27.7	5.7	31.7	0.5	52.3	43.6	73.9	53.9	21.6	10.3	*1)
Vert.	4924.0	42.8	33.3	31.6	7.9	30.8	0.5	51.5	42.5	73.9	53.9	22.4	11.4	*2)
Vert.	7386.0	46.5	36.5	35.6	6.7	33.5	0.5	55.3	45.8	73.9	53.9	18.6	8.1	*2)
Vert.	9848.0	43.0	34.2	36.2	7.7	34.1	-	52.8	44.0	73.9	53.9	21.1	9.9	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)
*2) Noise synchronized with duty of carrier freqency

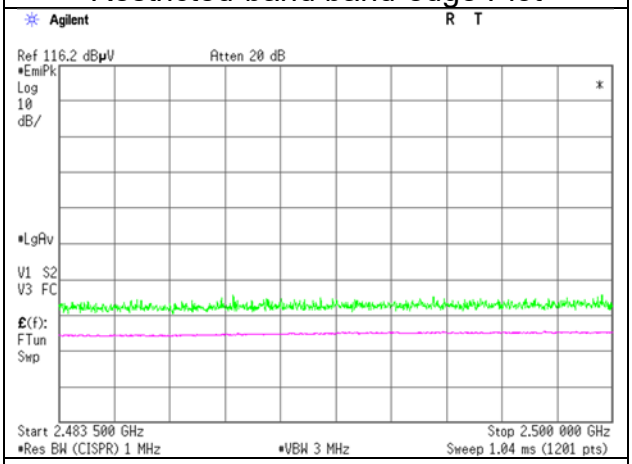
Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 dB
	10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11b 2462 MHz

Horizontal

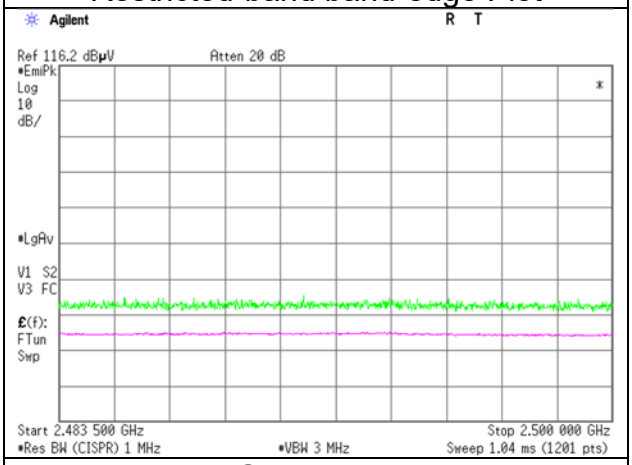
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11g 2412 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	61.3	38.8	27.8	5.6	31.8	1.7	62.8	42.1	73.9	53.9	11.1	11.8	*1)
Hori.	4824.0	41.0	31.4	31.5	7.9	30.8	-	49.5	39.9	73.9	53.9	24.4	14.0	Floor noise
Hori.	7236.0	42.3	33.3	35.7	6.7	33.5	-	51.2	42.2	73.9	53.9	22.7	11.7	Floor noise
Hori.	9648.0	42.6	33.2	35.8	7.6	34.1	-	52.0	42.6	73.9	53.9	21.9	11.3	Floor noise
Vert.	2390.0	60.8	38.0	27.8	5.6	31.8	1.7	62.3	41.3	73.9	53.9	11.6	12.6	*1)
Vert.	4824.0	40.8	31.4	31.5	7.9	30.8	-	49.3	39.9	73.9	53.9	24.6	14.0	Floor noise
Vert.	7236.0	42.3	33.3	35.7	6.7	33.5	-	51.2	42.2	73.9	53.9	22.7	11.7	Floor noise
Vert.	9648.0	42.5	33.0	35.8	7.6	34.1	-	51.9	42.4	73.9	53.9	22.0	11.5	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.
*1) Not Out of Band emission(Leakage Power)

20dBc Data Sheet

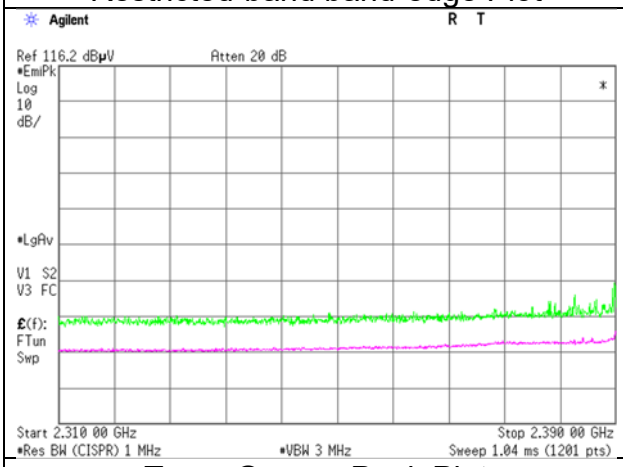
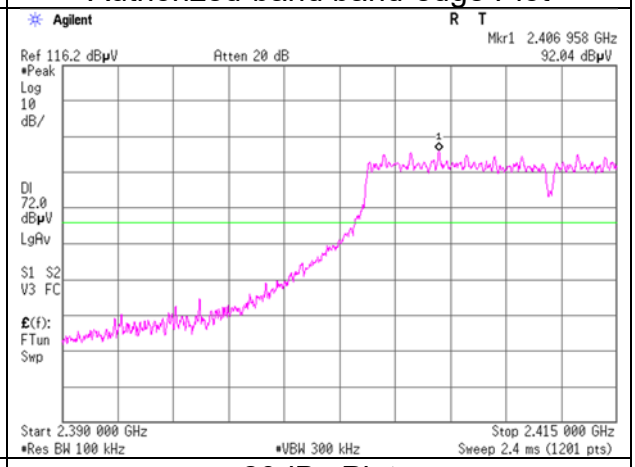
Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.0	92.0	27.7	5.6	31.8	93.6	-	-	Carrier
Hori.	2400.0	60.8	27.8	5.6	31.8	62.4	73.6	11.2	
Vert.	2412.0	91.5	27.7	5.6	31.8	93.0	-	-	Carrier
Vert.	2400.0	59.8	27.8	5.6	31.8	61.4	73.0	11.7	

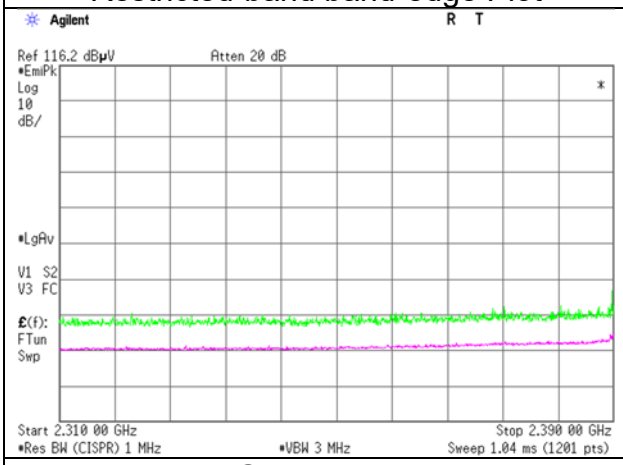
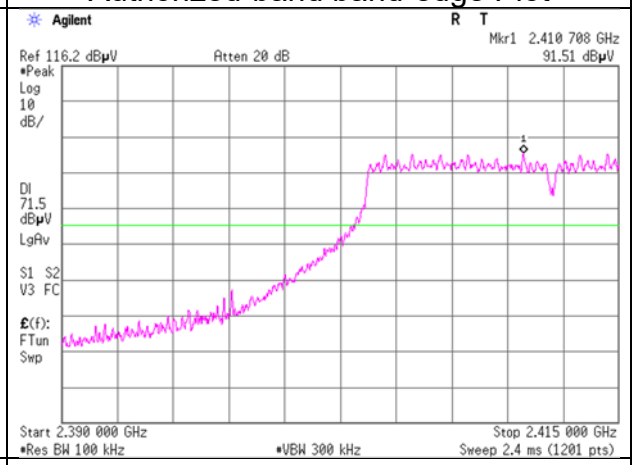
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11g 2412 MHz

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11g 2437 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4874.0	41.0	31.1	31.5	7.9	30.8	-	49.6	39.7	73.9	53.9	24.3	14.2	Floor noise
Hori.	7311.0	42.5	33.5	35.6	6.7	33.5	-	51.4	42.4	73.9	53.9	22.5	11.5	Floor noise
Hori.	9748.0	42.5	33.3	36.0	7.7	34.1	-	52.1	42.9	73.9	53.9	21.8	11.0	Floor noise
Vert.	4874.0	40.9	31.1	31.5	7.9	30.8	-	49.5	39.7	73.9	53.9	24.4	14.2	Floor noise
Vert.	7311.0	42.5	33.5	35.6	6.7	33.5	-	51.4	42.4	73.9	53.9	22.5	11.5	Floor noise
Vert.	9748.0	42.5	33.3	36.0	7.7	34.1	-	52.1	42.9	73.9	53.9	21.8	11.0	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.

