RADIO TEST REPORT

Test Report No. 15471317S-A-R1

Customer	**Murata Manufacturing Co., Ltd.**
Description of EUT	**Communication Module**
Model Number of EUT	**Type1VY-002**
FCC ID	**VPYLB1VY002**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**April 18, 2025**
Remarks	**Wireless LAN (2.4 GHz band) and Bluetooth Low Energy part(s)**

Representative Test Engineer	Approved By
Yosuke Murakami Engineer	Kazutaka Takeyama Leader

CERTIFICATE 1266.03

☐ 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. 15471317S-A

This report is a revised version of 15471317S-A. 15471317S-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15471317S-A	April 14, 2025	-
1	15471317S-A-R1	April 18, 2025	**Clause 3.2** [FCC Part 15.203 Antenna requirement] Corrected from; “The EUT has an external antenna connector, but it is installed inside the end product by the professionals.” to; “The EUT has a unique coupling/antenna connector (U.FL connector).”

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	Murata Manufacturing Co., Ltd.
Address	1-10-1 Higashikotari, Nagaokakyo-shi, Kyoto 617-8555 Japan
Telephone Number	+81-50-1737-2801
Contact Person	Kenji Hayashikoshi

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	Communication Module
Model Number	Type1VY-002
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	September 5 and 9 and November 13, 2024
Test Date	September 17, 2024 to March 4, 2025

2.2 Product Description

General Specification

Rating	VDD3P3, SWREG_IN, VDD_FEM: Typ.: DC 3.3 V, Min.: DC 3.135 V, Max.: DC 3.465 V VDDIO_GPIO, VDDIO_AO: Typ.: DC 3.3 V, 1.8 V, Min.: DC 3.135 V, 1.71 V, Max.: DC 3.465 V, 1.89 V
Operating Temperature	-30 deg. C to +85 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.

Bluetooth (BR/EDR/BTLE)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS, GFSK / π/4-DQPSK, 8DPSK / GFSK
Antenna Gain a)	0.82 dBi

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)	0.82 dBi

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

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5720 MHz 5745 MHz to 5825 MHz
	40 MHz Band:	5190 MHz to 5230 MHz 5270 MHz to 5310 MHz 5510 MHz to 5710 MHz 5755 MHz to 5795 MHz
	80 MHz Band:	5210 MHz 5290 MHz 5530 MHz to 5690 MHz 5775 MHz
Type of Modulation	OFDM	
Antenna Gain a)	0.96 dBi	

Transmission patterns

Mode	Config.1	Config.2	Config.3	Config.4	Config.5	
Bluetooth	-	-	Transmit	Transmit *1)	Transmit *2)	-
2.4 GHz	Transmit	-	-	-	-	Transmit *2)
5 GHz	-	Transmit	-	Transmit *1)	-	-

*1) Simultaneous operation of WLAN and BT
*2) Exclusive operation of either WLAN or BT

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart C The latest version on the first day of the testing period
Title	FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators Section 15.207 Conducted limits Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	28.1 dB, 17.65030 MHz, AV, N Mode: Tx, 11n-20, 2412 MHz	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)	0.7 dB 9920.00 MHz, AV, Horizontal Mode: Tx BT LE 2480 MHz	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 module is constantly provided with the stable voltage from the host device. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
The EUT has a unique coupling/antenna connector (U.FL connector). Therefore the equipment complies with the requirement of 15.203.

3.3 Addition to Standard

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

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

3.4 Uncertainty

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

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

Item	Frequency range	Uncertainty (+/-)
Conducted Emission (AC Mains) LISN	150 kHz to 30 MHz	3.0 dB
Radiated Emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.3 dB
	30 MHz to 200 MHz	4.8 dB
	200 MHz to 1 GHz	6.1 dB
	1 GHz to 6 GHz	4.7 dB
	6 GHz to 18 GHz	5.3 dB
	18 GHz to 40 GHz	5.5 dB
Radiated Emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB
	18 GHz to 40 GHz	5.8 dB

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)	1.3 dB
Power Measurement above 1 GHz (Peak Detector)	1.5 dB
Spurious Emission (Conducted) below 1 GHz	0.93 dB
Conducted Emissions Power Density Measurement 1 GHz to 3 GHz	0.93 dB
Conducted Emissions Power Density Measurement 3 GHz to 18 GHz	3.0 dB
Spurious Emission (Conducted) 18 GHz to 26.5 GHz	2.8 dB
Spurious Emission (Conducted) 26.5 GHz to 40 GHz	2.3 dB
Bandwidth Measurement	0.012 %
Duty Cycle and Time Measurement	0.27 %
Temperature	2.2 deg.C.
Humidity	3.4 %
Voltage	0.92 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan
Telephone: +81-463-50-6400
A2LA Certificate Number: 1266.03
(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

Test room	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber (SAC1)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber (SAC2)	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber (SAC3)	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber (SAC4)	8.1 x 5.1 x 3.55	8.1 x 5.1	-
Wireless anechoic chamber 1 (WAC1)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
Wireless anechoic chamber 2 (WAC2)	9.5 x 6.0 x 5.4	9.5 x 6.0	3 m
No.1 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	2.55 x 4.1 x 2.5	-	-
No.2 Measurement room	4.5 x 3.5 x 2.5	-	-
Wireless shielded room 1	3.0 x 4.5 x 2.7	3.0 x 4.5	-
Wireless shielded room 2	3.0 x 4.5 x 2.7	3.0 x 4.5	-

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)	2 Mbps (short), 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.	
*Power of the EUT was set by the software as follows; Power Setting: 8.5 (Setting value) Software: QRCT version 3.0.276.0 (QMSL version 6.1.274.QOHONEMS) (Date: 2024.9.11, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. Test operating mode was determined as follows according to “Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - ” of TCB Council Workshop October 2009 .	

*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)	2412 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)	1M-PHY Uncoded PHY (1M-PHY), Maximum Packet Size, PRBS9
*Power of the EUT was set by the software as follows; Power Setting: Fixed Software: QRCT version 3.0.276.0 (QMSL version 6.1.274.QOHONEMS) (Date: 2024.9.11, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*Details of Operating Mode(s)

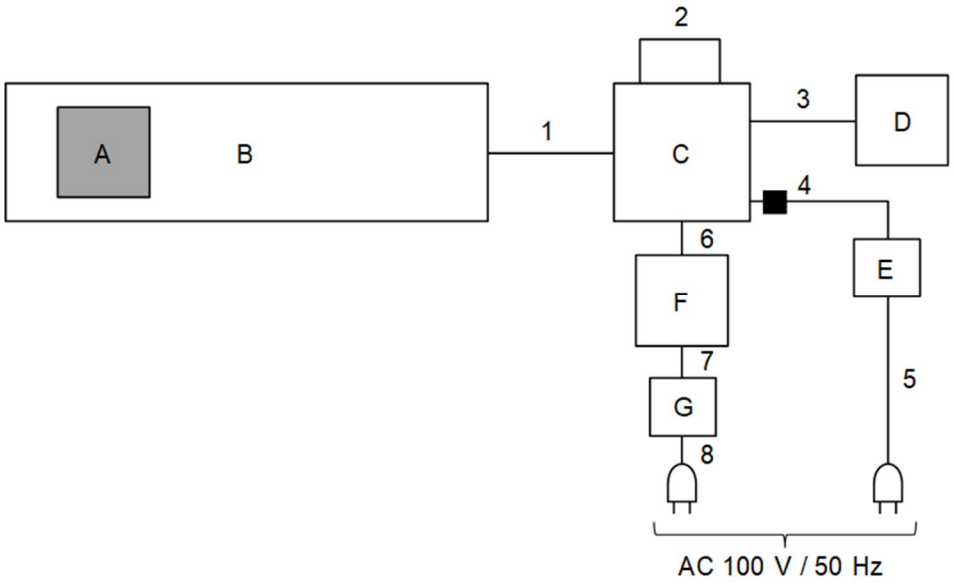
Test Item	Operating Mode	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz)	Tx BT LE, 1M-PHY *1)	2480 MHz
Radiated Spurious Emission (Above 1 GHz), Maximum Peak Output Power, Power Density, 6dB Bandwidth, 99% Occupied Bandwidth, Conducted Spurious Emission	Tx BT LE, 1M-PHY	2402 MHz 2440 MHz 2480 MHz
*1) Conducted emissions and Spurious emissions for frequencies below 1 GHz were limited to the channel that had the highest power during the antenna terminal test, as preliminary testing indicated that changing the operating frequency had no significant impact on the emissions in those frequency bands.		

Simultaneous transmission

Test Item	Mode *1)
Radiated Spurious Emission	Tx BT LE 2480 MHz + 11ac-40 5550 MHz
*1) Simultaneous transmission was tested on the channel that was the worst for single transmission.	

4.2 Configuration and Peripherals

< For Antenna Terminal Conducted Test >



■: Standard Ferrite Core

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

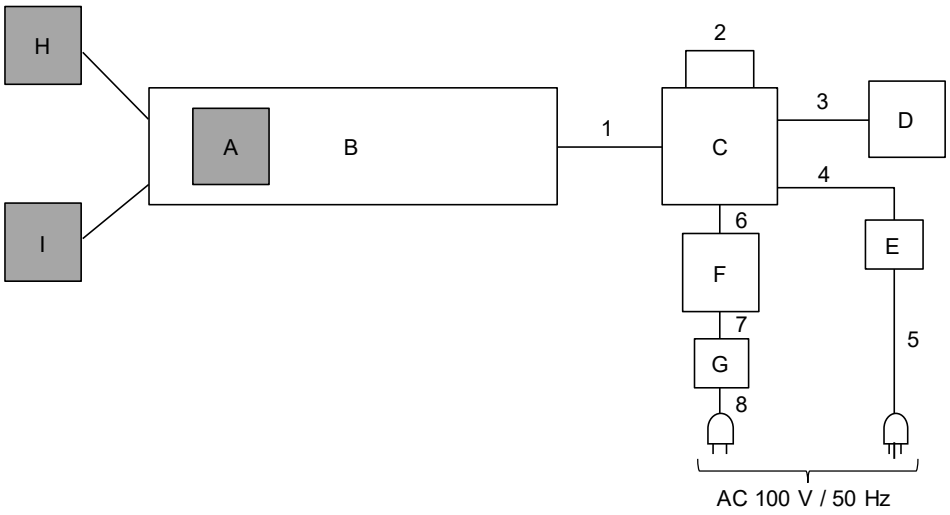
Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Communication Module	Type1VY-002	#001	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	P2ML11773	#001	Murata Manufacturing Co., Ltd.	-
C	Mini personal computer	Brix	No.i7-No.04	GIGABYTE	-
D	SSD	SSD370S	H32675-1153	Transcend	-
E	AC Adaptor	FSP065-REB	H4511000886	FSP GROUP INC.	-
F	Laptop Computer	ThinkPad L580	PF-1LTWJ8	LENOVO	-
G	AC Adaptor	ADLX45YLC2A	8SSA10E75842L1CZ94J0D3D	LENOVO	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.15	Unshielded	Unshielded	-
2	USB	0.5	Shielded	Shielded	-
3	Singal	0.1	Shielded	Shielded	-
4	DC	1.6	Unshielded	Unshielded	-
5	AC	0.6	Unshielded	Unshielded	-
6	LAN	2.0	Unshielded	Unshielded	-
7	DC	1.8	Unshielded	Unshielded	-
8	AC	0.9	Unshielded	Unshielded	-

<For Radiated Emission test>



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

Description of EUT and Support Equipment

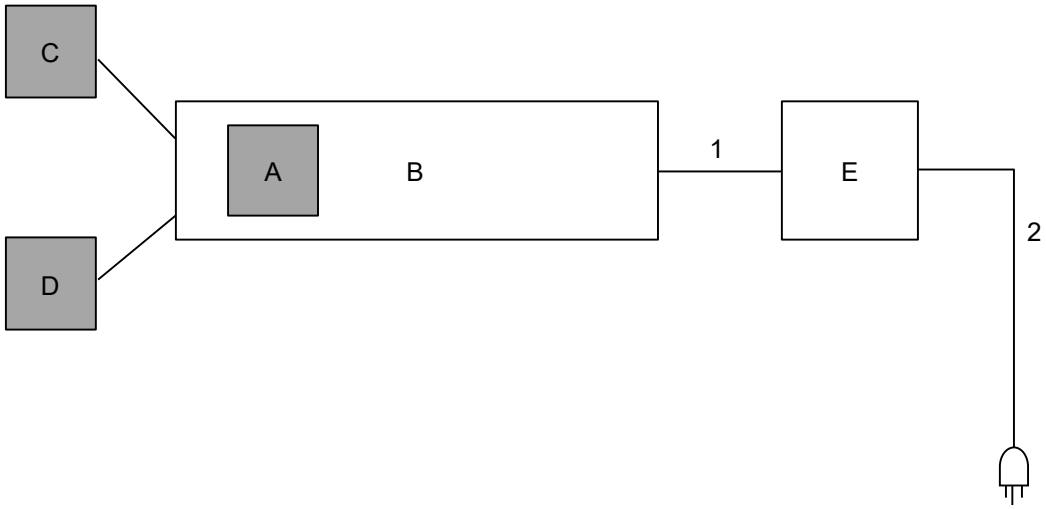
No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	Communication module	Type1VY-002	#002	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	P2ML11773	#002	Murata Manufacturing Co., Ltd.	-
C	Mini personal computer	Brix	No.i5-32	GIGABYTE	-
D	SSD	SSD370S	F3559-2490	Transcend	-
E	Power Supply (DC)	PAN35-10A	CY002947	Kikusui Electronics Corp.	-
F	Laptop Computer	A6G7FPF8D511	90054652H	TOSHIBA	-
G	AC Adaptor	PA5177U-1ACA	K80611667CGD	TOSHIBA	-
H	Antenna (monopole)	chain0 monopole 5 GHz	#1	SONY	EUT *1)
I	Antenna (monopole)	chain0 monopole 2.4 GHz	#2	SONY	EUT

*1) Not used for 2.4 GHz WLAN transmission/reception.

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal	0.3	Unshielded	Unshielded	-
2	USB	0.6	Shielded	Shielded	-
3	Signal	0.1	Shielded	Shielded	-
4	DC	1.6	Unshielded	Unshielded	-
5	AC	1.0	Unshielded	Unshielded	-
6	LAN	1.6	Unshielded	Unshielded	-
7	DC	1.8	Unshielded	Unshielded	-
8	AC	0.9	Unshielded	Unshielded	-

<For Radiated Emission test (Simultaneous Transmission) and Conducted Emission test>



AC 100 V / 50 Hz (Radiated Emission test)
AC 120 V / 60 Hz (Conducted Emission test)

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

Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	Communication module	Type1VY-002	#020	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	P2ML11773	#020	Murata Manufacturing Co., Ltd.	-
C	Antenna (monopole)	chain0 monopole 5 GHz	#1	SONY	EUT
D	Antenna (monopole)	chain0 monopole 2.4 GHz	#2	SONY	EUT
E	Power Supply (DC)	PAN35-10A	NA000955 *1) DE001677 *2)	Kikusui Electronics Corp.	-

*1) Used for Radiated Emission test.
*2) Used for Conducted Emission test.

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC	2.0	Unshielded	Unshielded	-
2	AC	1.8	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a wooden table of nominal size, 0.8 m by 1.6 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.