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11g 2462 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2483.5	56.8	39.5	27.7	5.7	31.7	1.7	58.4	42.8	73.9	53.9	15.5	11.1	*1)
Hori.	4924.0	41.0	31.2	31.6	7.9	30.8	-	49.7	39.9	73.9	53.9	24.2	14.0	Floor noise
Hori.	7386.0	42.6	33.2	35.6	6.7	33.5	-	51.4	42.0	73.9	53.9	22.5	11.9	Floor noise
Hori.	9848.0	43.1	34.2	36.2	7.7	34.1	-	52.9	44.0	73.9	53.9	21.0	9.9	Floor noise
Vert.	2483.5	57.3	40.0	27.7	5.7	31.7	1.7	58.9	43.3	73.9	53.9	15.0	10.6	*1)
Vert.	4924.0	40.9	31.2	31.6	7.9	30.8	-	49.6	39.9	73.9	53.9	24.3	14.0	Floor noise
Vert.	7386.0	42.5	33.1	35.6	6.7	33.5	-	51.3	41.9	73.9	53.9	22.6	12.0	Floor noise
Vert.	9848.0	43.1	34.1	36.2	7.7	34.1	-	52.9	43.9	73.9	53.9	21.0	10.0	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)

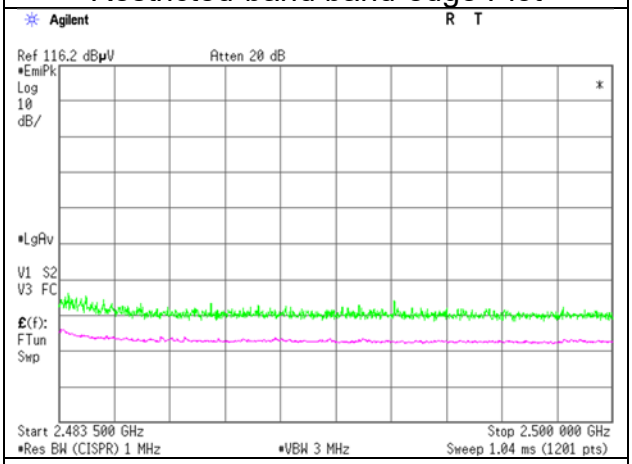
Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 dB
	10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11g 2462 MHz

Horizontal

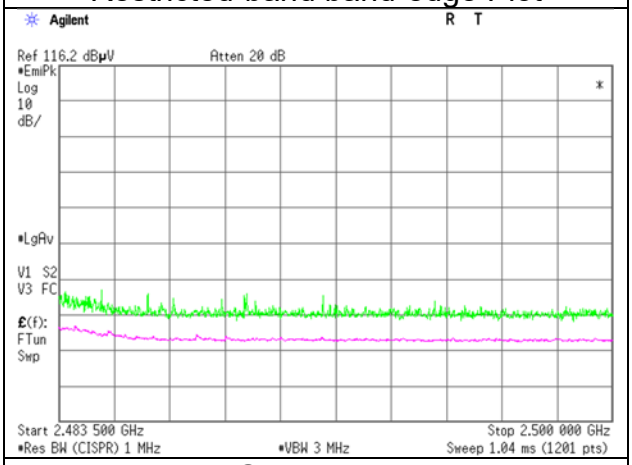
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11n-20 2412 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	61.7	39.0	27.8	5.6	31.8	1.8	63.2	42.3	73.9	53.9	10.7	11.6	*1)
Hori.	4824.0	41.1	31.4	31.5	7.9	30.8	-	49.6	39.9	73.9	53.9	24.3	14.0	Floor noise
Hori.	7236.0	42.3	33.3	35.7	6.7	33.5	-	51.2	42.2	73.9	53.9	22.7	11.7	Floor noise
Hori.	9648.0	42.5	33.2	35.8	7.6	34.1	-	51.9	42.6	73.9	53.9	22.0	11.3	Floor noise
Vert.	2390.0	61.8	39.3	27.8	5.6	31.8	1.8	63.3	42.6	73.9	53.9	10.6	11.3	*1)
Vert.	4824.0	41.1	31.4	31.5	7.9	30.8	-	49.6	39.9	73.9	53.9	24.3	14.0	Floor noise
Vert.	7236.0	42.2	33.3	35.7	6.7	33.5	-	51.1	42.2	73.9	53.9	22.8	11.7	Floor noise
Vert.	9648.0	42.5	33.1	35.8	7.6	34.1	-	51.9	42.5	73.9	53.9	22.0	11.4	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)

20dBc Data Sheet

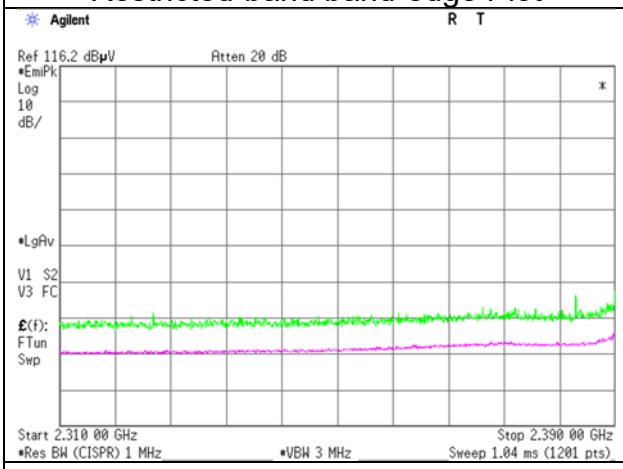
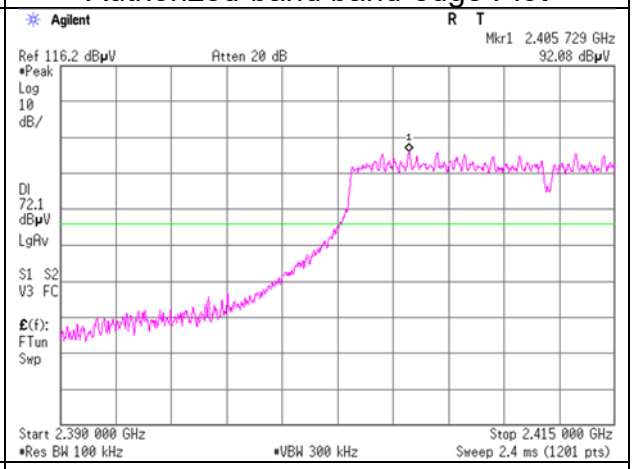
Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.0	92.1	27.7	5.6	31.8	93.6	-	-	Carrier
Hori.	2400.0	58.7	27.8	5.6	31.8	60.3	73.6	13.3	
Vert.	2412.0	92.4	27.7	5.6	31.8	93.9	-	-	Carrier
Vert.	2400.0	59.6	27.8	5.6	31.8	61.2	73.9	12.7	

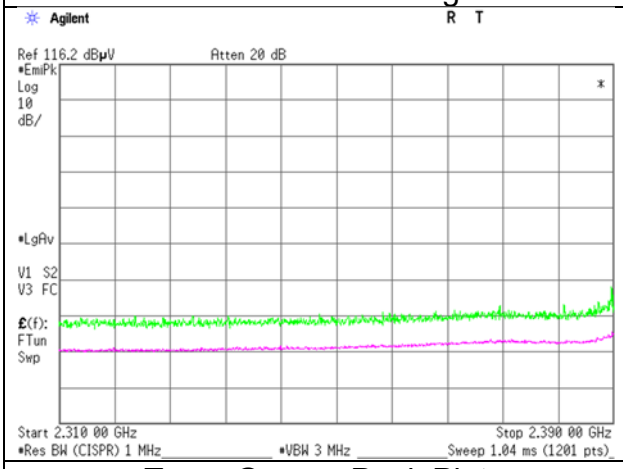
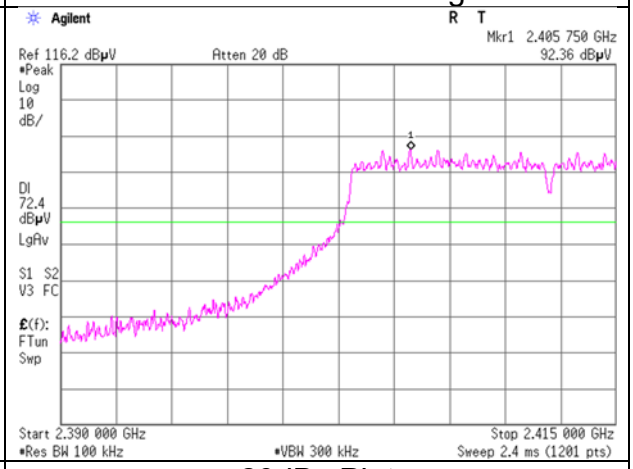
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11n-20 2412 MHz

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11n-20 2437 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4874.0	41.0	31.1	31.5	7.9	30.8	-	49.6	39.7	73.9	53.9	24.3	14.2	Floor noise
Hori.	7311.0	42.6	33.5	35.6	6.7	33.5	-	51.5	42.4	73.9	53.9	22.4	11.5	Floor noise
Hori.	9748.0	42.6	33.3	36.0	7.7	34.1	-	52.2	42.9	73.9	53.9	21.7	11.0	Floor noise
Vert.	4874.0	40.9	31.1	31.5	7.9	30.8	-	49.5	39.7	73.9	53.9	24.4	14.2	Floor noise
Vert.	7311.0	42.4	33.5	35.6	6.7	33.5	-	51.3	42.4	73.9	53.9	22.6	11.5	Floor noise
Vert.	9748.0	42.5	33.3	36.0	7.7	34.1	-	52.1	42.9	73.9	53.9	21.8	11.0	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.

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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.1	No.4	No.2
Date	June 13, 2024	June 16, 2024	June 17, 2024
Temperature / Humidity	22 deg. C / 60 % RH	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Junya Okuno (Below 1 GHz)	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11n-20 2462 MHz		

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	194.8	24.5	-	16.6	9.5	28.0	-	22.6	-	43.5	-	20.9	-	
Hori.	206.6	30.8	-	11.4	9.6	28.0	-	23.9	-	43.5	-	19.6	-	
Hori.	249.0	32.2	-	11.8	10.0	27.7	-	26.3	-	46.0	-	19.7	-	
Hori.	276.7	30.4	-	13.3	10.3	27.7	-	26.2	-	46.0	-	19.8	-	
Hori.	581.0	32.5	-	18.8	12.5	29.3	-	34.5	-	46.0	-	11.5	-	
Hori.	747.0	30.8	-	20.1	13.4	29.2	-	35.1	-	46.0	-	10.9	-	
Hori.	2483.5	59.2	40.8	27.7	5.7	31.7	1.8	60.8	44.2	73.9	53.9	13.1	9.7	*1)
Hori.	4924.0	41.0	31.2	31.6	7.9	30.8	-	49.7	39.9	73.9	53.9	24.2	14.0	Floor noise
Hori.	7386.0	42.6	33.2	35.6	6.7	33.5	-	51.4	42.0	73.9	53.9	22.5	11.9	Floor noise
Hori.	9848.0	43.0	34.2	36.2	7.7	34.1	-	52.8	44.0	73.9	53.9	21.1	9.9	Floor noise
Vert.	130.7	28.0	-	13.8	8.8	28.3	-	22.3	-	43.5	-	21.2	-	
Vert.	132.2	27.3	-	13.9	8.8	28.3	-	21.8	-	43.5	-	21.8	-	
Vert.	249.0	35.5	-	11.8	10.0	27.7	-	29.6	-	46.0	-	16.4	-	
Vert.	276.7	27.0	-	13.3	10.3	27.7	-	22.8	-	46.0	-	23.2	-	
Vert.	314.5	27.1	-	14.0	10.6	27.8	-	23.9	-	46.0	-	22.1	-	
Vert.	581.0	34.3	-	18.8	12.5	29.3	-	36.3	-	46.0	-	9.7	-	
Vert.	2483.5	59.7	41.2	27.7	5.7	31.7	1.8	61.3	44.6	73.9	53.9	12.6	9.3	*1)
Vert.	4924.0	41.0	31.2	31.6	7.9	30.8	-	49.7	39.9	73.9	53.9	24.2	14.0	Floor noise
Vert.	7386.0	42.6	33.2	35.6	6.7	33.5	-	51.4	42.0	73.9	53.9	22.5	11.9	Floor noise
Vert.	9848.0	43.1	34.1	36.2	7.7	34.1	-	52.9	43.9	73.9	53.9	21.0	10.0	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)

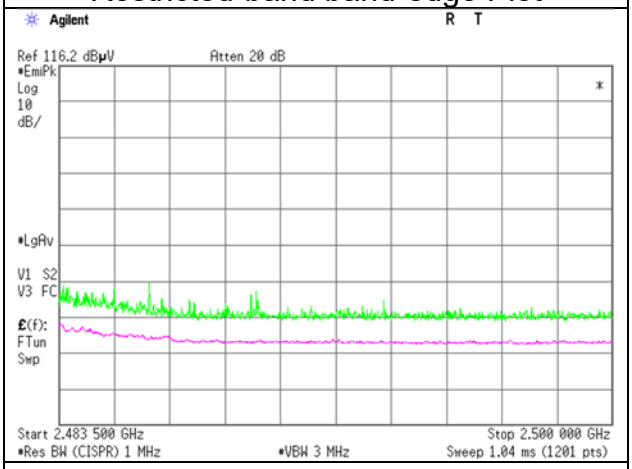
Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 dB
	10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 16, 2024
Temperature / Humidity	23 deg. C / 56 % RH
Engineer	Takafumi Noguchi (1 GHz to 6 GHz)
Mode	Tx 11n-20 2462 MHz

Horizontal

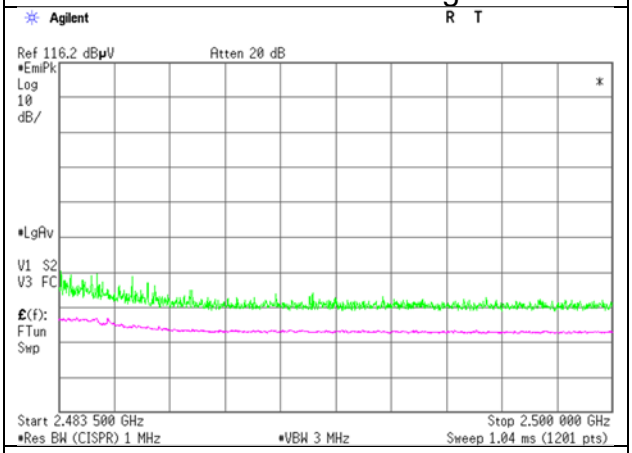
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 58 % RH	22 deg. C / 50 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx BT LE 2402 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	2390.0	42.7	33.7	27.8	5.6	31.8	1.7	44.2	37.0	73.9	53.9	29.7	17.0	*1)
Hori.	4804.0	45.6	38.1	31.5	7.9	30.9	1.7	54.1	48.3	73.9	53.9	19.9	5.6	*2)
Hori.	7206.0	45.5	36.2	35.6	6.7	33.4	1.7	54.3	46.8	73.9	53.9	19.6	7.1	*2)
Hori.	9608.0	42.9	33.9	35.7	7.6	34.0	-	52.2	43.2	73.9	53.9	21.7	10.7	Floor noise
Vert.	2390.0	42.1	33.5	27.8	5.6	31.8	1.7	43.7	36.7	73.9	53.9	30.2	17.2	*1)
Vert.	4804.0	45.6	37.7	31.5	7.9	30.9	1.7	54.1	47.9	73.9	53.9	19.8	6.0	*2)
Vert.	7206.0	45.6	36.4	35.6	6.7	33.4	1.7	54.4	47.0	73.9	53.9	19.5	6.9	*2)
Vert.	9608.0	42.9	33.9	35.7	7.6	34.0	-	52.2	43.2	73.9	53.9	21.7	10.7	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)
*2) Noise synchronized with duty of carrier freqency

20dBc Data Sheet

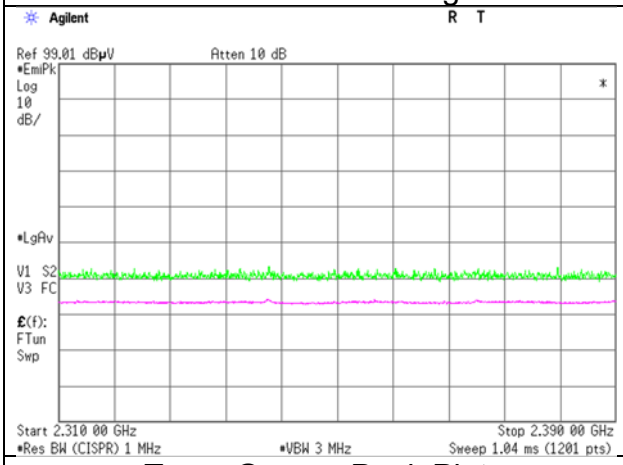
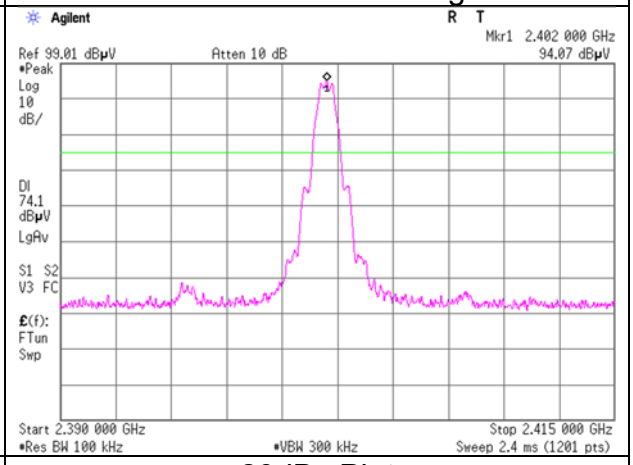
Polarity [Hori/Vert]	Frequency [MHz]	Reading (PK) [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.0	94.1	27.7	5.6	31.8	95.6	-	-	Carrier
Hori.	2400.0	39.1	27.8	5.6	31.8	40.6	75.6	35.0	
Vert.	2402.0	93.4	27.7	5.6	31.8	95.0	-	-	Carrier
Vert.	2400.0	37.7	27.8	5.6	31.8	39.2	75.0	35.7	