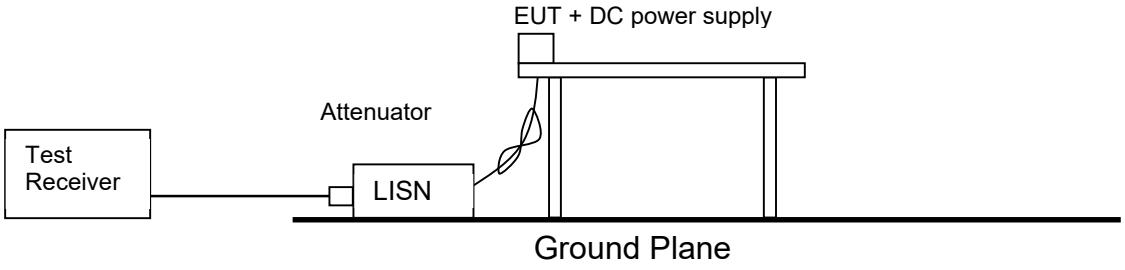
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via DC power supply in a Shielded room.
The EUT was connected to a LISN (AMN).
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, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane. Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	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.

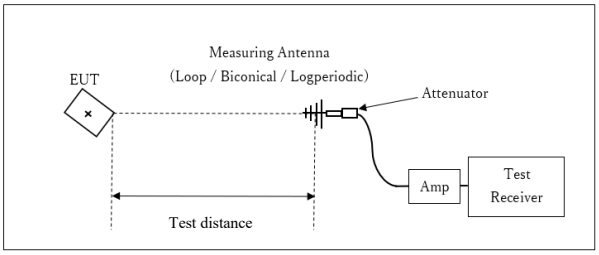
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

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

*1) Measurement with Average detector was not performed. The limit for Average detector is applied to the measurement value with Peak detector used Duty cycle correction factor (DCCF). (Only Simultaneous transmission mode)

Figure 2: Test Setup

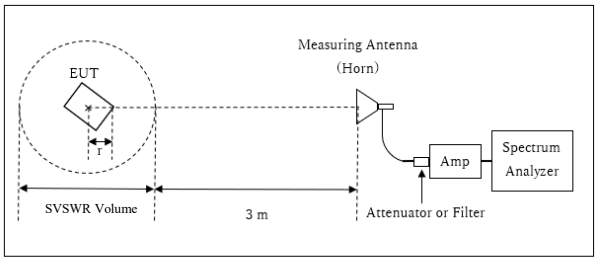
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

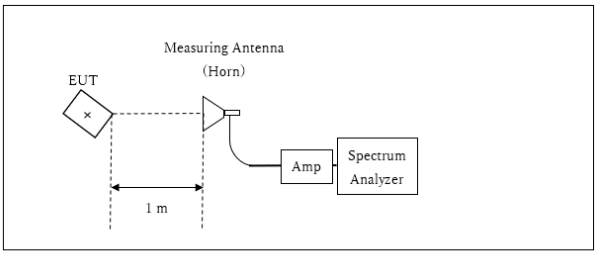


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.86 m / 3.0 m) = 2.19 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.86 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.14 m

10 GHz to 26.5 GHz



× : Center of turn table

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

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

WLAN

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

BT LE

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

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
6 dB Bandwidth	20 MHz or 10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99 % Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4) *5)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart (9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)
*5) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 - 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

Test results are rounded off and limit are rounded down, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

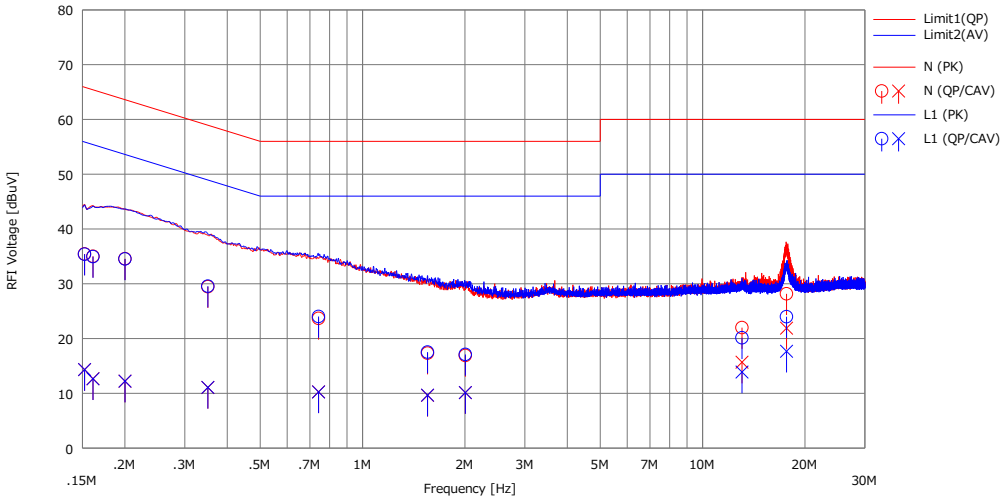
Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test Data

Conducted Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	December 5, 2024
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Yosuke Murakami
Mode	Tx 11n-20 2412 MHz

Limit : FCC_Part 15 Subpart C(15.207)



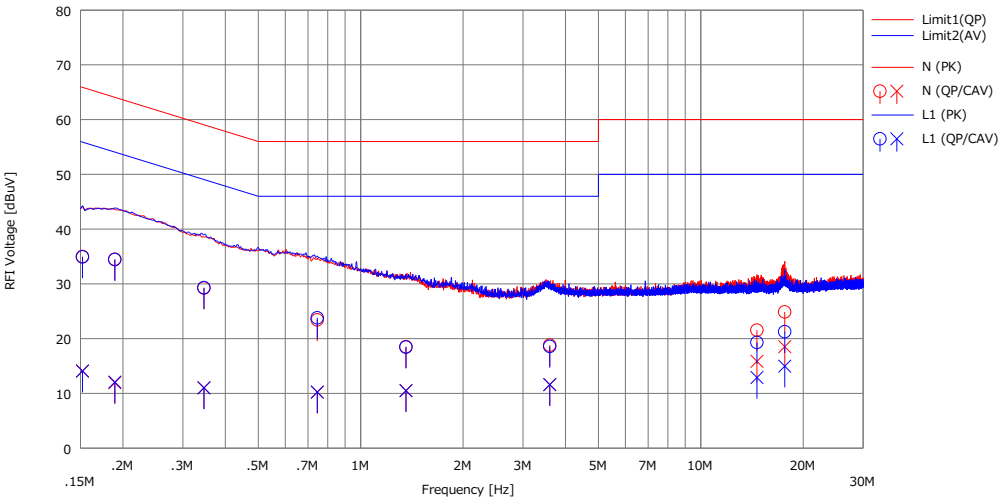
No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15218	20.03	-1.09	15.41	35.44	14.32	65.88	55.88	30.4	41.5	N	
2	0.16120	19.58	-2.75	15.42	35.00	12.67	65.40	55.40	30.4	42.7	N	
3	0.20013	19.16	-3.19	15.41	34.57	12.22	63.61	53.61	29.0	41.3	N	
4	0.35088	14.02	-4.38	15.43	29.45	11.05	58.94	48.94	29.4	37.8	N	
5	0.74212	8.19	-5.21	15.48	23.67	10.27	56.00	46.00	32.3	35.7	N	
6	1.55281	1.78	-5.92	15.54	17.32	9.62	56.00	46.00	38.6	36.3	N	
7	2.00626	1.34	-5.43	15.56	16.90	10.13	56.00	46.00	39.1	35.8	N	
8	13.05459	5.84	-0.46	16.14	21.98	15.68	60.00	50.00	38.0	34.3	N	
9	17.65030	11.81	5.56	16.34	28.15	21.90	60.00	50.00	31.8	28.1	N	
10	0.15218	19.97	-1.09	15.42	35.39	14.33	65.88	55.88	30.4	41.5	L1	
11	0.16120	19.55	-2.76	15.41	34.96	12.65	65.40	55.40	30.4	42.7	L1	
12	0.20013	19.10	-3.21	15.42	34.52	12.21	63.61	53.61	29.0	41.4	L1	
13	0.35088	14.13	-4.36	15.43	29.56	11.07	58.94	48.94	29.3	37.8	L1	
14	0.74212	8.53	-5.24	15.49	24.02	10.25	56.00	46.00	31.9	35.7	L1	
15	1.55281	1.99	-5.86	15.53	17.52	9.67	56.00	46.00	38.4	36.3	L1	
16	2.00626	1.51	-5.47	15.59	17.10	10.12	56.00	46.00	38.9	35.8	L1	
17	13.05459	4.10	-2.15	16.03	20.13	13.88	60.00	50.00	39.8	36.1	L1	
18	17.65030	7.82	1.50	16.17	23.99	17.67	60.00	50.00	36.0	32.3	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]

Conducted Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	December 5, 2024
Temperature / Humidity	23 deg. C / 40 % RH
Engineer	Yosuke Murakami
Mode	Tx BT LE (1M-PHY) 2480 MHz

Limit : FCC_Part 15 Subpart C(15.207)



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15213	19.58	-1.32	15.41	34.99	14.09	65.88	55.88	30.8	41.7	N	
2	0.18933	19.07	-3.46	15.41	34.48	11.95	64.07	54.07	29.5	42.1	N	
3	0.34608	13.80	-4.42	15.43	29.23	11.01	59.06	49.06	29.8	38.0	N	
4	0.74539	7.94	-5.27	15.48	23.42	10.21	56.00	46.00	32.5	35.7	N	
5	1.35895	3.00	-5.02	15.53	18.53	10.51	56.00	46.00	37.4	35.4	N	
6	3.59770	3.13	-4.06	15.66	18.79	11.60	56.00	46.00	37.2	34.4	N	
7	14.63029	5.33	-0.36	16.21	21.54	15.85	60.00	50.00	38.4	34.1	N	
8	17.65134	8.54	2.18	16.34	24.88	18.52	60.00	50.00	35.1	31.4	N	
9	0.15213	19.49	-1.34	15.42	34.91	14.08	65.88	55.88	30.9	41.8	L1	
10	0.18933	19.00	-3.35	15.42	34.42	12.07	64.07	54.07	29.6	42.0	L1	
11	0.34608	13.87	-4.44	15.43	29.30	10.99	59.06	49.06	29.7	38.0	L1	
12	0.74539	8.29	-5.25	15.49	23.78	10.24	56.00	46.00	32.2	35.7	L1	
13	1.35895	2.92	-5.04	15.51	18.43	10.47	56.00	46.00	37.5	35.5	L1	
14	3.59770	2.91	-4.06	15.66	18.57	11.60	56.00	46.00	37.4	34.4	L1	
15	14.63029	3.21	-3.18	16.08	19.29	12.90	60.00	50.00	40.7	37.1	L1	
16	17.65134	5.09	-1.20	16.17	21.26	14.97	60.00	50.00	38.7	35.0	L1	

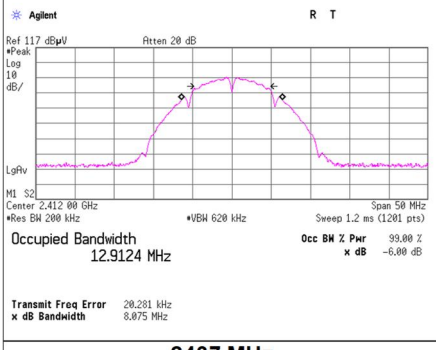
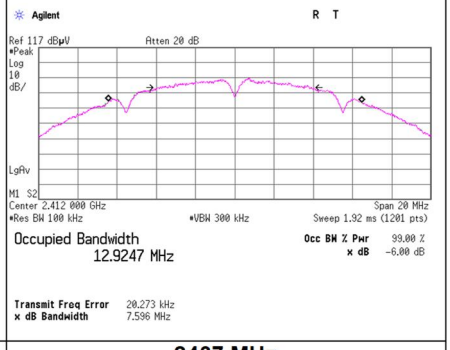
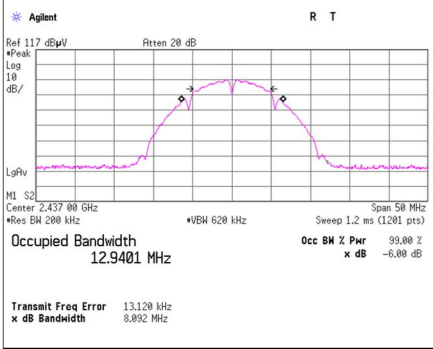
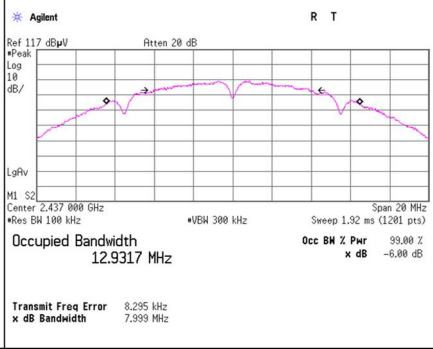
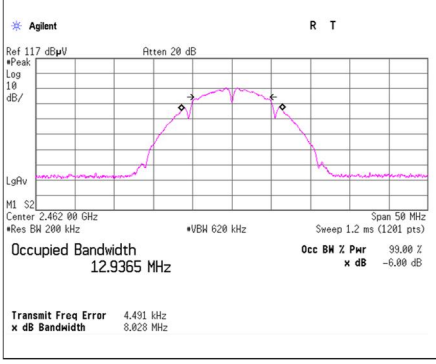
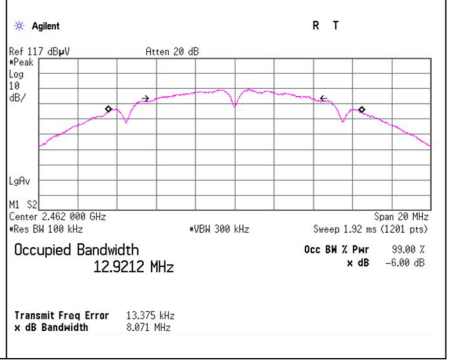
Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 3, 2024
Temperature / Humidity	25 deg. C / 55 % RH
Engineer	Makoto Hosaka
Mode	Tx

11b

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	12912.4	7.596	> 0.5000
2437	12940.1	7.999	> 0.5000
2462	12936.5	8.071	> 0.5000

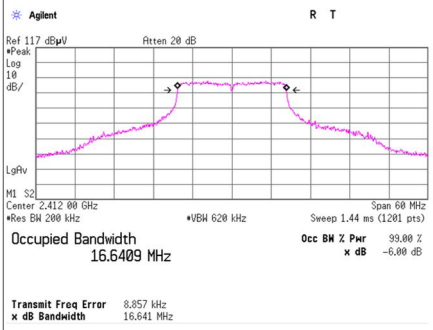
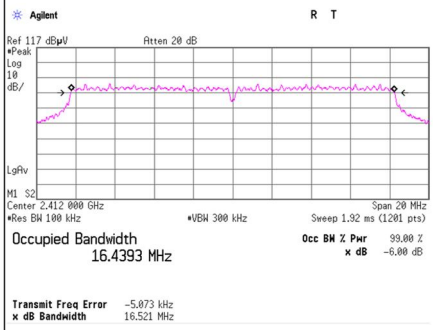
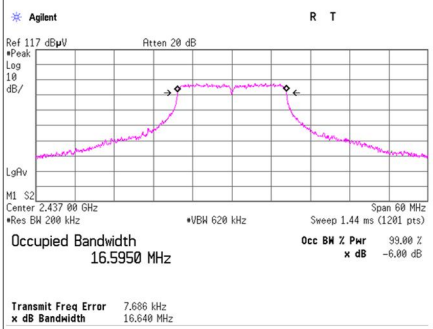
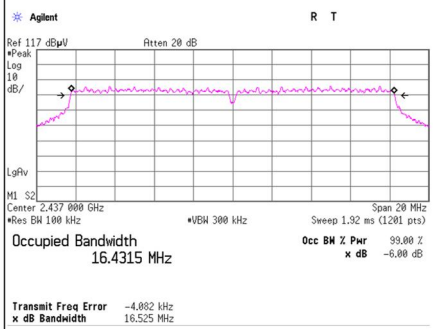
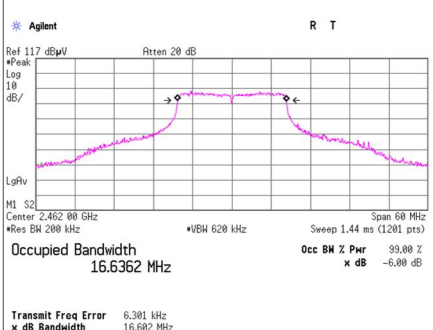
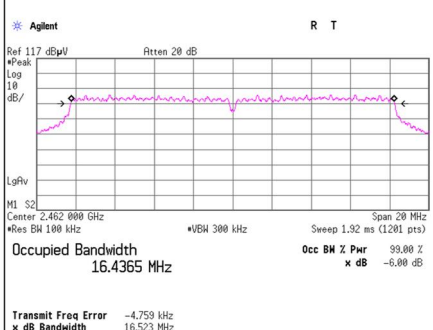
99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	2412 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2462 MHz
	