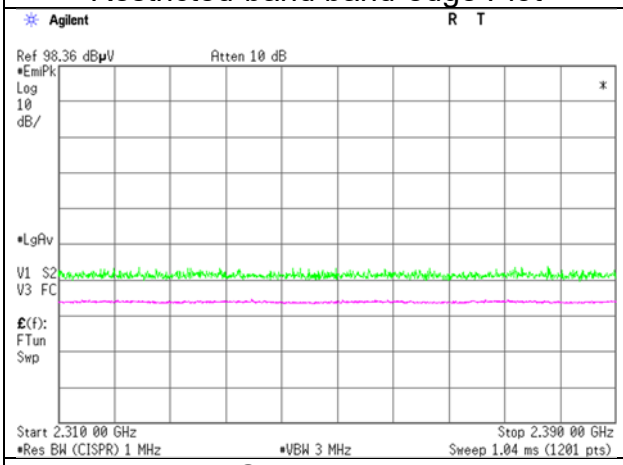
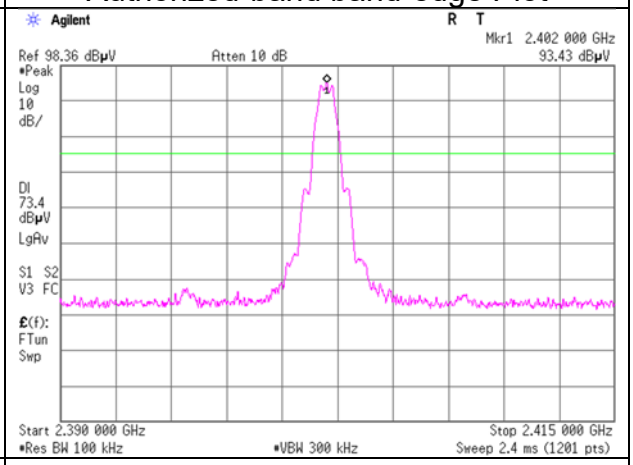
Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+Distance factor(above 1 GHz)) - Gain(Amprifier)

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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	June 16, 2024
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)
Mode	Tx BT LE 2402 MHz

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

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

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

Radiated Spurious Emission

Test place	Ise EMC Lab.	
Semi Anechoic Chamber	No.4	No.2
Date	June 16, 2024	June 17, 2024
Temperature / Humidity	23 deg. C / 58 % RH	22 deg. C / 50 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx BT LE 2440 MHz	

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	4880.0	44.3	36.0	31.6	7.9	30.8	1.7	52.8	46.3	73.9	53.9	21.1	7.6	*1)
Hori.	7320.0	46.7	37.3	35.6	6.7	33.5	1.7	55.6	47.9	73.9	53.9	18.3	6.0	*1)
Hori.	9760.0	42.6	33.4	36.0	7.7	34.1	-	52.2	43.0	73.9	53.9	21.7	10.9	Floor noise
Vert.	4880.0	44.2	35.8	31.6	7.9	30.8	1.7	52.8	46.1	73.9	53.9	21.1	7.8	*1)
Vert.	7320.0	46.7	37.3	35.6	6.7	33.5	1.7	55.6	47.9	73.9	53.9	18.3	6.0	*1)
Vert.	9760.0	42.6	33.4	36.0	7.7	34.1	-	52.2	43.0	73.9	53.9	21.7	10.9	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) Noise synchronized with duty of carrier freqency

Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 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.1	No.4	No.2
Date	June 13, 2024	June 16, 2024	June 17, 2024
Temperature / Humidity	22 deg. C / 60 % RH	23 deg. C / 58 % RH	22 deg. C / 50 % RH
Engineer	Junya Okuno (Below 1 GHz)	Nachi Konegawa (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx BT LE 2480 MHz		

Polarity [Hori/Vert]	Frequency [MHz]	Reading (QP / PK) [dBuV]	Reading (AV) [dBuV]	Ant. Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result (QP / PK) [dBuV/m]	Result (AV) [dBuV/m]	Limit (QP / PK) [dBuV/m]	Limit (AV) [dBuV/m]	Margin (QP / PK) [dB]	Margin (AV) [dB]	Remark
Hori.	174.2	21.9	-	15.8	9.3	28.1	-	18.9	-	43.5	-	24.6	-	
Hori.	249.0	30.1	-	11.8	10.0	27.7	-	24.2	-	46.0	-	21.8	-	
Hori.	287.7	28.1	-	13.5	10.4	27.7	-	24.3	-	46.0	-	21.7	-	
Hori.	434.2	22.2	-	16.3	11.5	28.7	-	21.2	-	46.0	-	24.8	-	
Hori.	581.0	30.6	-	18.8	12.5	29.3	-	32.6	-	46.0	-	13.4	-	
Hori.	747.0	29.3	-	20.1	13.4	29.2	-	33.6	-	46.0	-	12.4	-	
Hori.	2483.5	49.5	35.8	27.7	5.7	31.7	1.7	51.1	39.1	73.9	53.9	22.8	14.8	*1)
Hori.	2486.3	46.4	35.5	27.7	5.7	31.7	1.7	48.0	38.8	73.9	53.9	25.9	15.1	*2)
Hori.	4960.0	43.7	35.8	31.7	7.9	30.8	1.7	52.5	46.3	73.9	53.9	21.4	7.6	*2)
Hori.	7440.0	46.5	37.8	35.5	6.8	33.5	1.7	55.3	48.3	73.9	53.9	18.6	5.6	*2)
Hori.	9920.0	42.9	33.8	36.2	7.7	34.1	-	52.7	43.6	73.9	53.9	21.2	10.3	Floor noise
Vert.	128.3	28.4	-	13.6	8.8	28.3	-	22.4	-	43.5	-	21.1	-	
Vert.	135.8	26.5	-	14.2	8.9	28.3	-	21.3	-	43.5	-	22.2	-	
Vert.	138.9	27.5	-	14.5	8.9	28.3	-	22.6	-	43.5	-	20.9	-	
Vert.	249.0	35.1	-	11.8	10.0	27.7	-	29.2	-	46.0	-	16.8	-	
Vert.	291.4	27.0	-	13.6	10.4	27.7	-	23.3	-	46.0	-	22.8	-	
Vert.	581.0	35.9	-	18.8	12.5	29.3	-	37.9	-	46.0	-	8.1	-	
Vert.	2483.5	48.6	34.9	27.7	5.7	31.7	1.7	50.2	38.2	73.9	53.9	23.7	15.7	*1)
Vert.	2486.3	46.0	32.5	27.7	5.7	31.7	1.7	47.6	35.8	73.9	53.9	26.3	18.1	*2)
Vert.	4960.0	43.9	35.7	31.7	7.9	30.8	1.7	52.7	46.2	73.9	53.9	21.2	7.7	*2)
Vert.	7440.0	46.7	37.9	35.5	6.8	33.5	1.7	55.5	48.4	73.9	53.9	18.4	5.5	*2)
Vert.	9920.0	42.9	33.9	36.2	7.7	34.1	-	52.7	43.7	73.9	53.9	21.2	10.2	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)
*2) Noise synchronized with duty of carrier freqency

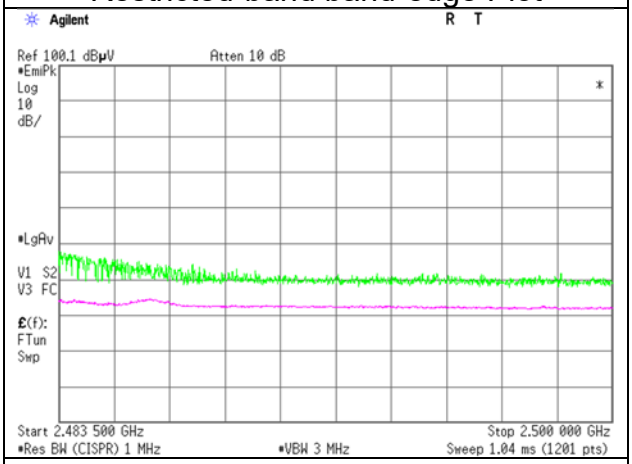
Distance factor:	1 GHz - 6 GHz	20log (3.9 m / 3.0 m) = 2.28 dB
	6 GHz - 10 GHz	20log (3.65 m / 3.0 m) = 1.71 dB
	10 GHz - 26.5 GHz	20log (1.0 m / 3.0 m) = -9.5 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	June 16, 2024
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Nachi Konegawa (1 GHz to 6 GHz)
Mode	Tx BT LE 2480 MHz

Horizontal

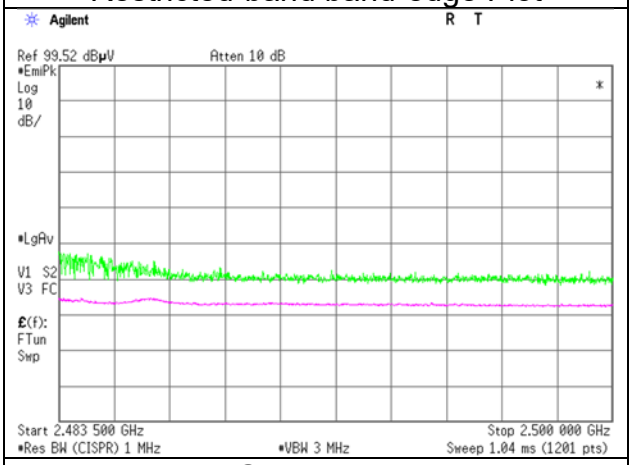
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

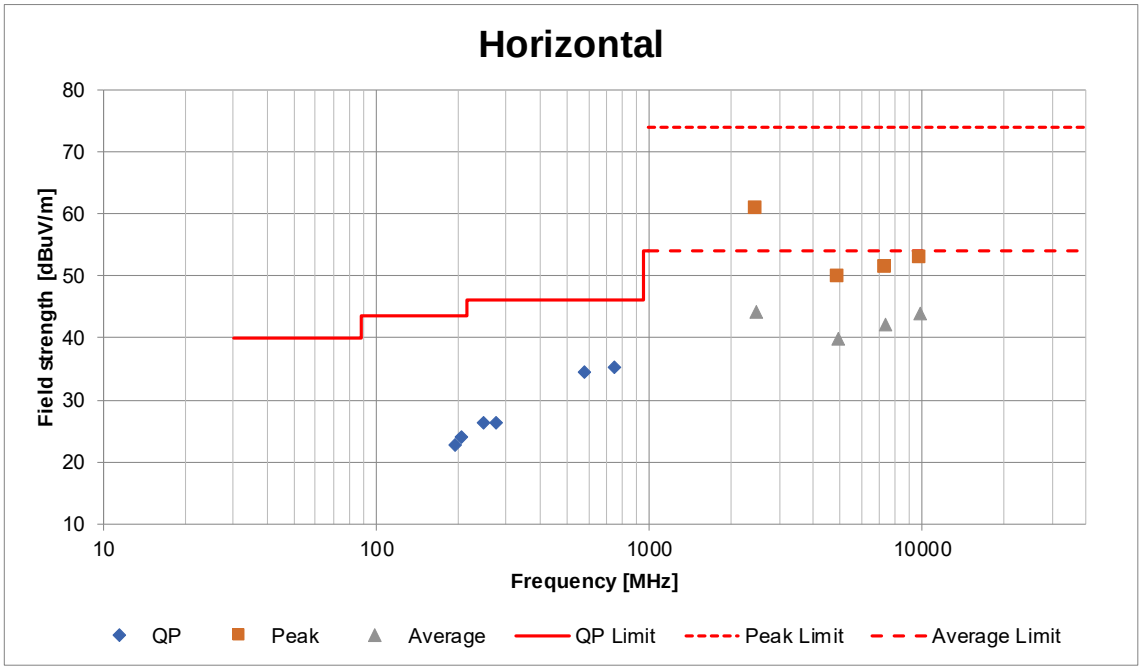


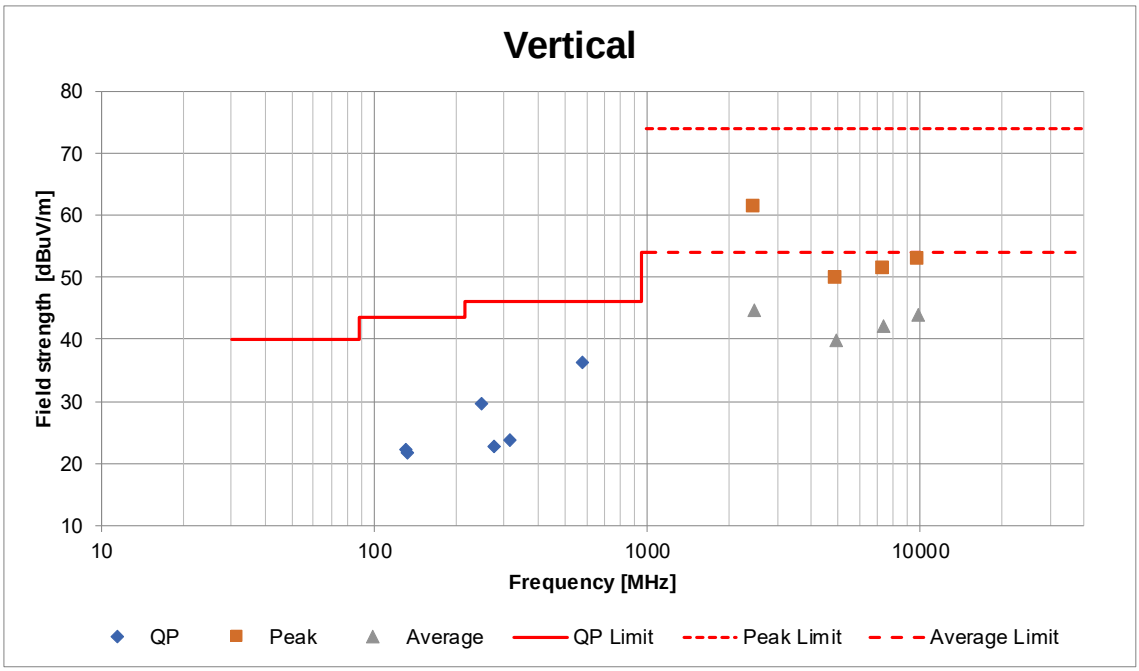
Trace Green : Peak Plot
Trace Purple : Average Plot

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

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

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.1	No.4	No.2
Date	June 13, 2024	June 16, 2024	June 17, 2024
Temperature / Humidity	22 deg. C / 60 % RH	23 deg. C / 56 % RH	22 deg. C / 50 % RH
Engineer	Junya Okuno (Below 1 GHz)	Takafumi Noguchi (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx 11n-20 2462 MHz		