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 3, 2024
Temperature / Humidity	25 deg. C / 55 % RH
Engineer	Makoto Hosaka
Mode	Tx

11g

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	16640.9	16.521	> 0.5000
2437	16595.0	16.525	> 0.5000
2462	16636.2	16.523	> 0.5000

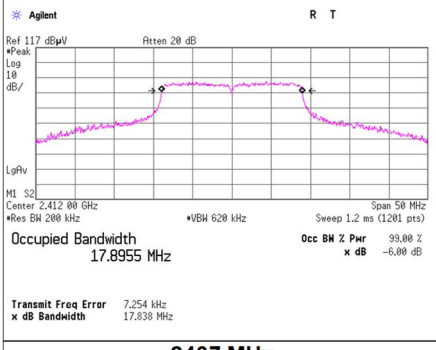
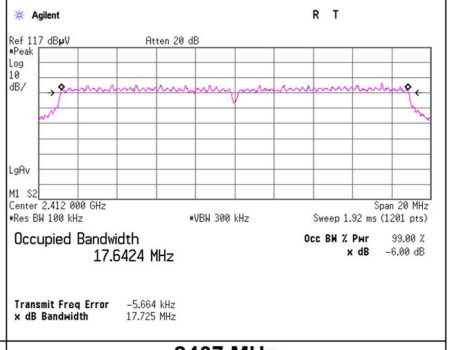
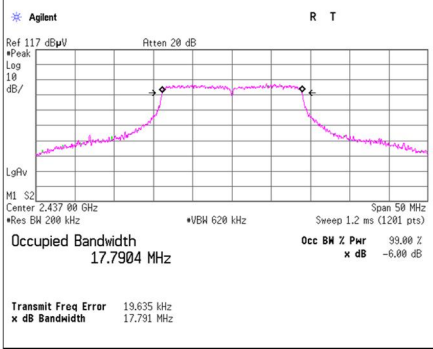
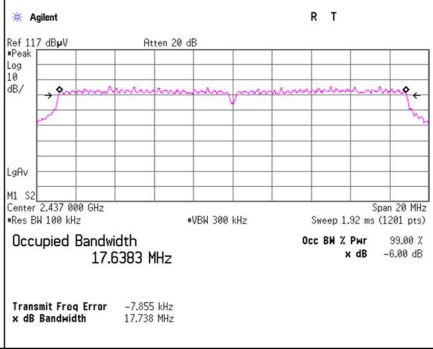
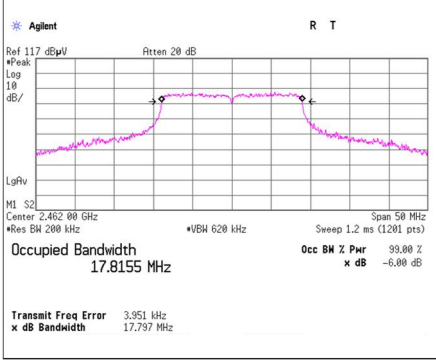
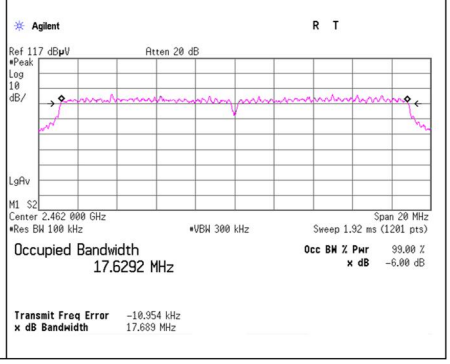
99 % Occupied Bandwidth	6 dB Bandwidth
2412 MHz	2412 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2462 MHz
	

99 % Occupied Bandwidth and 6 dB Bandwidth

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 3, 2024
Temperature / Humidity	25 deg. C / 55 % RH
Engineer	Makoto Hosaka
Mode	Tx

11n-20

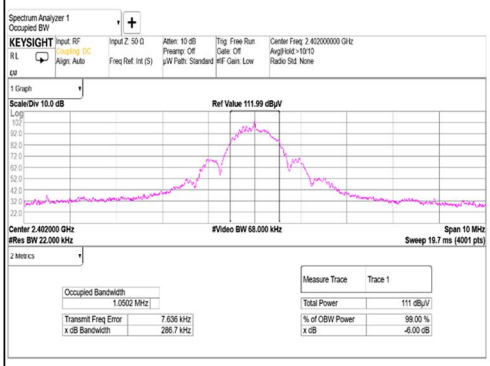
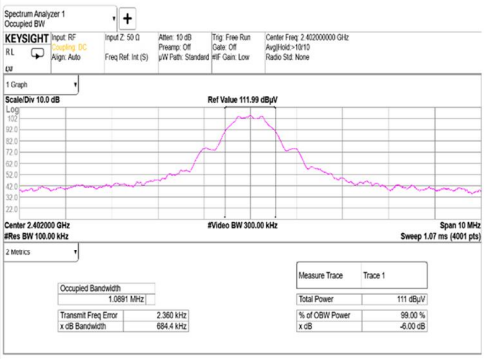
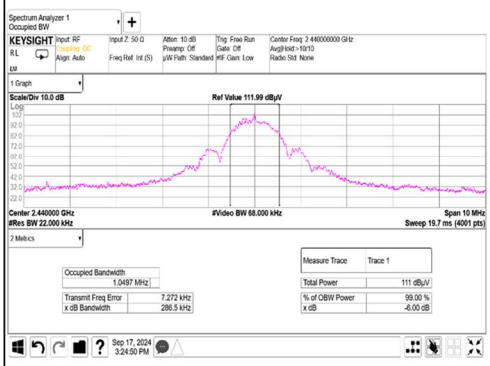
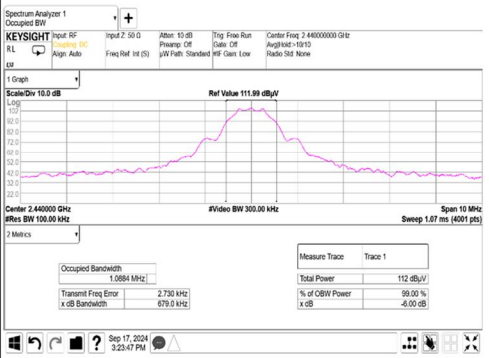
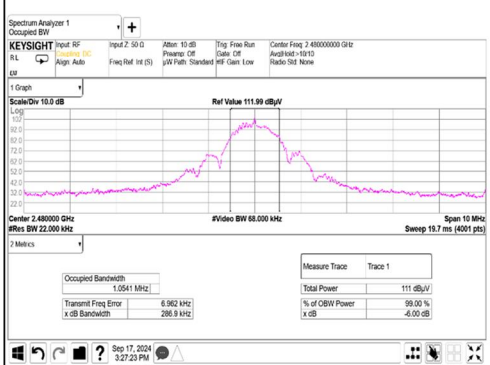
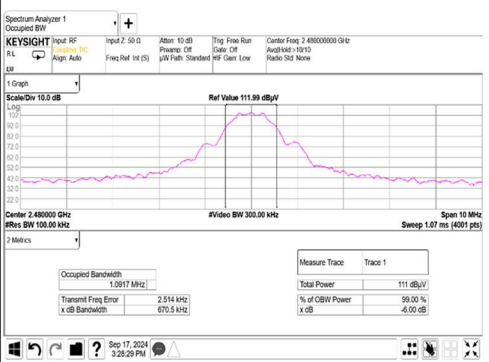
Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2412	17895.5	17.725	> 0.5000
2437	17790.4	17.738	> 0.5000
2462	17815.5	17.689	> 0.5000

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

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx BT LE (1M-PHY)

Frequency [MHz]	99 % Occupied Bandwidth [kHz]	6 dB Bandwidth [MHz]	Limit for 6 dB Bandwidth [MHz]
2402	1050.2	0.684	> 0.5000
2440	1049.7	0.679	> 0.5000
2480	1054.1	0.671	> 0.5000

99 % Occupied Bandwidth	6 dB Bandwidth
2402 MHz	2402 MHz
	
2440 MHz	2440 MHz
	
2480 MHz	2480 MHz
	

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 25, 2024
Temperature / Humidity	24 deg. C / 51 % RH
Engineer	Yuta Shiba
Mode	Tx

11b

Maximum peak output power 2 Mbps (short) (worst)

				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	0.70	1.73	9.89	12.32	17.07	30.00	1000	17.68	0.82	13.14	20.62	36.02	4000	22.88
2437	0.45	1.75	9.89	12.09	16.18	30.00	1000	17.91	0.82	12.91	19.54	36.02	4000	23.11
2462	0.31	1.78	9.89	11.98	15.79	30.00	1000	18.02	0.82	12.80	19.07	36.02	4000	23.22

11g

Maximum peak output power 36 Mbps (worst)

				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	7.31	1.73	9.89	18.93	78.21	30.00	1000	11.07	0.82	19.75	94.46	36.02	4000	16.27
2437	7.47	1.75	9.89	19.11	81.47	30.00	1000	10.89	0.82	19.93	98.40	36.02	4000	16.09
2462	7.14	1.78	9.89	18.81	76.10	30.00	1000	11.19	0.82	19.63	91.91	36.02	4000	16.39

11n-20

Maximum peak output power MCS 4 (worst)

				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	8.37	1.73	9.89	19.99	99.83	30.00	1000	10.01	0.82	20.81	120.57	36.02	4000	15.21
2437	8.29	1.75	9.89	19.93	98.40	30.00	1000	10.07	0.82	20.75	118.85	36.02	4000	15.27
2462	8.02	1.78	9.89	19.69	93.19	30.00	1000	10.31	0.82	20.51	112.56	36.02	4000	15.51

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx, BT LE (1M-PHY)

Maximum peak output power

				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	-1.99	1.71	9.89	9.61	9.15	30.00	1000	20.39	0.82	10.43	11.05	36.02	4000	25.59
2440	-1.93	1.76	9.89	9.72	9.38	30.00	1000	20.28	0.82	10.54	11.32	36.02	4000	25.48
2480	-1.85	1.78	9.89	9.82	9.59	30.00	1000	20.18	0.82	10.64	11.58	36.02	4000	25.38

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

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 24, 2024
Temperature / Humidity	26 deg. C / 47 % RH
Engineer	Kenichi Adachi
Mode	Tx

(Peak)

11b 2412MHz

Rate [Mbps]	Reading [dBm]	Remark
1	-1.36	
2 (long)	-1.40	
2(short)	-0.70	*
5.5 (long)	-1.18	
5.5 (short)	-0.81	
11 (long)	-1.34	
11 (short)	-1.08	

*: Worst Rate

11g 2412MHz

Rate [Mbps]	Reading [dBm]	Remark
6	2.52	
9	2.37	
12	2.59	
18	2.48	
24	5.39	
36	5.42	*
48	4.84	
54	3.79	

*: Worst Rate

11n-20 2412MHz

MCS	Reading [dBm]	Remark
0	2.60	
1	2.59	
2	2.54	
3	5.48	
4	6.13	*
5	5.46	
6	4.96	
7	5.50	

*: Worst Rate

* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.
* All comparisons were carried out on same frequency and measurement factors.
* This result value is not the final data and does not include cable attenuation or attenuation of attenuators.
* Worst rate check was performed at different power settings than the main measurements.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 25, 2024
Temperature / Humidity	24 deg. C / 51 % RH
Engineer	Yuta Shiba
Mode	Tx

11b

Average power 2 Mbps (short) (worst)

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.32	1.73	9.89	9.30	8.52	0.00	9.30	8.52
2437	-2.51	1.75	9.89	9.13	8.18	0.00	9.13	8.18
2462	-2.40	1.78	9.89	9.27	8.46	0.00	9.27	8.46
						(*1)		

11g

Average power 36 Mbps (worst)

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.55	1.73	9.89	9.07	8.08	0.00	9.07	8.08
2437	-2.66	1.75	9.89	8.98	7.91	0.00	8.98	7.91
2462	-2.77	1.78	9.89	8.90	7.77	0.00	8.90	7.77
						(*1)		

11n-20

Average power MCS 4 (worst)

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.51	1.73	9.89	9.11	8.15	0.00	9.11	8.15
2437	-2.65	1.75	9.89	8.99	7.93	0.00	8.99	7.93
2462	-2.64	1.78	9.89	9.03	8.01	0.00	9.03	8.01
						(*1)		

Sample Calculation: (*1) Power was measured with using the gate function of power meter.

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

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx BT LE (1M-PHY)

Average power

(*1)

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-2.21	1.71	9.89	9.39	8.69	0.00	9.39	8.69
2440	-2.13	1.76	9.89	9.52	8.95	0.00	9.52	8.95
2480	-2.03	1.78	9.89	9.64	9.20	0.00	9.64	9.20

(*1) Power was measured with using the gate function of power meter.

Sample Calculation:

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

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

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

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 24, 2024
Temperature / Humidity	26 deg. C / 47 % RH
Engineer	Kenichi Adachi
Mode	Tx

11b 2412MHz

Rate [Mbps]	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
1	-4.13	0.00	-4.13	
2 (long)	-4.06	0.00	-4.06	
2 (short)	-3.44	0.00	-3.44	*
5.5 (long)	-4.00	0.00	-4.00	
5.5 (short)	-3.61	0.00	-3.61	
11 (long)	-4.20	0.00	-4.20	
11 (short)	-3.75	0.00	-3.75	

*: Worst Rate

11g 2412MHz

Rate [Mbps]	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
6	-4.40	0.00	-4.40	
9	-4.42	0.00	-4.42	
12	-4.39	0.00	-4.39	
18	-4.40	0.00	-4.40	
24	-3.92	0.00	-3.92	
36	-3.64	0.00	-3.64	*
48	-3.65	0.00	-3.65	
54	-3.69	0.00	-3.69	

*: Worst Rate

11n-20 2412MHz

MCS	Reading [dBm]	Duty Factor [dB]	Result [dBm]	Remark
0	-4.40	0.00	-4.40	
1	-4.19	0.00	-4.19	
2	-4.16	0.00	-4.16	
3	-3.80	0.00	-3.80	
4	-3.74	0.00	-3.74	*
5	-4.02	0.00	-4.02	
6	-3.99	0.00	-3.99	
7	-3.91	0.00	-3.91	

*: Worst Rate

Sample Calculation: Result [dBm] = Reading [dBm] + Duty Factor [dB]

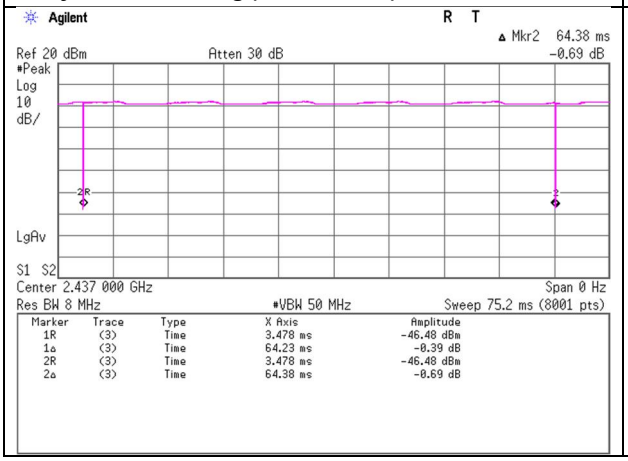
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.
* All comparisons were carried out on same frequency and measurement factors.
* This result value is not the final data and does not include cable attenuation or attenuation of attenuators.
* Worst rate check was performed at different power settings than the main measurements.
(*1) Power was measured with using the gate function of power meter.

Burst rate confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	October 2, 2024	October 3, 2024
Temperature / Humidity	24 deg. C / 57 % RH	25 deg. C / 55 % RH
Engineer	Makoto Hosaka	Makoto Hosaka
Mode	Tx	

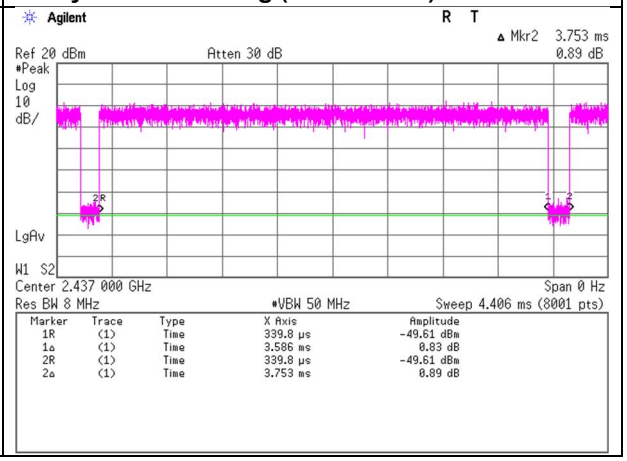
11b, 2 Mbps(short)

Tx on / (Tx on + Tx off) = 0.998
Tx on / (Tx on + Tx off) * 100 = 99.8 %
Duty factor = 20 * log (64.38 / 64.23) = 0.02 dB



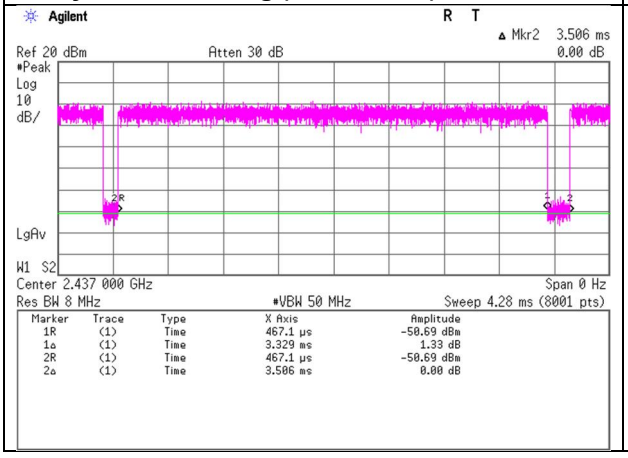
11g, 36 Mbps

Tx on / (Tx on + Tx off) = 0.956
Tx on / (Tx on + Tx off) * 100 = 95.6 %
Duty factor = 20 * log (3.753 / 3.586) = 0.40 dB



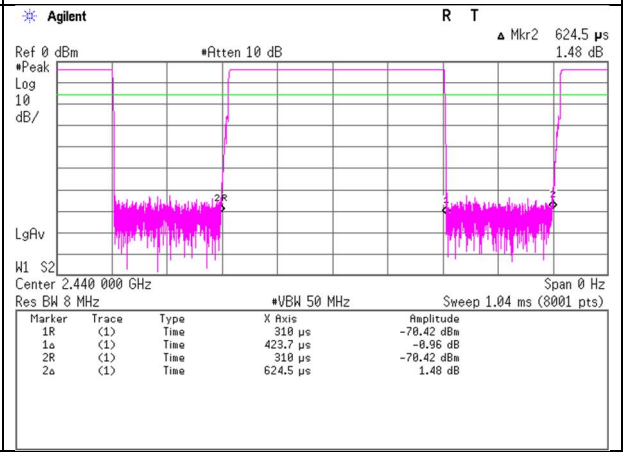
11n-20 MCS 4

Tx on / (Tx on + Tx off) = 0.950
Tx on / (Tx on + Tx off) * 100 = 95.0 %
Duty factor = 20 * log (3.506 / 3.329) = 0.45 dB



BT LE (1M-PHY)

Tx on / (Tx on + Tx off) = 0.678
Tx on / (Tx on + Tx off) * 100 = 67.8 %
Duty factor = 20 * log (0.625 / 0.424) = 3.37 dB

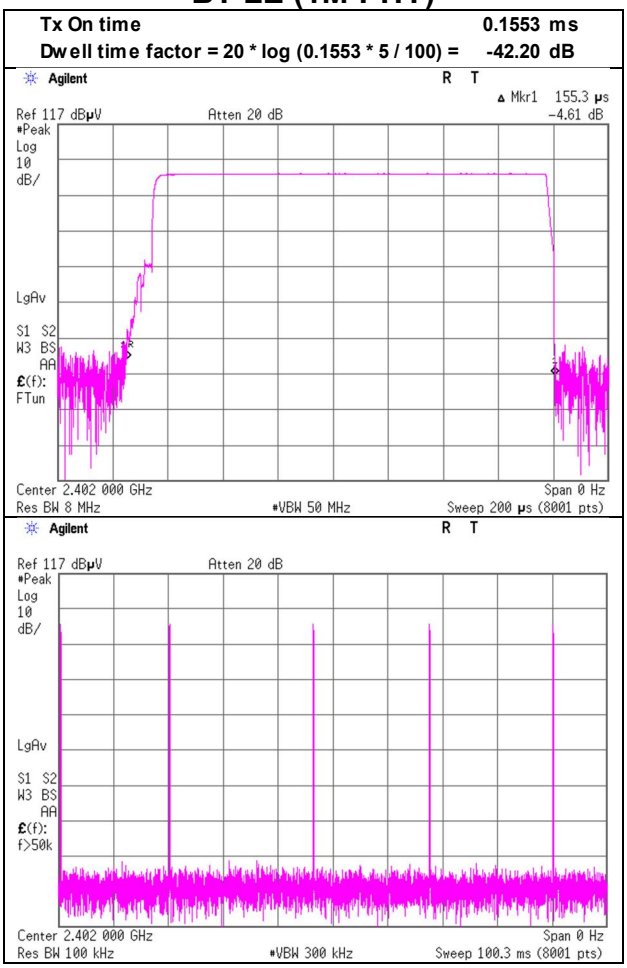


* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Duty cycle correction factor
(For Simultaneous transmission)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	March 4, 2025
Temperature / Humidity	24 deg. C / 27 % RH
Engineer	Yosuke Murakami
Mode	Tx, Advertise Mode

BT LE (1M-PHY)



Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2412 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2390.000	PK	47.22	27.85	-28.23	-	2.19	49.03	73.9	24.8	151	140	-
Hori.	4824.000	PK	47.45	32.07	-35.73	-	2.19	45.98	73.9	27.9	162	50	-
Hori.	7236.000	PK	46.38	36.38	-34.06	-	2.19	50.89	73.9	23.0	150	0	Floor Noise
Hori.	9648.000	PK	46.20	37.93	-31.63	-	2.19	54.69	73.9	19.2	150	0	Floor Noise
Hori.	2390.000	AV	36.83	27.85	-28.23	-	2.19	38.64	53.9	15.2	151	140	-
Hori.	4824.000	AV	37.05	32.07	-35.73	-	2.19	35.58	53.9	18.3	162	50	-
Hori.	7236.000	AV	35.45	36.38	-34.06	-	2.19	39.96	53.9	13.9	150	0	Floor Noise
Hori.	9648.000	AV	35.39	37.93	-31.63	-	2.19	43.88	53.9	**10.0**	150	0	Floor Noise
Vert.	2390.000	PK	47.23	27.85	-28.23	-	2.19	49.04	73.9	24.8	163	162	-
Vert.	4824.000	PK	46.71	32.07	-35.73	-	2.19	45.24	73.9	28.6	168	324	-
Vert.	7236.000	PK	46.77	36.38	-34.06	-	2.19	51.28	73.9	22.6	150	0	Floor Noise
Vert.	9648.000	PK	46.55	37.93	-31.63	-	2.19	55.04	73.9	18.8	150	0	Floor Noise
Vert.	2390.000	AV	36.14	27.85	-28.23	-	2.19	37.95	53.9	15.9	163	162	-
Vert.	4824.000	AV	35.86	32.07	-35.73	-	2.19	34.39	53.9	19.5	168	324	-
Vert.	7236.000	AV	35.37	36.38	-34.06	-	2.19	39.88	53.9	14.0	150	0	Floor Noise
Vert.	9648.000	AV	35.35	37.93	-31.63	-	2.19	43.84	53.9	**10.0**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

20 dBc Data Sheet

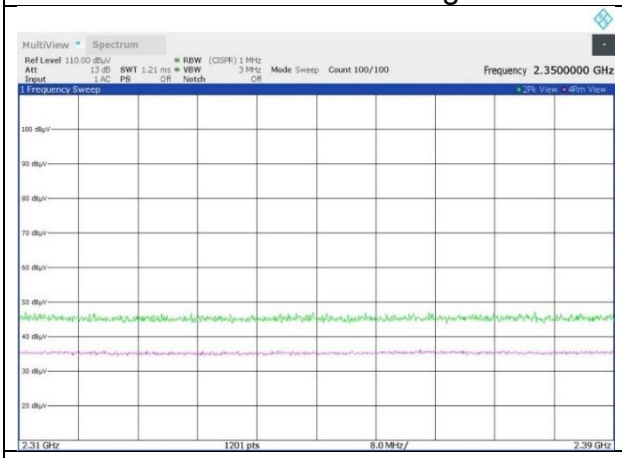
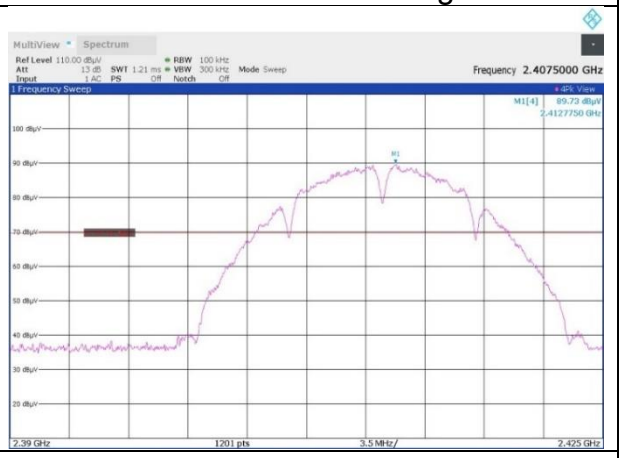
(RBW 100 kHz, VBW 300 kHz)

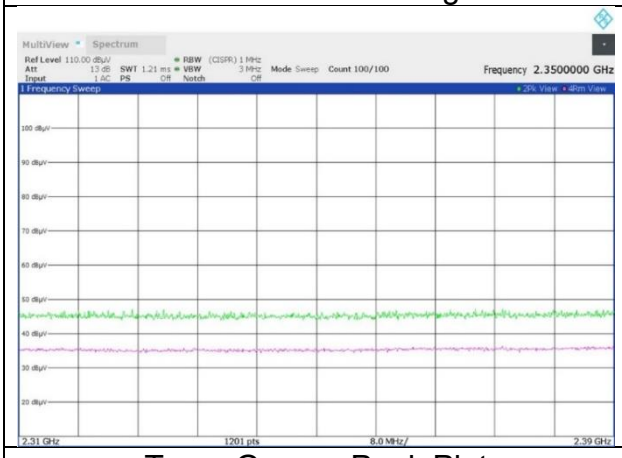
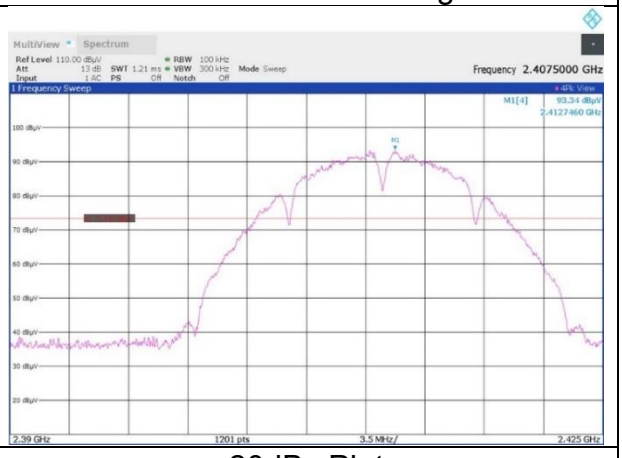
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.73	27.89	-28.23	-	2.19	91.58	-	-	Carrier
Hori.	2400.000	PK	39.41	27.89	-28.22	-	2.19	41.27	71.5	30.2	-
Vert.	2412.000	PK	93.34	27.89	-28.23	-	2.19	95.19	-	-	Carrier
Vert.	2400.000	PK	41.04	27.89	-28.22	-	2.19	42.90	75.1	32.2	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 5, 2024
Temperature / Humidity	24 deg.C, 62 %RH
Engineer	Yuta Shiba
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	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4874.000	PK	47.24	32.30	-35.79	-	2.19	45.94	73.9	27.9	162	50	-
Hori.	7311.000	PK	46.46	36.61	-33.93	-	2.19	51.33	73.9	22.5	150	0	Floor Noise
Hori.	9748.000	PK	46.23	37.93	-31.51	-	2.19	54.84	73.9	19.0	150	0	Floor Noise
Hori.	4874.000	AV	37.08	32.30	-35.79	-	2.19	35.78	53.9	18.1	162	50	-
Hori.	7311.000	AV	35.82	36.61	-33.93	-	2.19	40.69	53.9	13.2	150	0	Floor Noise
Hori.	9748.000	AV	34.79	37.93	-31.51	-	2.19	43.40	53.9	10.5	150	0	Floor Noise
Vert.	4874.000	PK	46.46	32.30	-35.79	-	2.19	45.16	73.9	28.7	165	326	-
Vert.	7311.000	PK	46.50	36.61	-33.93	-	2.19	51.37	73.9	22.5	150	0	Floor Noise
Vert.	9748.000	PK	46.06	37.93	-31.51	-	2.19	54.67	73.9	19.2	150	0	Floor Noise
Vert.	4874.000	AV	35.89	32.30	-35.79	-	2.19	34.59	53.9	19.3	165	326	-
Vert.	7311.000	AV	35.76	36.61	-33.93	-	2.19	40.63	53.9	13.2	150	0	Floor Noise
Vert.	9748.000	AV	34.85	37.93	-31.51	-	2.19	43.46	53.9	**10.4**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11b 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2483.500	PK	47.11	27.96	-28.18	-	2.19	49.08	73.9	24.8	171	142	-
Hori.	4924.000	PK	47.04	32.55	-35.84	-	2.19	45.94	73.9	27.9	185	53	-
Hori.	7386.000	PK	46.48	36.71	-33.78	-	2.19	51.60	73.9	22.3	150	0	Floor Noise
Hori.	9848.000	PK	46.03	37.92	-31.38	-	2.19	54.76	73.9	19.1	150	0	Floor Noise
Hori.	2483.500	AV	35.40	27.96	-28.18	-	2.19	37.37	53.9	16.5	171	142	-
Hori.	4924.000	AV	36.23	32.55	-35.84	-	2.19	35.13	53.9	18.7	185	53	-
Hori.	7386.000	AV	35.45	36.71	-33.78	-	2.19	40.57	53.9	13.3	150	0	Floor Noise
Hori.	9848.000	AV	35.21	37.92	-31.38	-	2.19	43.94	53.9	9.9	150	0	Floor Noise
Vert.	2483.500	PK	47.70	27.96	-28.18	-	2.19	49.67	73.9	24.2	162	159	-
Vert.	4924.000	PK	46.79	32.55	-35.84	-	2.19	45.69	73.9	28.2	168	325	-
Vert.	7386.000	PK	46.17	36.71	-33.78	-	2.19	51.29	73.9	22.6	150	0	Floor Noise
Vert.	9848.000	PK	46.23	37.92	-31.38	-	2.19	54.96	73.9	18.9	150	0	Floor Noise
Vert.	2483.500	AV	35.42	27.96	-28.18	-	2.19	37.39	53.9	16.5	162	159	-
Vert.	4924.000	AV	35.85	32.55	-35.84	-	2.19	34.75	53.9	19.1	168	325	-
Vert.	7386.000	AV	35.53	36.71	-33.78	-	2.19	40.65	53.9	13.2	150	0	Floor Noise
Vert.	9848.000	AV	35.31	37.92	-31.38	-	2.19	44.04	53.9	**9.8**	150	0	Floor Noise