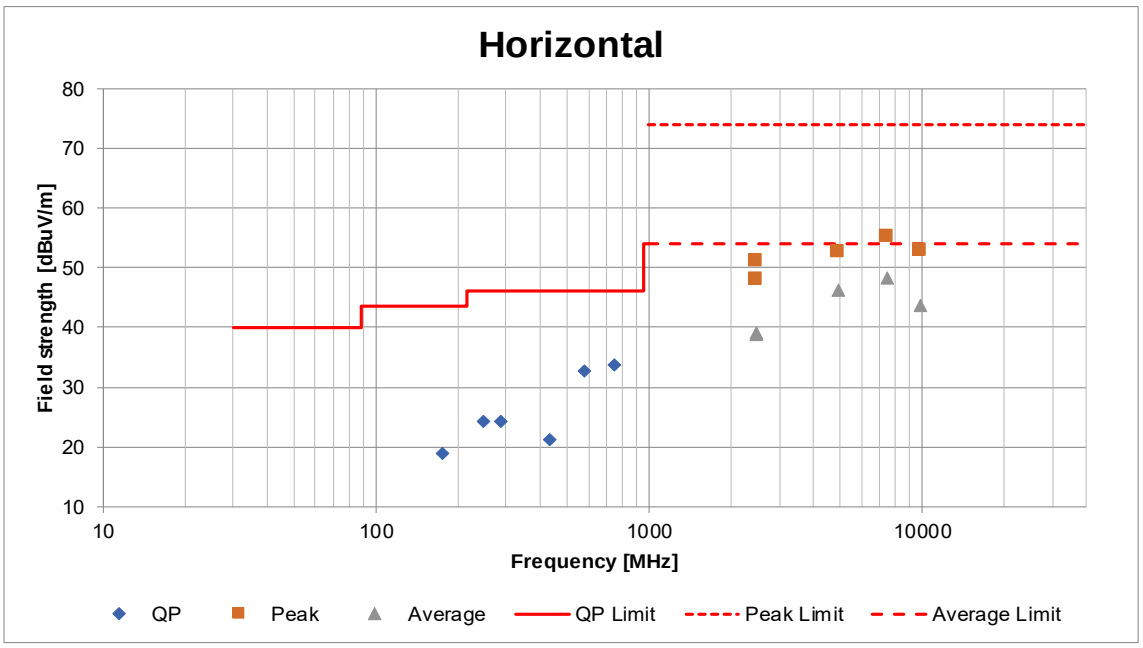


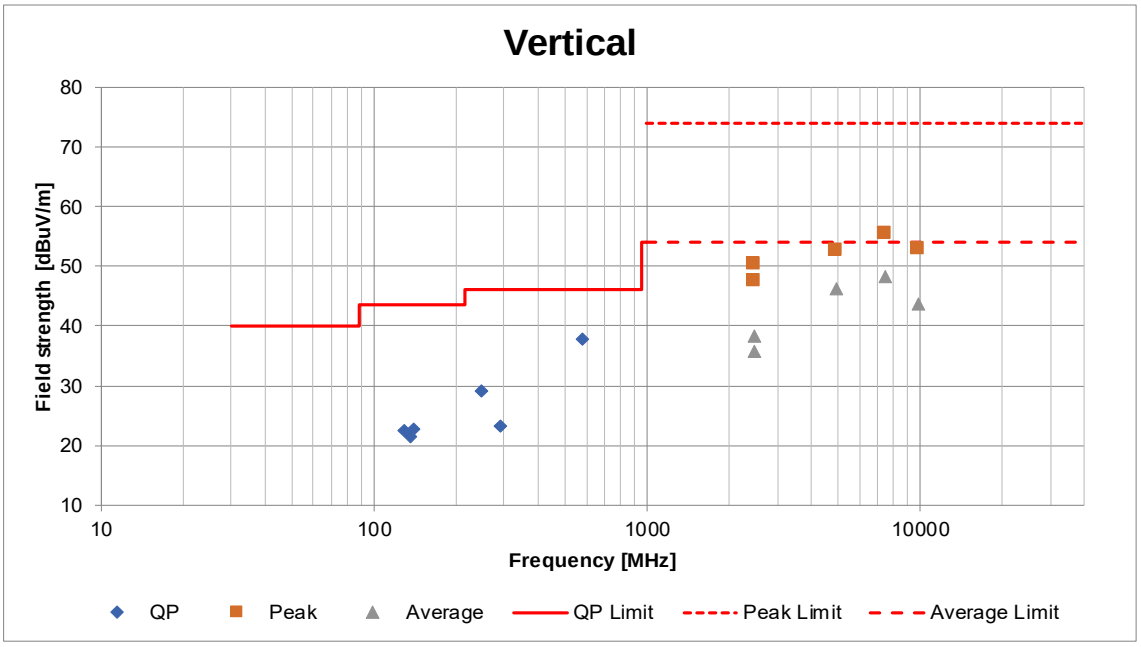


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

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

Test place	Ise EMC Lab.		
Semi Anechoic Chamber	No.1	No.4	No.2
Date	June 13, 2024	June 16, 2024	June 17, 2024
Temperature / Humidity	22 deg. C / 60 % RH	23 deg. C / 58 % RH	22 deg. C / 50 % RH
Engineer	Junya Okuno (Below 1 GHz)	Nachi Konegawa (1 GHz to 6 GHz)	Takafumi Noguchi (Above 6 GHz)
Mode	Tx BT LE 2480 MHz		



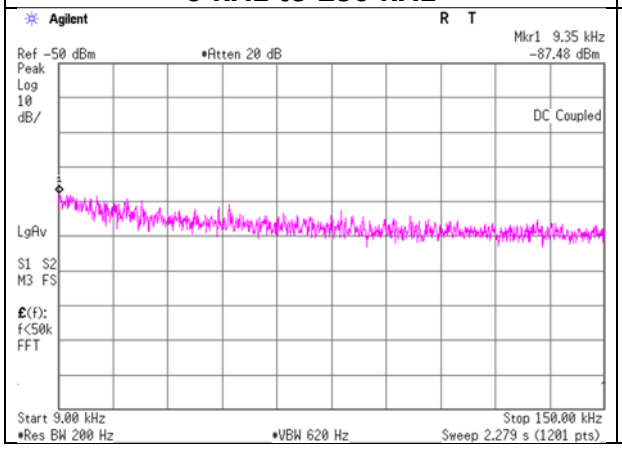


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

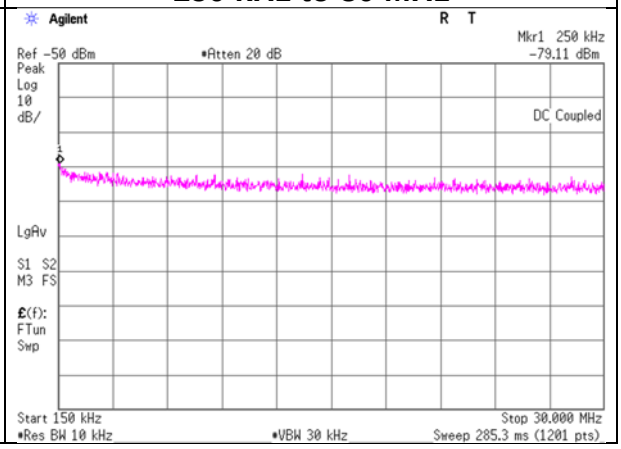
Conducted Spurious Emission

Test place	Ise EMC Lab. No.8 Measurement Room
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 58 % RH
Engineer	Tomoya Sone
Mode	Tx 11n-20 2462 MHz

9 kHz to 150 kHz



150 kHz to 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.35	-87.5	0.50	9.7	2.0	1	-75.3	300	6.0	-14.0	48.1	62.1	
250.00	-79.1	0.51	9.7	2.0	1	-66.9	300	6.0	-5.7	19.6	25.3	

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)

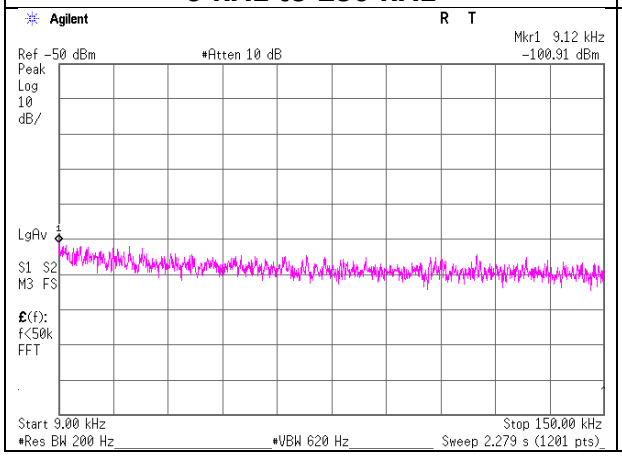
N: Number of output

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

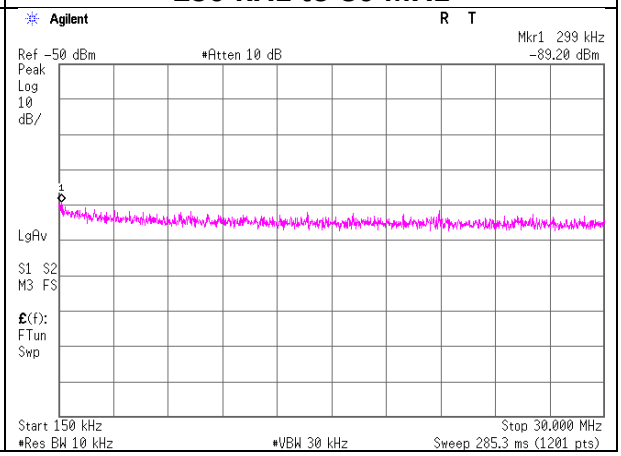
Conducted Spurious Emission

Test place	Ise EMC Lab. No.8 Measurement Room
Date	June 18, 2024
Temperature / Humidity	23 deg. C / 59 % RH
Engineer	Tomoya Sone
Mode	Tx BT LE 2402 MHz

9 kHz to 150 kHz



150 kHz to 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.12	-100.9	0.50	9.7	2.0	1	-88.7	300	6.0	-27.5	48.4	75.9	
299.00	-89.2	0.51	9.7	2.0	1	-77.0	300	6.0	-15.7	18.0	33.7	

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)

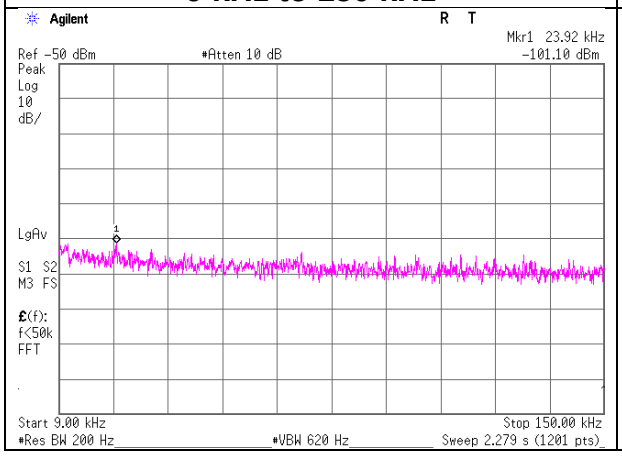
N: Number of output

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

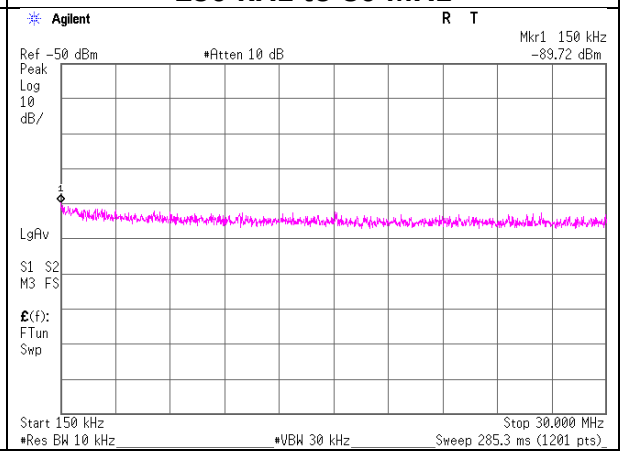
Conducted Spurious Emission

Test place	Ise EMC Lab. No.8 Measurement Room
Date	June 18, 2024
Temperature / Humidity	23 deg. C / 59 % RH
Engineer	Tomoya Sone
Mode	Tx BT LE 2440 MHz

9 kHz to 150 kHz



150 kHz to 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
23.92	-101.1	0.50	9.7	2.0	1	-88.9	300	6.0	-27.7	40.0	67.7	
150.00	-89.7	0.51	9.7	2.0	1	-77.5	300	6.0	-16.3	24.0	40.3	

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)