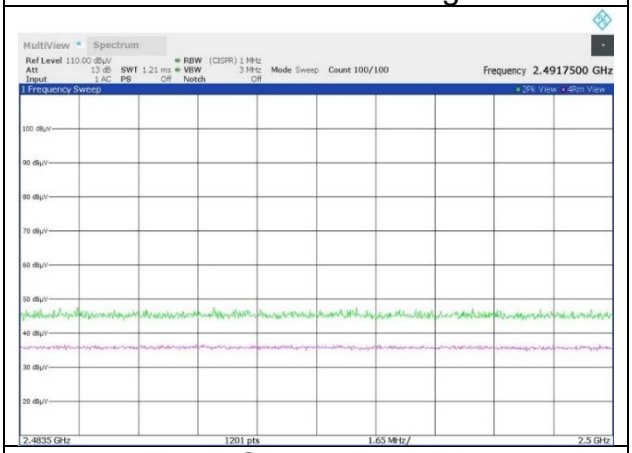
Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 5, 2024
Temperature / Humidity	24 deg.C, 62 %RH
Engineer	Yuta Shiba
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	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2412 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2390.000	PK	58.34	27.85	-28.23	-	2.19	60.15	73.9	13.7	169	145	-
Hori.	4824.000	PK	46.85	32.07	-35.73	-	2.19	45.38	73.9	28.5	158	52	-
Hori.	7236.000	PK	46.39	36.38	-34.06	-	2.19	50.90	73.9	23.0	150	0	Floor Noise
Hori.	9648.000	PK	46.02	37.93	-31.63	-	2.19	54.51	73.9	19.3	150	0	Floor Noise
Hori.	7236.000	AV	35.52	36.38	-34.06	-	2.19	40.03	53.9	13.8	150	0	Floor Noise
Hori.	9648.000	AV	35.32	37.93	-31.63	-	2.19	43.81	53.9	10.0	150	0	Floor Noise
Vert.	2390.000	PK	62.36	27.85	-28.23	-	2.19	64.17	73.9	9.7	155	168	-
Vert.	4824.000	PK	46.63	32.07	-35.73	-	2.19	45.16	73.9	28.7	152	332	-
Vert.	7236.000	PK	46.27	36.38	-34.06	-	2.19	50.78	73.9	23.1	150	0	Floor Noise
Vert.	9648.000	PK	46.31	37.93	-31.63	-	2.19	54.80	73.9	19.1	150	0	Floor Noise
Vert.	7236.000	AV	35.36	36.38	-34.06	-	2.19	39.87	53.9	14.0	150	0	Floor Noise
Vert.	9648.000	AV	35.25	37.93	-31.63	-	2.19	43.74	53.9	10.1	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	39.98	27.85	-28.23	-	0.40	2.19	42.19	53.9	11.7	*1)
Hori.	4824.000	AV	36.83	32.07	-35.73	-	0.40	2.19	35.76	53.9	18.1	-
Vert.	2390.000	AV	44.01	27.85	-28.23	-	0.40	2.19	46.22	53.9	**7.6**	*1)
Vert.	4824.000	AV	35.77	32.07	-35.73	-	0.40	2.19	34.70	53.9	19.2	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

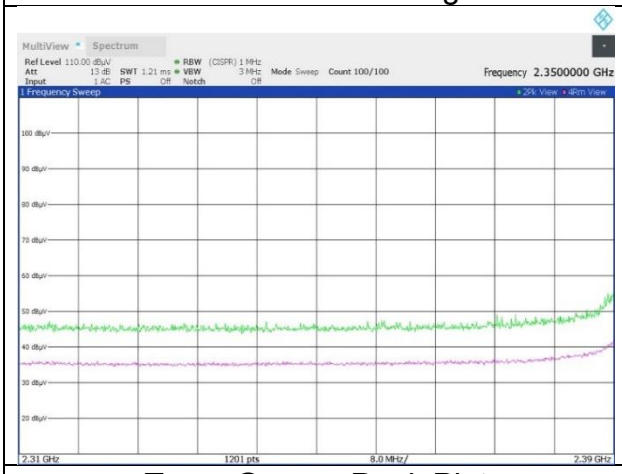
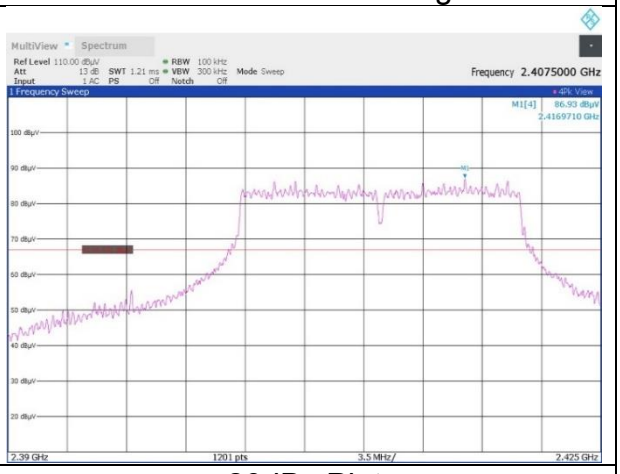
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

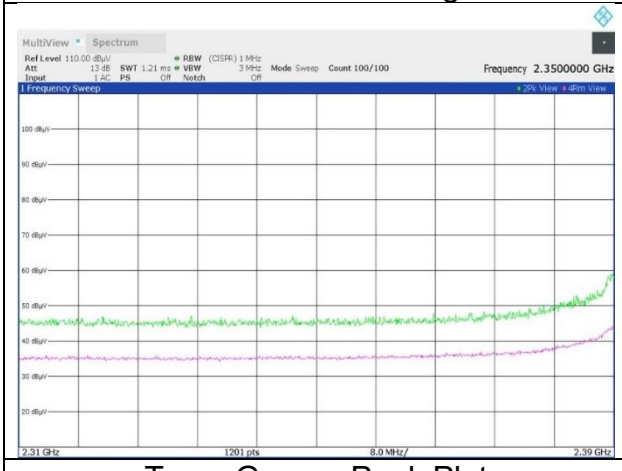
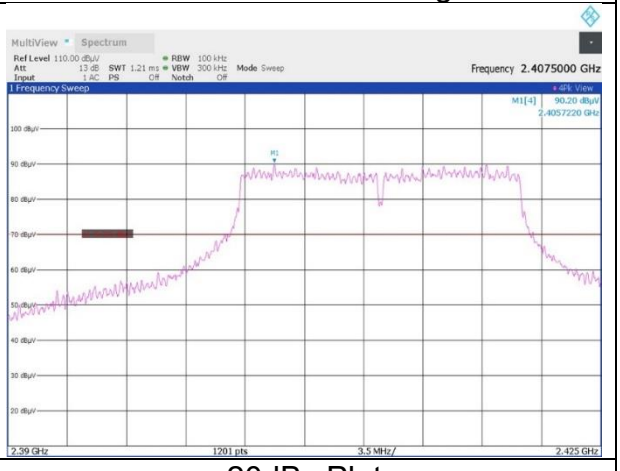
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.93	27.89	-28.23	-	2.19	88.78	-	-	Carrier
Hori.	2400.000	PK	56.30	27.89	-28.22	-	2.19	58.16	68.7	10.5	-
Vert.	2412.000	PK	90.20	27.89	-28.23	-	2.19	92.05	-	-	Carrier
Vert.	2400.000	PK	59.73	27.89	-28.22	-	2.19	61.59	72.0	10.4	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 5, 2024
Temperature / Humidity	24 deg.C, 62 %RH
Engineer	Yuta Shiba
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	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4874.000	PK	47.33	32.30	-35.79	-	2.19	46.03	73.9	27.8	163	50	-
Hori.	7311.000	PK	46.34	36.61	-33.93	-	2.19	51.21	73.9	22.6	150	0	Floor Noise
Hori.	9748.000	PK	46.10	37.93	-31.51	-	2.19	54.71	73.9	19.1	150	0	Floor Noise
Hori.	7311.000	AV	35.85	36.61	-33.93	-	2.19	40.72	53.9	13.1	150	0	Floor Noise
Hori.	9748.000	AV	34.94	37.93	-31.51	-	2.19	43.55	53.9	**10.3**	150	0	Floor Noise
Vert.	4874.000	PK	46.63	32.30	-35.79	-	2.19	45.33	73.9	28.5	168	336	-
Vert.	7311.000	PK	46.67	36.61	-33.93	-	2.19	51.54	73.9	22.3	150	0	Floor Noise
Vert.	9748.000	PK	46.40	37.93	-31.51	-	2.19	55.01	73.9	18.8	150	0	Floor Noise
Vert.	7311.000	AV	35.77	36.61	-33.93	-	2.19	40.64	53.9	13.2	150	0	Floor Noise
Vert.	9748.000	AV	34.89	37.93	-31.51	-	2.19	43.50	53.9	10.4	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	36.76	32.30	-35.79	-	0.40	2.19	35.86	53.9	18.0	-
Vert.	4874.000	AV	35.97	32.30	-35.79	-	0.40	2.19	35.07	53.9	18.8	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 5, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 62 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11g 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2483.500	PK	58.93	27.96	-28.18	-	2.19	60.90	73.9	13.0	163	145	-
Hori.	4924.000	PK	46.97	32.55	-35.84	-	2.19	45.87	73.9	28.0	215	52	-
Hori.	7386.000	PK	46.16	36.71	-33.78	-	2.19	51.28	73.9	22.6	150	0	Floor Noise
Hori.	9848.000	PK	46.31	37.92	-31.38	-	2.19	55.04	73.9	18.8	150	0	Floor Noise
Hori.	7386.000	AV	35.47	36.71	-33.78	-	2.19	40.59	53.9	13.3	150	0	Floor Noise
Hori.	9848.000	AV	35.27	37.92	-31.38	-	2.19	44.00	53.9	9.9	150	0	Floor Noise
Vert.	2483.500	PK	62.72	27.96	-28.18	-	2.19	64.69	73.9	9.2	144	158	-
Vert.	4924.000	PK	46.41	32.55	-35.84	-	2.19	45.31	73.9	28.5	168	325	-
Vert.	7386.000	PK	46.22	36.71	-33.78	-	2.19	51.34	73.9	22.5	150	0	Floor Noise
Vert.	9848.000	PK	46.28	37.92	-31.38	-	2.19	55.01	73.9	18.8	150	0	Floor Noise
Vert.	7386.000	AV	35.50	36.71	-33.78	-	2.19	40.62	53.9	13.2	150	0	Floor Noise
Vert.	9848.000	AV	35.22	37.92	-31.38	-	2.19	43.95	53.9	9.9	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

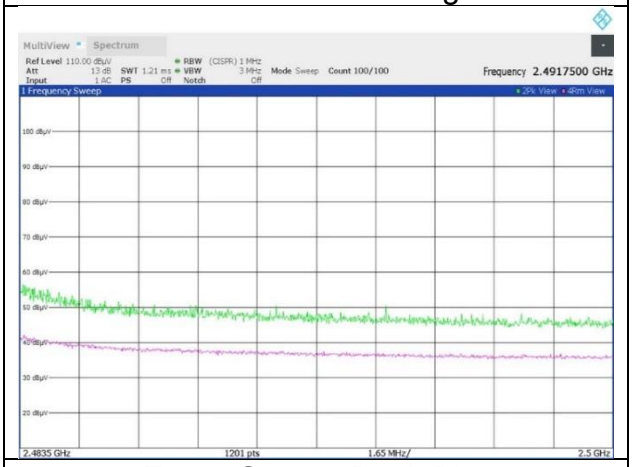
Average measurement value with Duty Factor

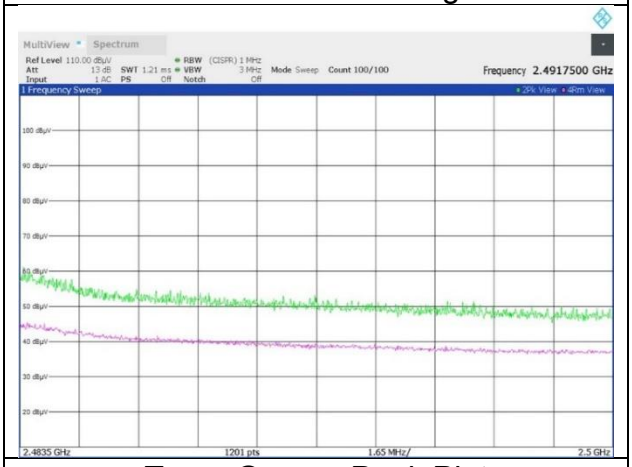
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	43.06	27.96	-28.18	-	0.40	2.19	45.43	53.9	8.4	*1)
Hori.	4924.000	AV	36.20	32.55	-35.84	-	0.40	2.19	35.50	53.9	18.4	-
Vert.	2483.500	AV	46.17	27.96	-28.18	-	0.40	2.19	48.54	53.9	**5.3**	*1)
Vert.	4924.000	AV	35.80	32.55	-35.84	-	0.40	2.19	35.10	53.9	18.8	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 5, 2024
Temperature / Humidity	24 deg.C, 62 %RH
Engineer	Yuta Shiba
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	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 6, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	23 deg.C, 60 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Yohsuke Matsuzawa	Takayuki Kobayashi	Yuta Shiba
	(30 MHz to1 GHz)	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2412 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	193.345	QP	37.20	14.12	7.15	33.13	0.00	25.34	43.5	18.1	166	62	-
Hori.	276.448	QP	49.00	13.16	7.43	32.94	0.00	36.65	46.0	9.3	121	70	-
Hori.	322.107	QP	52.70	14.23	7.57	32.84	0.00	41.66	46.0	**4.3**	100	301	-
Hori.	499.999	QP	41.20	17.76	8.04	32.38	0.00	34.62	46.0	11.3	100	62	-
Hori.	959.971	QP	35.10	22.25	8.93	30.34	0.00	35.94	46.0	10.0	100	141	-
Hori.	2390.000	PK	62.28	27.85	-28.23	-	2.19	64.09	73.9	9.8	164	142	-
Hori.	4824.000	PK	47.13	32.07	-35.73	-	2.19	45.66	73.9	28.2	157	55	-
Hori.	7236.000	PK	46.57	36.38	-34.06	-	2.19	51.08	73.9	22.8	150	0	Floor Noise
Hori.	9648.000	PK	46.24	37.93	-31.63	-	2.19	54.73	73.9	19.1	150	0	Floor Noise
Hori.	7236.000	AV	35.49	36.38	-34.06	-	2.19	40.00	53.9	13.9	150	0	Floor Noise
Hori.	9648.000	AV	35.29	37.93	-31.63	-	2.19	43.78	53.9	10.1	150	0	Floor Noise
Vert.	39.155	QP	39.10	11.64	6.32	32.91	0.00	24.15	40.0	15.8	100	320	-
Vert.	59.338	QP	46.70	9.52	6.38	33.15	0.00	29.45	40.0	10.5	100	174	-
Vert.	328.625	QP	39.50	14.46	7.59	32.83	0.00	28.72	46.0	17.2	100	148	-
Vert.	479.990	QP	37.80	17.18	8.00	32.45	0.00	30.53	46.0	15.4	143	128	-
Vert.	499.998	QP	42.90	17.76	8.04	32.38	0.00	36.32	46.0	9.6	127	199	-
Vert.	2390.000	PK	66.56	27.85	-28.23	-	2.19	68.37	73.9	5.5	133	169	-
Vert.	4824.000	PK	46.68	32.07	-35.73	-	2.19	45.21	73.9	28.6	137	333	-
Vert.	7236.000	PK	46.36	36.38	-34.06	-	2.19	50.87	73.9	23.0	150	0	Floor Noise
Vert.	9648.000	PK	46.09	37.93	-31.63	-	2.19	54.58	73.9	19.3	150	0	Floor Noise
Vert.	7236.000	AV	35.48	36.38	-34.06	-	2.19	39.99	53.9	13.9	150	0	Floor Noise
Vert.	9648.000	AV	35.24	37.93	-31.63	-	2.19	43.73	53.9	10.1	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	42.75	27.85	-28.23	-	0.45	2.19	45.01	53.9	8.8	*1)
Hori.	4824.000	AV	36.87	32.07	-35.73	-	0.45	2.19	35.85	53.9	18.0	-
Vert.	2390.000	AV	47.21	27.85	-28.23	-	0.45	2.19	49.47	53.9	4.4	*1)
Vert.	4824.000	AV	35.63	32.07	-35.73	-	0.45	2.19	34.61	53.9	19.2	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

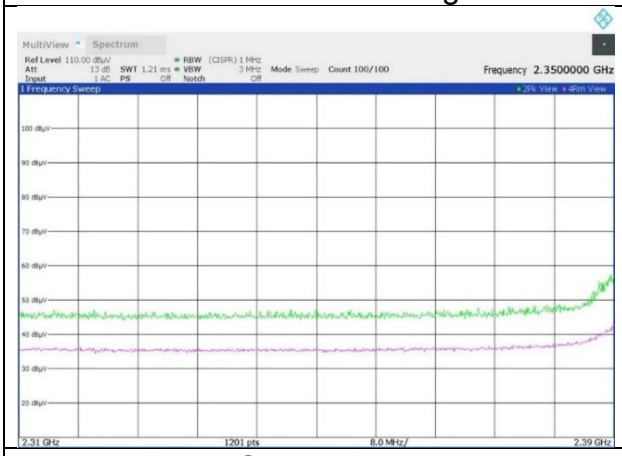
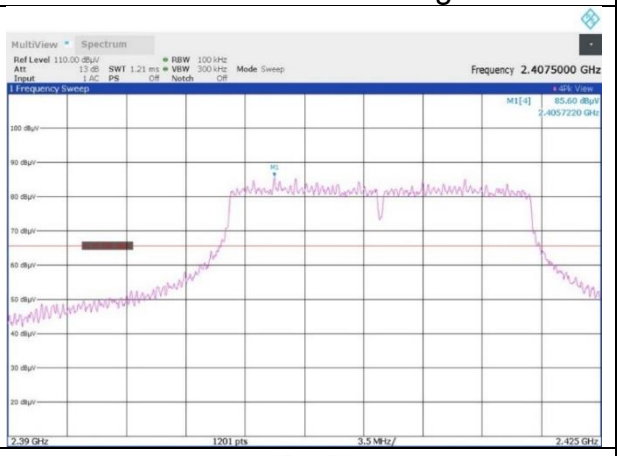
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

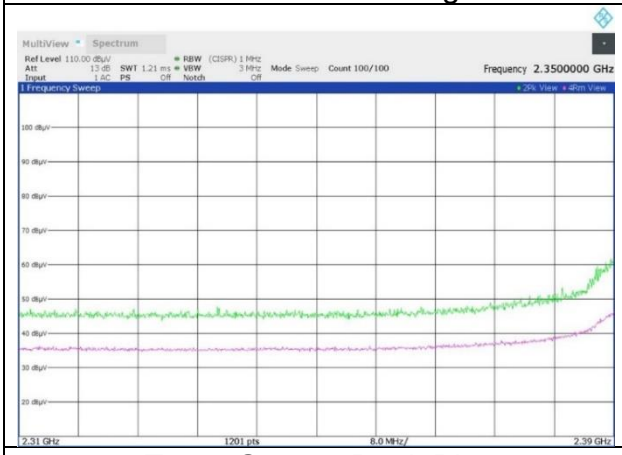
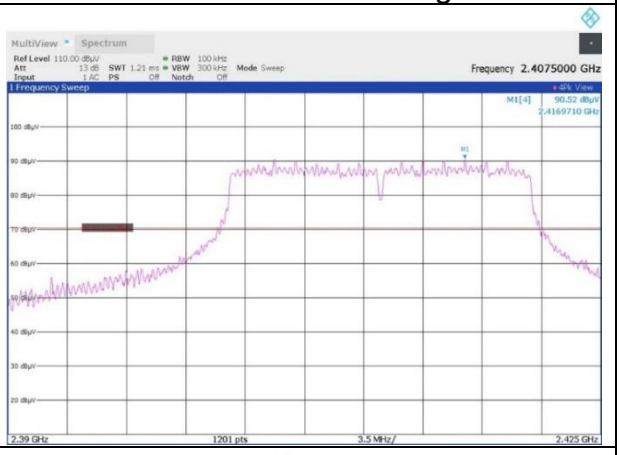
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	85.60	27.89	-28.23	-	2.19	87.45	-	-	Carrier
Hori.	2400.000	PK	56.75	27.89	-28.22	-	2.19	58.61	67.4	8.7	-
Vert.	2412.000	PK	90.52	27.89	-28.23	-	2.19	92.37	-	-	Carrier
Vert.	2400.000	PK	62.18	27.89	-28.22	-	2.19	64.04	72.3	8.2	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 6, 2024
Temperature / Humidity	23 deg.C, 60 %RH
Engineer	Yohsuke Matsuzawa
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	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 6, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	23 deg.C, 60 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yohsuke Matsuzawa	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2437 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4874.000	PK	47.26	32.30	-35.79	-	2.19	45.96	73.9	27.9	171	53	-
Hori.	7311.000	PK	46.46	36.61	-33.93	-	2.19	51.33	73.9	22.5	150	0	Floor Noise
Hori.	9748.000	PK	45.98	37.93	-31.51	-	2.19	54.59	73.9	19.3	150	0	Floor Noise
Hori.	7311.000	AV	35.92	36.61	-33.93	-	2.19	40.79	53.9	13.1	150	0	Floor Noise
Hori.	9748.000	AV	34.85	37.93	-31.51	-	2.19	43.46	53.9	**10.4**	150	0	Floor Noise
Vert.	4874.000	PK	46.57	32.30	-35.79	-	2.19	45.27	73.9	28.6	174	318	-
Vert.	7311.000	PK	46.48	36.61	-33.93	-	2.19	51.35	73.9	22.5	150	0	Floor Noise
Vert.	9748.000	PK	46.05	37.93	-31.51	-	2.19	54.66	73.9	19.2	150	0	Floor Noise
Vert.	7311.000	AV	35.84	36.61	-33.93	-	2.19	40.71	53.9	13.1	150	0	Floor Noise
Vert.	9748.000	AV	34.80	37.93	-31.51	-	2.19	43.41	53.9	**10.4**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4874.000	AV	36.64	32.30	-35.79	-	0.45	2.19	35.79	53.9	18.1	-
Vert.	4874.000	AV	36.01	32.30	-35.79	-	0.45	2.19	35.16	53.9	18.7	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 6, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	23 deg.C, 60 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yohsuke Matsuzawa	Takayuki Kobayashi	Yuta Shiba
	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2462 MHz		

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2483.500	PK	51.83	27.96	-28.18	-	2.19	53.80	73.9	20.1	133	144	-
Hori.	4924.000	PK	46.82	32.55	-35.84	-	2.19	45.72	73.9	28.1	116	55	-
Hori.	7386.000	PK	46.21	36.71	-33.78	-	2.19	51.33	73.9	22.5	150	0	Floor Noise
Hori.	9848.000	PK	46.05	37.92	-31.38	-	2.19	54.78	73.9	19.1	150	0	Floor Noise
Hori.	7386.000	AV	35.41	36.71	-33.78	-	2.19	40.53	53.9	13.3	150	0	Floor Noise
Hori.	9848.000	AV	35.31	37.92	-31.38	-	2.19	44.04	53.9	9.8	150	0	Floor Noise
Vert.	2483.500	PK	68.35	27.96	-28.18	-	2.19	70.32	73.9	3.5	134	164	-
Vert.	4924.000	PK	46.65	32.55	-35.84	-	2.19	45.55	73.9	28.3	202	322	-
Vert.	7386.000	PK	46.14	36.71	-33.78	-	2.19	51.26	73.9	22.6	150	0	Floor Noise
Vert.	9848.000	PK	46.07	37.92	-31.38	-	2.19	54.80	73.9	19.1	150	0	Floor Noise
Vert.	7386.000	AV	35.37	36.71	-33.78	-	2.19	40.49	53.9	13.4	150	0	Floor Noise
Vert.	9848.000	AV	35.20	37.92	-31.38	-	2.19	43.93	53.9	9.9	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

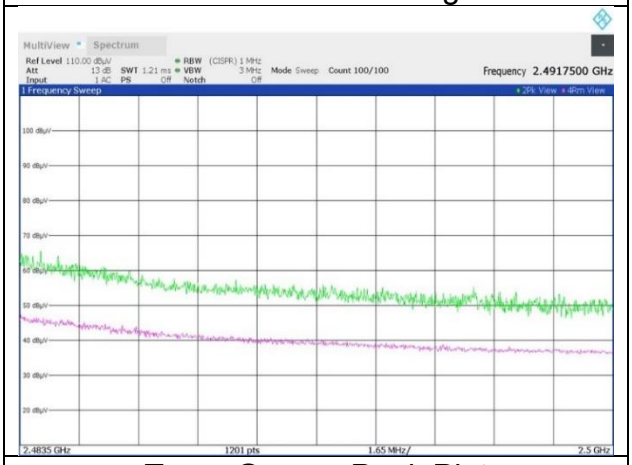
Average measurement value with Duty Factor

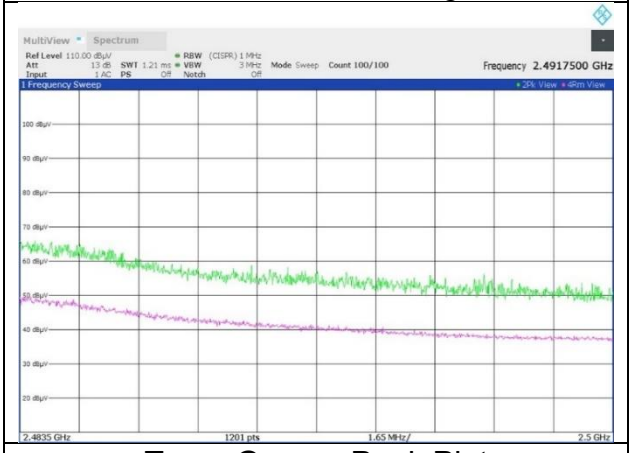
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	45.75	27.96	-28.18	-	0.45	2.19	48.17	53.9	5.7	*1)
Hori.	4924.000	AV	36.20	32.55	-35.84	-	0.45	2.19	35.55	53.9	18.3	-
Vert.	2483.500	AV	48.46	27.96	-28.18	-	0.45	2.19	50.88	53.9	**3.0**	*1)
Vert.	4924.000	AV	35.76	32.55	-35.84	-	0.45	2.19	35.11	53.9	18.7	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 6, 2024
Temperature / Humidity	23 deg.C, 60 %RH
Engineer	Yohsuke Matsuzawa
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	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(30 MHz to1 GHz)	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx BT LE (1M-PHY) 2402 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	2390.000	PK	51.84	27.85	-28.23	-	2.19	53.65	73.9	20.2	156	85	-
Hori.	4804.000	PK	47.74	31.97	-35.72	-	2.19	46.18	73.9	27.7	143	59	-
Hori.	7206.000	PK	46.55	36.23	-34.11	-	2.19	50.86	73.9	23.0	150	0	Floor Noise
Hori.	9608.000	PK	46.67	37.93	-31.67	-	2.19	55.12	73.9	18.7	142	55	-
Hori.	7206.000	AV	35.85	36.23	-34.11	-	2.19	40.16	53.9	13.7	150	0	Floor Noise
Vert.	2390.000	PK	51.29	27.85	-28.23	-	2.19	53.10	73.9	20.8	146	173	-
Vert.	4804.000	PK	46.51	31.97	-35.72	-	2.19	44.95	73.9	28.9	159	172	-
Vert.	7206.000	PK	46.13	36.23	-34.11	-	2.19	50.44	73.9	23.4	150	0	Floor Noise
Vert.	9608.000	PK	46.82	37.93	-31.67	-	2.19	55.27	73.9	18.6	171	176	-
Vert.	7206.000	AV	35.28	36.23	-34.11	-	2.19	39.59	53.9	14.3	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	36.84	27.85	-28.23	-	3.37	2.19	42.02	53.9	11.8	*1)
Hori.	4804.000	AV	35.97	31.97	-35.72	-	3.37	2.19	37.78	53.9	16.1	-
Hori.	9608.000	AV	35.83	37.93	-31.67	-	3.37	2.19	47.65	53.9	**6.2**	-
Vert.	2390.000	AV	37.08	27.85	-28.23	-	3.37	2.19	42.26	53.9	11.6	*1)
Vert.	4804.000	AV	35.83	31.97	-35.72	-	3.37	2.19	37.64	53.9	16.2	-
Vert.	9608.000	AV	35.87	37.93	-31.67	-	3.37	2.19	47.69	53.9	**6.2**	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