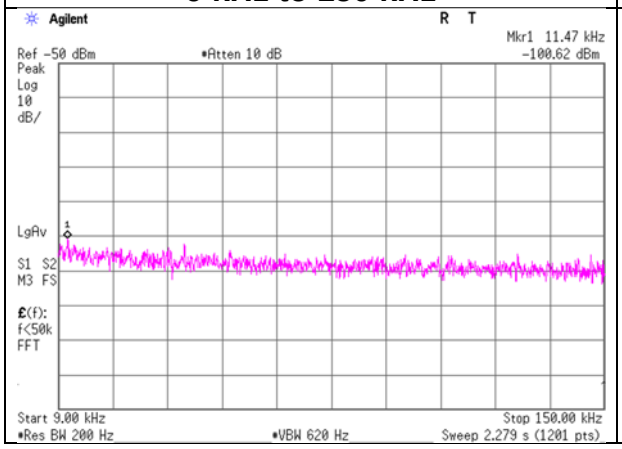
N: Number of output

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

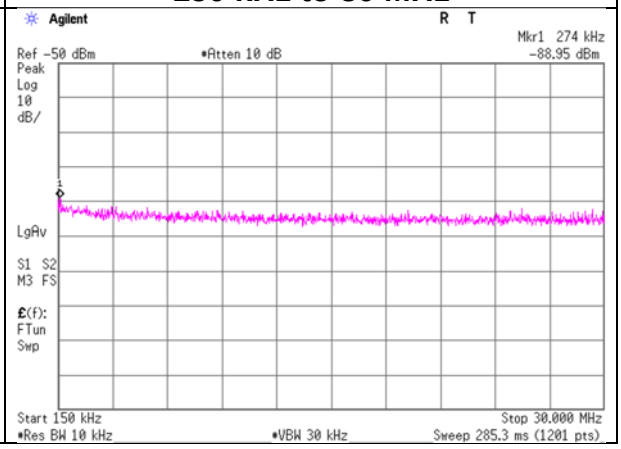
Conducted Spurious Emission

Test place	Ise EMC Lab. No.8 Measurement Room
Date	June 18, 2024
Temperature / Humidity	23 deg. C / 59 % RH
Engineer	Tomoya Sone
Mode	Tx BT LE 2480 MHz

9 kHz to 150 kHz



150 kHz to 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain* [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.47	-100.6	0.50	9.7	2.0	1	-88.4	300	6.0	-27.2	46.4	73.6	
274.00	-89.0	0.51	9.7	2.0	1	-76.8	300	6.0	-15.5	18.8	34.3	

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	Ise EMC Lab. No.8 Measurement Room	
Date	June 18, 2024	June 19, 2024
Temperature / Humidity	23 deg. C / 59 % RH	21 deg. C / 58 % RH
Engineer	Tomoya Sone	Tomoya Sone
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-11.52	1.39	9.73	-0.40	8.00	8.40
2437	-11.77	1.40	9.73	-0.64	8.00	8.64
2462	-11.51	1.41	9.73	***-0.37***	8.00	8.37

11g

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-25.23	1.39	9.73	-14.11	8.00	22.11
2437	-23.67	1.40	9.73	**-12.54**	8.00	20.54
2462	-24.86	1.41	9.73	-13.72	8.00	21.72

11n-20

Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2412	-25.84	1.39	9.73	-14.72	8.00	22.72
2437	-24.68	1.40	9.73	-13.55	8.00	21.55
2462	-24.30	1.41	9.73	***-13.16***	8.00	21.16

BT LE

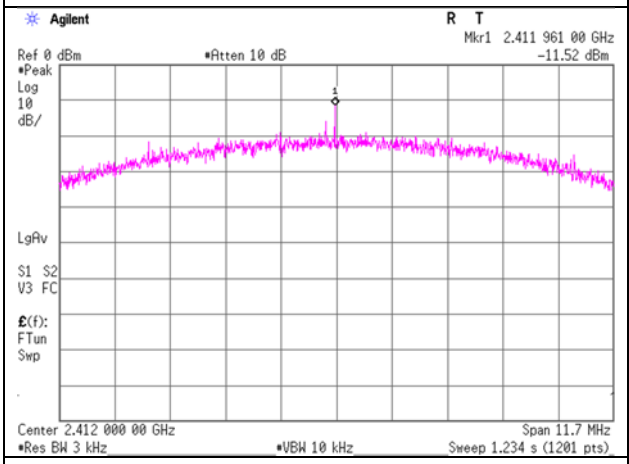
Freq. [MHz]	Reading [dBm / 3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm / 3 kHz]	Limit [dBm / 3 kHz]	Margin [dB]
2402	-24.05	1.39	9.73	-12.93	8.00	20.93
2400	-23.32	1.40	9.73	-12.19	8.00	20.19
2480	-22.81	1.41	9.73	***-11.67***	8.00	19.67

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

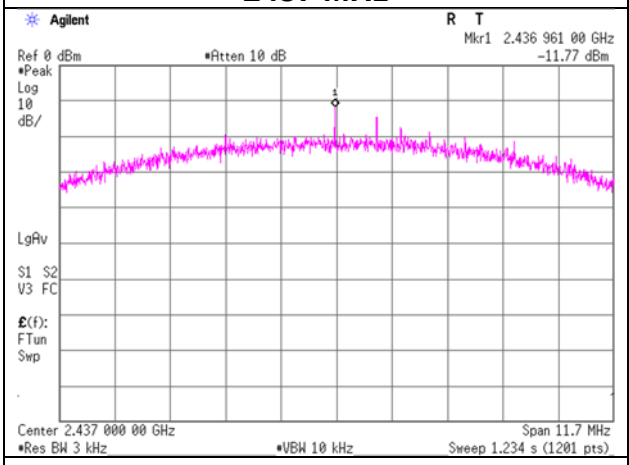
Power Density

11b

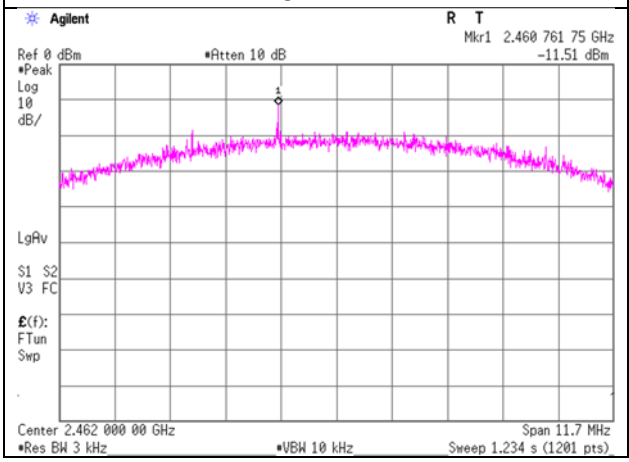
2412 MHz



2437 MHz

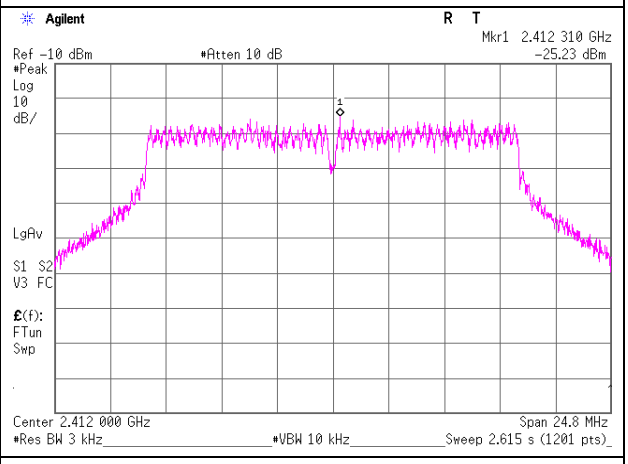


2462 MHz

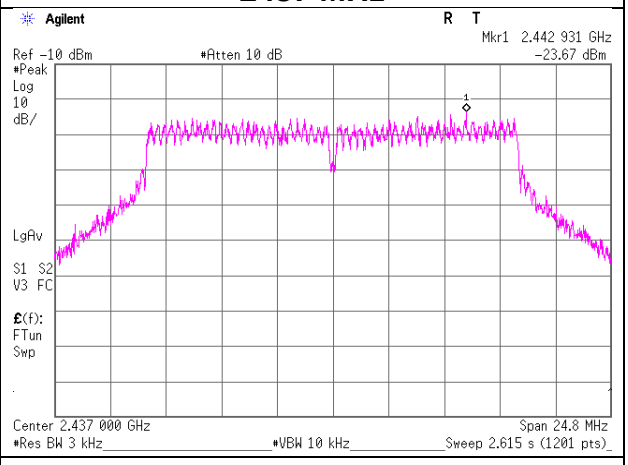


11g

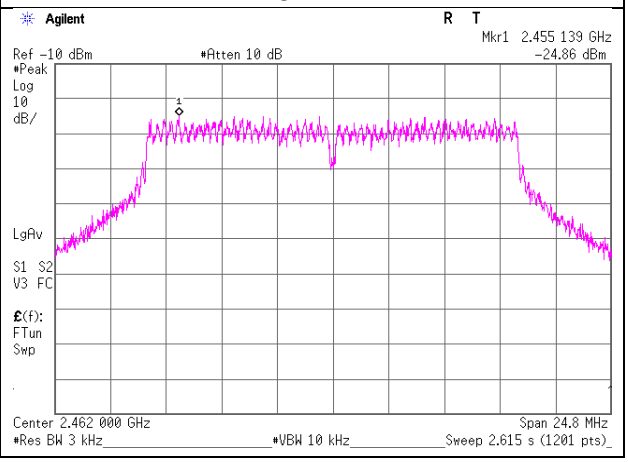
2412 MHz



2437 MHz



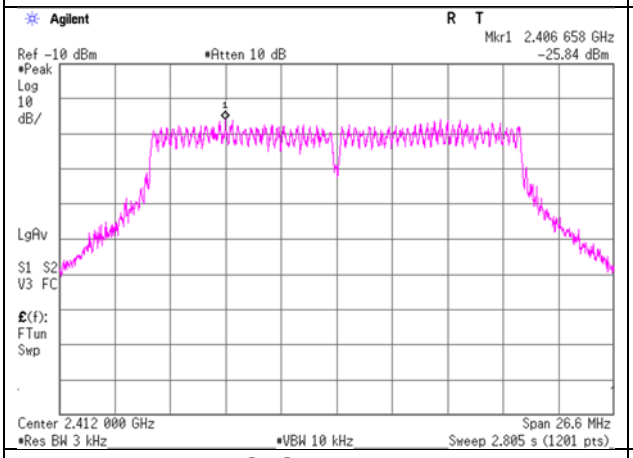
2462 MHz



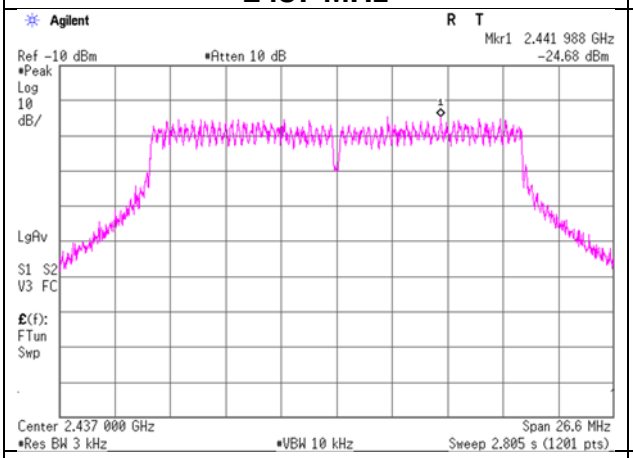
Power Density

11n-20

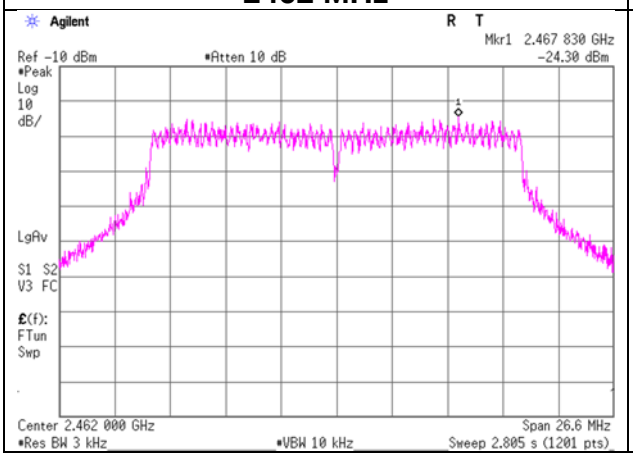
2412 MHz



2437 MHz

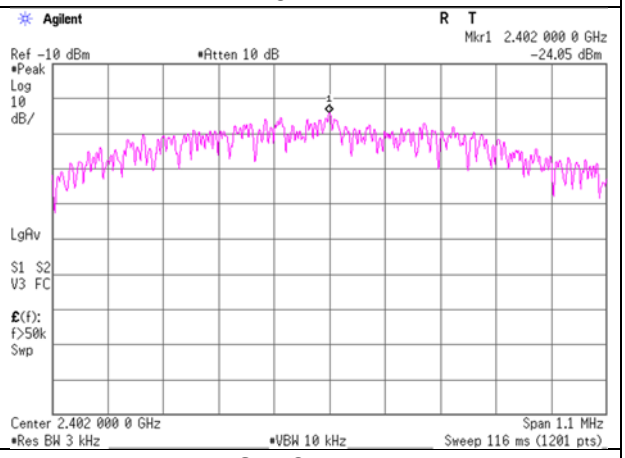


2462 MHz

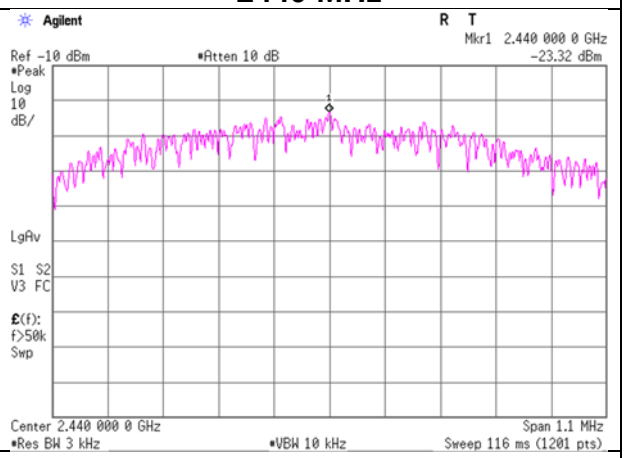


BT LE

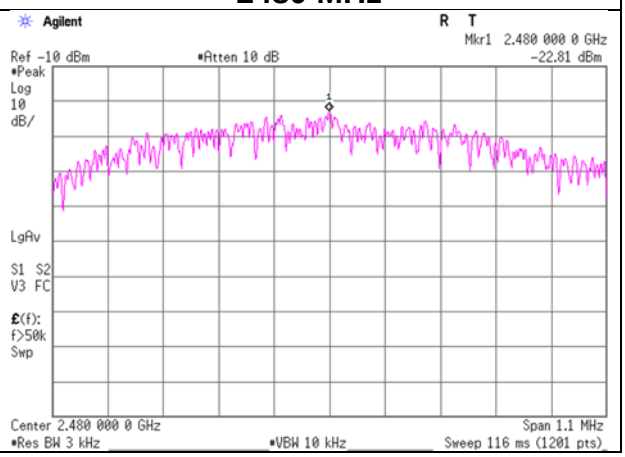
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test Instruments

Test Equipment (1/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
CE	141222	Coaxial Cable	Fujikura,HP, Mini-Circits,Fujikura	3D-2W (12m)/ 5D-2W (5m)/ 5D-2W (0.8m)/ 5D-2W (1m)	-	02/17/2024	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	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/01/2023	12
CE	141925	Terminator	TME	CT-01	-	11/17/2023	12
CE	142004	AC2_Semi Anechoic Chamber (NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	12/12/2023	24
CE	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
CE	144196	Test Receiver	Rohde & Schwarz	ESCI	100608	10/18/2023	12
CE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
CE	244707	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202102	01/25/2024	12
RE	141198	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+ BBA9106	2513	06/06/2023	12
RE	141213	Attenuator (6dB)	Weinschel Corp	2	BK7971	11/16/2023	12
RE	141296	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	002	09/01/2023	12
RE	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	03/05/2024	12
RE	141393	Microwave Cable	Junkosha	MWX221	1604S254(1 m)/ 1608S088(5 m)	08/01/2023	12
RE	141404	High Pass Filter 3.5-24GHz	TOKIMEC	TF323DCA	601	05/23/2024	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	557	05/17/2024	12
RE	141513	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170306	07/19/2023	12
RE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	02/01/2024	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/01/2023	12
RE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
RE	141568	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	2901	01/10/2024	12
RE	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/17/2024	12
RE	141581	Microwave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2023	12
RE	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/17/2024	12
RE	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	05/09/2024	12
RE	141901	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY48250080	01/26/2024	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	11/20/2023	12
RE	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	12/06/2023	24
RE	142006	AC2_Semi Anechoic Chamber (SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/17/2023	24
RE	142017	AC4_Semi Anechoic Chamber (SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/14/2023	24
RE	142226	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	160924	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	225	11/29/2023	12
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	238713	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	688	08/10/2023	12

Test Equipment (2/2)

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	244707	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202102	01/25/2024	12
RE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
AT	141244	Attenuator (10dB)	Weinschel - API Technologies Corp	WA8-10-34	A198	02/17/2024	12
AT	141327	Coaxial Cable	UL Japan	-	-	02/09/2024	12
AT	141419	Attenuator	Weinschel Associates	WA56-10	56100305	05/22/2024	12
AT	141557	DIGIITAL HiTESTER	HIOKI E.E. CORPORATION	3805	070900530	01/31/2024	12
AT	141805	Power Meter	Anritsu Corporation	ML2495A	6K00003338	08/09/2023	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	141840	Power sensor	Anritsu Corporation	MA2411B	011737	08/09/2023	12
AT	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	05/09/2024	12
AT	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	05/30/2024	12
AT	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/26/2024	12
AT	197219	Microwave cable	Huber+Suhner	SF126E/11PC35/ 11PC35/2000MM	536999/126E	03/19/2024	12
AT	197220	Microwave cable	Huber+Suhner	SF126E/11PC35/ 11PC35/2000MM	537003/126E	03/14/2024	12
AT	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	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:

CE: Conducted Emission
RE: Radiated Emission
AT: Antenna Terminal Conducted test