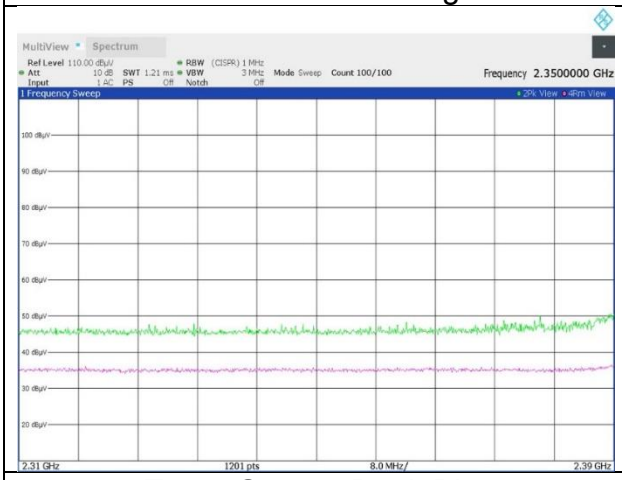
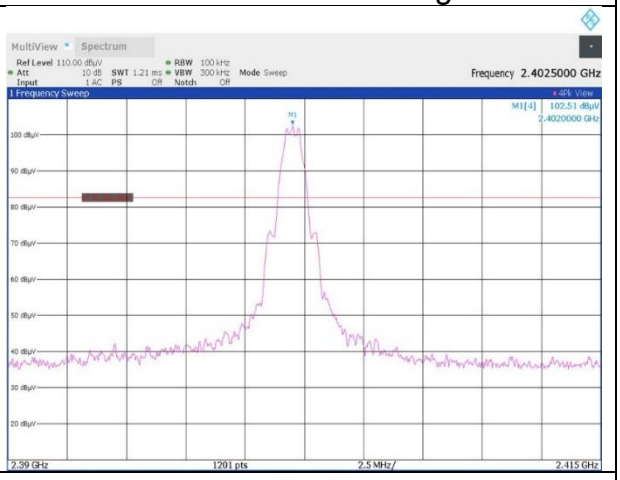
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

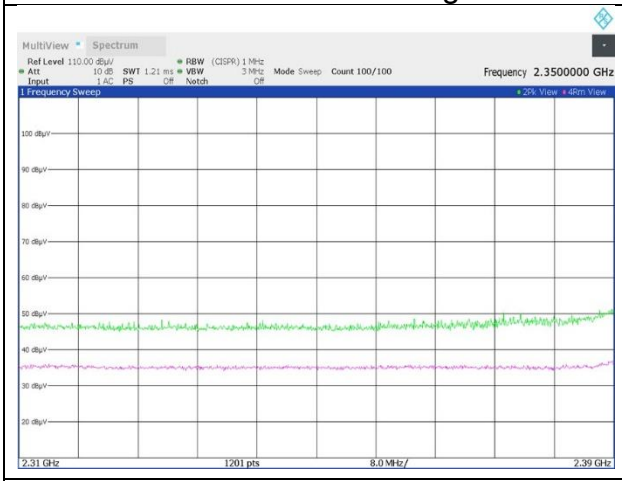
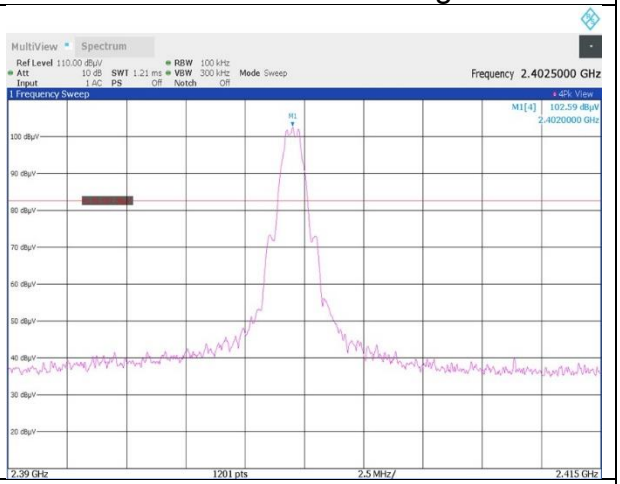
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	102.51	27.89	-28.22	-	2.19	104.37	-	-	Carrier
Hori.	2400.000	PK	47.23	27.89	-28.22	-	2.19	49.09	84.3	35.2	-
Vert.	2402.000	PK	102.59	27.89	-28.22	-	2.19	104.45	-	-	Carrier
Vert.	2400.000	PK	47.03	27.89	-28.22	-	2.19	48.89	84.4	35.5	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 12, 2024
Temperature / Humidity	22 deg.C, 43 %RH
Engineer	Akihiro Oda
Mode	Tx BT LE (1M-PHY) 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	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(30 MHz to1 GHz)	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx BT LE (1M-PHY) 2440 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	4880.000	PK	47.22	32.33	-35.79	-	2.19	45.95	73.9	27.9	129	178	-
Hori.	7320.000	PK	47.15	36.62	-33.90	-	2.19	52.06	73.9	21.8	150	0	Floor Noise
Hori.	9760.000	PK	49.21	37.93	-31.50	-	2.19	57.83	73.9	16.0	139	48	-
Hori.	7320.000	AV	36.31	36.62	-33.90	-	2.19	41.22	53.9	12.6	150	0	Floor Noise
Vert.	4880.000	PK	46.88	32.33	-35.79	-	2.19	45.61	73.9	28.2	168	39	-
Vert.	7320.000	PK	47.22	36.62	-33.90	-	2.19	52.13	73.9	21.7	150	0	Floor Noise
Vert.	9760.000	PK	46.65	37.93	-31.50	-	2.19	55.27	73.9	18.6	166	262	-
Vert.	7320.000	AV	36.51	36.62	-33.90	-	2.19	41.42	53.9	12.4	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	36.67	32.33	-35.79	-	3.37	2.19	38.77	53.9	15.1	-
Hori.	9760.000	AV	38.31	37.93	-31.50	-	3.37	2.19	50.30	53.9	**3.5**	-
Vert.	4880.000	AV	36.63	32.33	-35.79	-	3.37	2.19	38.73	53.9	15.1	-
Vert.	9760.000	AV	36.31	37.93	-31.50	-	3.37	2.19	48.30	53.9	5.5	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.

Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(30 MHz to1 GHz)	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx BT LE (1M-PHY) 2480 MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	359.990	QP	40.70	15.04	7.68	32.74	0.00	30.68	46.0	15.3	100	135	-
Hori.	480.004	QP	42.40	17.18	8.00	32.45	0.00	35.13	46.0	10.8	100	171	-
Hori.	500.000	QP	38.30	17.76	8.04	32.38	0.00	31.72	46.0	14.2	100	65	-
Hori.	504.002	QP	38.90	17.77	8.05	32.37	0.00	32.35	46.0	13.6	100	69	-
Hori.	959.973	QP	36.90	22.25	8.93	30.34	0.00	37.74	46.0	8.2	100	140	-
Hori.	2483.500	PK	57.67	27.96	-28.18	-	2.19	59.64	73.9	14.2	146	91	-
Hori.	4960.000	PK	47.68	32.62	-35.88	-	2.19	46.61	73.9	27.2	193	189	-
Hori.	7440.000	PK	46.61	36.69	-33.68	-	2.19	51.81	73.9	22.0	150	0	Floor Noise
Hori.	9920.000	PK	51.31	37.93	-31.31	-	2.19	60.12	73.9	13.7	147	46	-
Hori.	7440.000	AV	36.33	36.69	-33.68	-	2.19	41.53	53.9	12.3	150	0	Floor Noise
Vert.	56.529	QP	41.90	9.63	6.40	33.13	0.00	24.80	40.0	15.2	100	195	-
Vert.	59.611	QP	44.30	9.51	6.37	33.16	0.00	27.02	40.0	12.9	100	171	-
Vert.	479.987	QP	38.60	17.18	8.00	32.45	0.00	31.33	46.0	14.6	120	251	-
Vert.	500.000	QP	38.00	17.76	8.04	32.38	0.00	31.42	46.0	14.5	131	172	-
Vert.	504.002	QP	39.30	17.77	8.05	32.37	0.00	32.75	46.0	13.2	137	3	-
Vert.	2483.500	PK	58.29	27.96	-28.18	-	2.19	60.26	73.9	13.6	161	168	-
Vert.	4960.000	PK	46.86	32.62	-35.88	-	2.19	45.79	73.9	28.1	168	280	-
Vert.	7440.000	PK	46.35	36.69	-33.68	-	2.19	51.55	73.9	22.3	150	0	Floor Noise
Vert.	9920.000	PK	47.73	37.93	-31.31	-	2.19	56.54	73.9	17.3	176	236	-
Vert.	7440.000	AV	35.86	36.69	-33.68	-	2.19	41.06	53.9	12.8	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Average measurement value with Duty Factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.13	27.96	-28.18	-	3.37	2.19	45.47	53.9	8.4	*1)
Hori.	4960.000	AV	36.36	32.62	-35.88	-	3.37	2.19	38.66	53.9	15.2	-
Hori.	9920.000	AV	41.00	37.93	-31.31	-	3.37	2.19	53.18	53.9	**0.7**	-
Vert.	2483.500	AV	40.24	27.96	-28.18	-	3.37	2.19	45.58	53.9	8.3	*1)
Vert.	4960.000	AV	36.56	32.62	-35.88	-	3.37	2.19	38.86	53.9	15.0	-
Vert.	9920.000	AV	37.62	37.93	-31.31	-	3.37	2.19	49.80	53.9	4.1	-

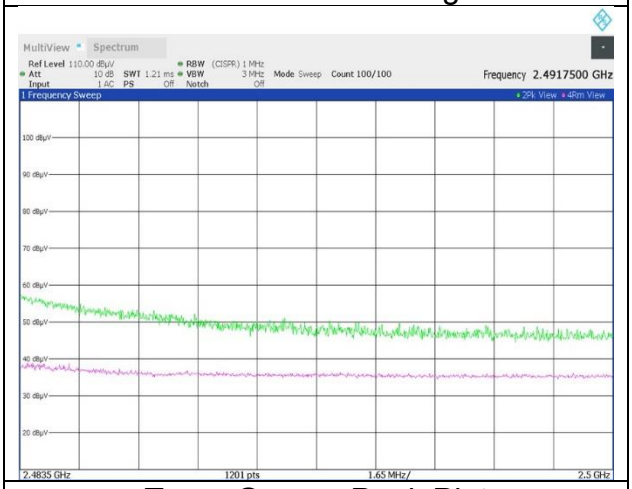
Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Duty Fac. + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (3.86 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty factor refer to "Burst rate confirmation" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	October 12, 2024
Temperature / Humidity	22 deg.C, 43 %RH
Engineer	Akihiro Oda
Mode	Tx BT LE (1M-PHY) 2480 MHz

Horizontal

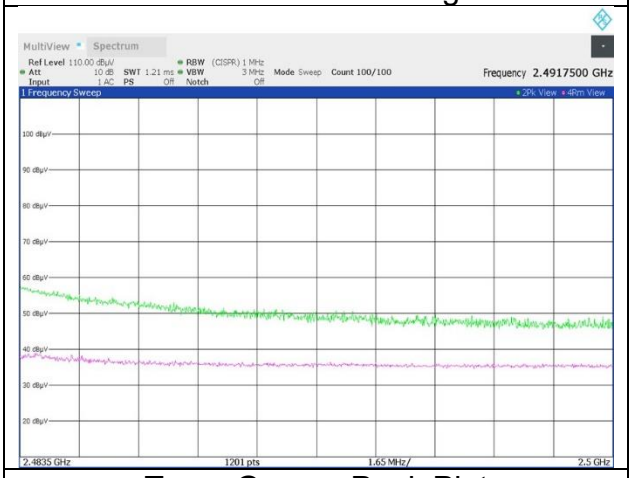
Restricted-band band-edge Plot



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

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	November 26, 2024	February 6, 2025	December 16, 2024	December 16, 2024
Temperature / Humidity	17 deg.C, 43 %RH	20 deg.C, 30 %RH	22 deg.C, 23 %RH	22 deg.C, 23 %RH
Engineer	Yosuke Murakami	Takayuki Kobayashi	Miku Ikudome	Miku Ikudome
	(30 MHz to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx BT LE (1M-PHY) 2480 MHz with WLAN 11ac-40 5550MHz			

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

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	81.299	QP	23.10	9.02	6.78	33.23	0.00	5.67	40.0	34.3	100	0	-
Hori.	113.151	QP	22.90	10.26	6.84	33.24	0.00	6.76	43.5	36.7	100	0	-
Hori.	433.960	QP	22.20	16.14	7.89	32.58	0.00	13.65	46.0	32.3	100	0	-
Hori.	881.774	QP	20.90	21.97	8.82	30.84	0.00	20.85	46.0	25.1	100	0	-
Hori.	2483.500	PK	55.39	27.96	-27.94	-	2.19	57.60	73.9	16.3	202	53	-
Hori.	4960.000	PK	63.96	32.62	-35.50	-	2.19	63.27	73.9	**10.6**	168	64	-
Hori.	7440.000	PK	49.98	36.69	-33.66	-	2.19	55.20	73.9	18.7	167	46	-
Hori.	9920.000	PK	48.94	37.93	-31.18	-	2.19	57.88	73.9	16.0	107	49	-
Vert.	62.038	QP	25.70	9.45	6.38	33.17	0.00	8.36	40.0	31.6	102	254	-
Vert.	92.500	QP	23.50	9.23	6.93	33.24	0.00	6.42	43.5	37.0	100	0	-
Vert.	132.142	QP	28.00	11.28	6.79	33.22	0.00	12.85	43.5	30.6	101	136	-
Vert.	422.217	QP	22.50	16.01	7.86	32.59	0.00	13.78	46.0	32.2	100	0	-
Vert.	2483.500	PK	56.49	27.96	-27.94	-	2.19	58.70	73.9	15.2	154	30	-
Vert.	4960.000	PK	54.84	32.62	-35.50	-	2.19	54.15	73.9	19.7	383	54	-
Vert.	7440.000	PK	49.48	36.69	-33.66	-	2.19	54.70	73.9	19.2	398	10	-
Vert.	9920.000	PK	47.22	37.93	-31.18	-	2.19	56.16	73.9	17.7	398	65	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.
*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).
Distance Fac. : 1 GHz to 10 GHz : 20log (2.19 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	55.39	27.96	-27.94	-	-42.20	2.19	15.40	53.9	38.5	*1)
Hori.	4960.000	PK	63.96	32.62	-35.50	-	-42.20	2.19	21.07	53.9	32.8	-
Hori.	7440.000	PK	49.98	36.69	-33.66	-	-42.20	2.19	13.00	53.9	40.9	-
Hori.	9920.000	PK	48.94	37.93	-31.18	-	-42.20	2.19	15.68	53.9	38.2	-
Vert.	2483.500	PK	56.49	27.96	-27.94	-	-42.20	2.19	16.50	53.9	37.4	*1)
Vert.	4960.000	PK	54.84	32.62	-35.50	-	-42.20	2.19	11.95	53.9	41.9	-
Vert.	7440.000	PK	49.48	36.69	-33.66	-	-42.20	2.19	12.50	53.9	41.4	-
Vert.	9920.000	PK	47.22	37.93	-31.18	-	-42.20	2.19	13.96	53.9	39.9	-

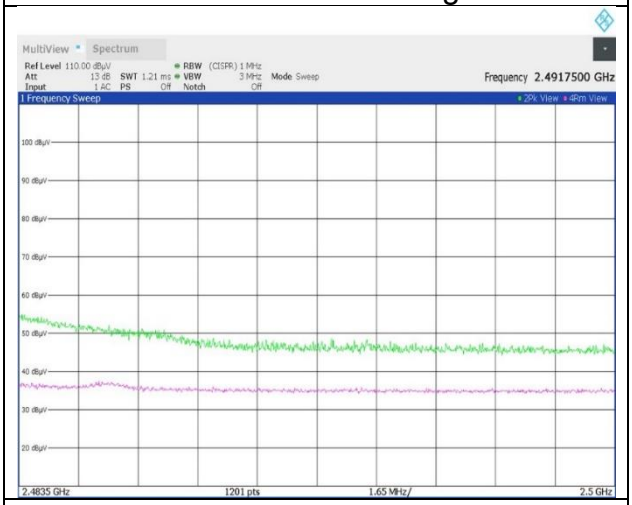
Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + DCCF + Distance Fac.
Distance Fac. : 1 GHz to 10 GHz : 20log (2.19 [m] / 3.0 [m]) = 2.19 [dB]
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]
Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	February 6, 2025
Temperature / Humidity	20 deg.C, 30 %RH
Engineer	Takayuki Kobayashi
Mode	Tx BT LE (1M-PHY) 2480 MHz with WLAN 11ac-40 5550MHz

Horizontal

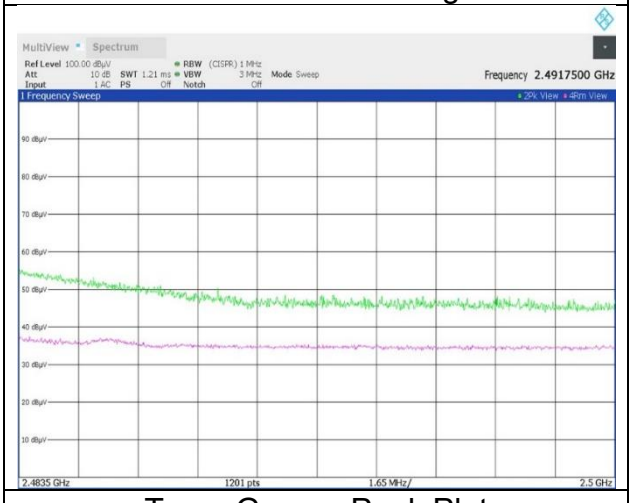
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

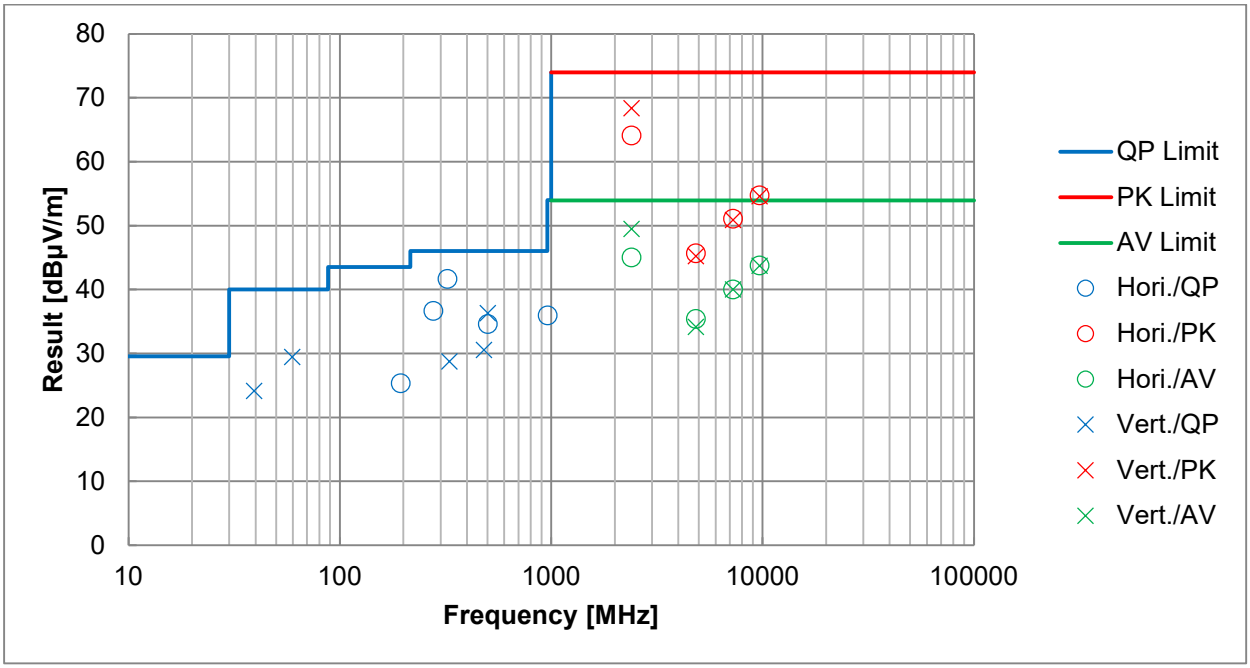


Trace Green : Peak Plot
Trace Purple : Average Plot

* 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)

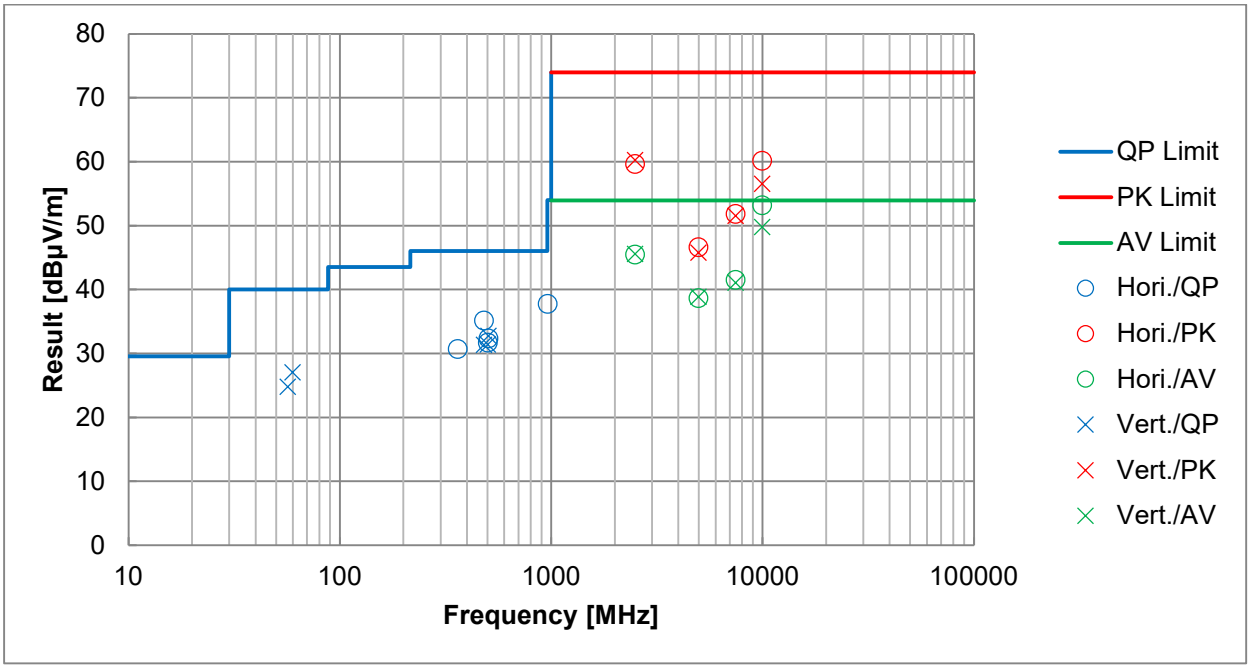
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 6, 2024	October 11, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	23 deg.C, 60 %RH	24 deg.C, 55 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Yohsuke Matsuzawa	Takayuki Kobayashi	Yuta Shiba
	(30 MHz to1 GHz)	(1 GHz to 2.8 GHz)	(2.8 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx 11n-20 2412 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	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC1	WAC1	WAC1	WAC1
Date	October 17, 2024	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	24 deg.C, 47 %RH	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Yuta Shiba	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx BT LE (1M-PHY) 2480 MHz			

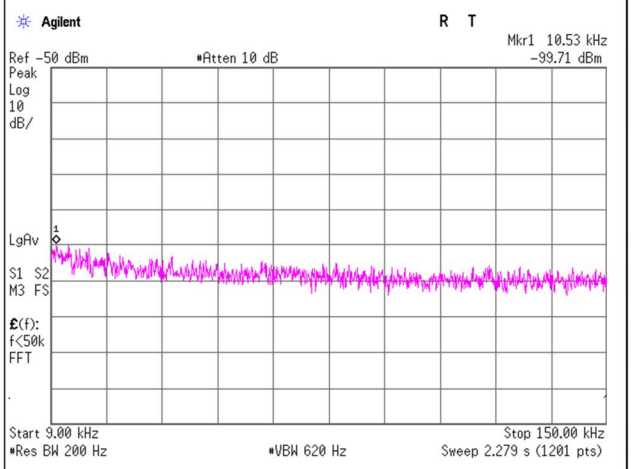


*These plots data contain sufficient number to show the trend of characteristic features for EUT.

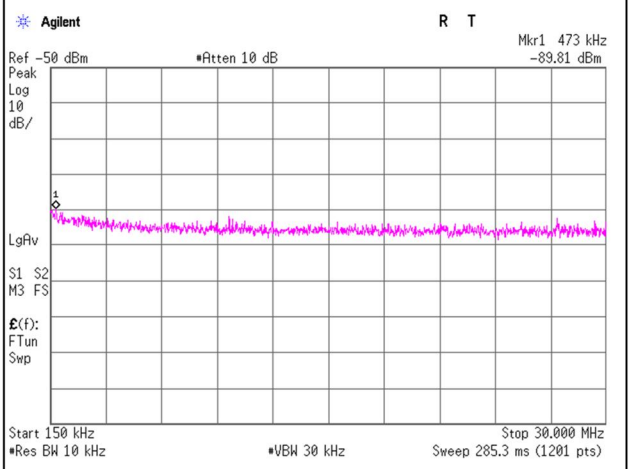
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 2, 2024
Temperature / Humidity	26 deg. C / 48 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20 2412 MHz

9 kHz - 150 kHz



150 kHz - 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
10.53	-99.7	0.7	9.8	2.0	1.0	-87.2	300	6.0	-25.9	47.1	73.0	-
473.00	-89.8	0.7	9.8	2.0	1.0	-77.3	300	6.0	-16.0	14.1	30.1	-

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)

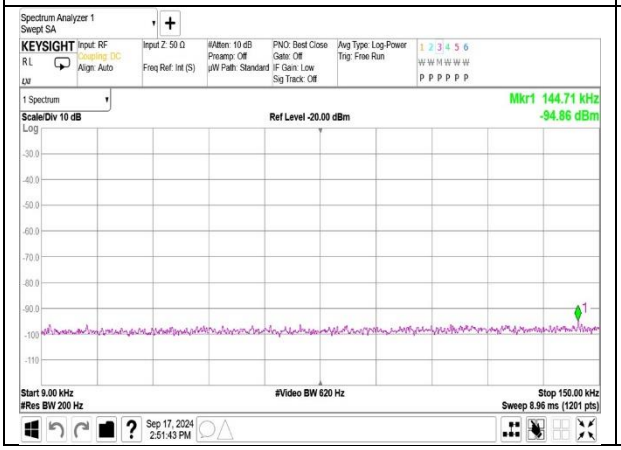
N: Number of output

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

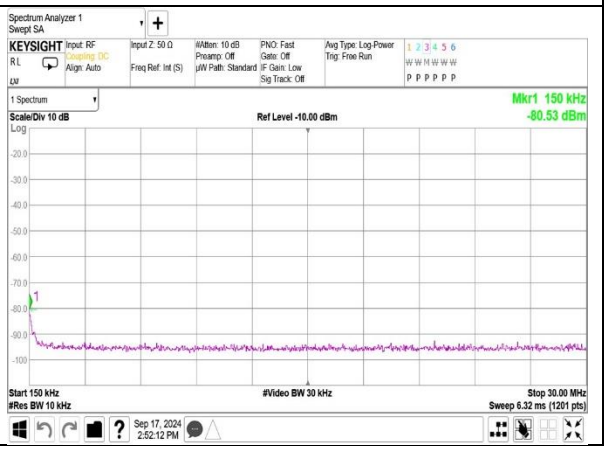
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx, BT LE, (1M-PHY) 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
144.71	-94.9	0.7	9.8	2.0	1.0	-82.3	300	6.0	-21.1	24.3	45.4	-
150.00	-80.5	0.7	9.8	2.0	1.0	-68.0	300	6.0	-6.7	24.0	30.7	-

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)

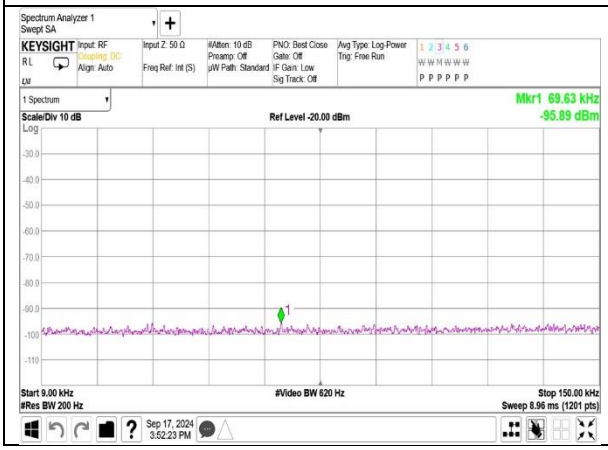
N: Number of output

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

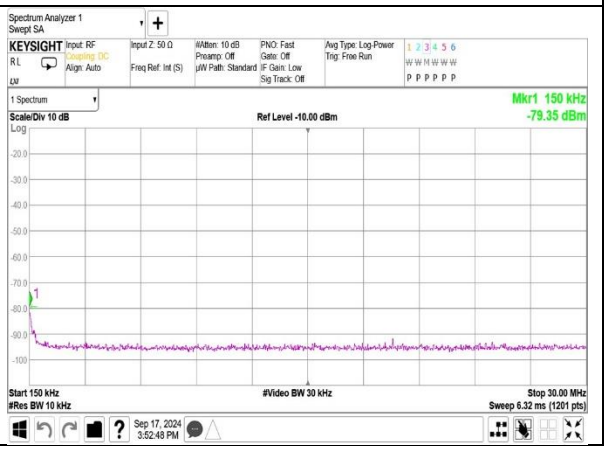
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx, BT LE, (1M-PHY) 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
69.63	-95.9	0.7	9.8	2.0	1.0	-83.4	300	6.0	-22.1	30.7	52.8	-
150.00	-79.3	0.7	9.8	2.0	1.0	-66.8	300	6.0	-5.6	24.0	29.6	-

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)

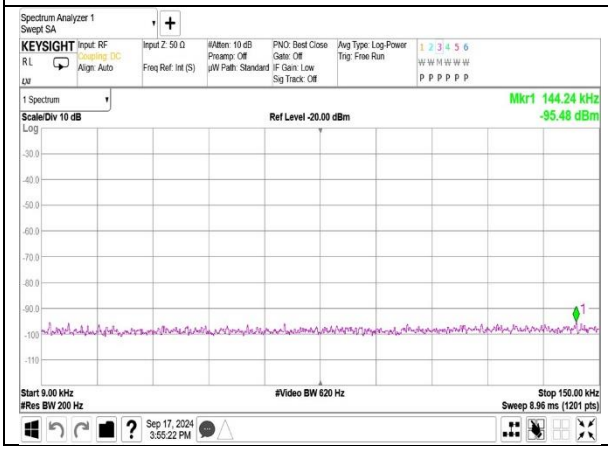
N: Number of output

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

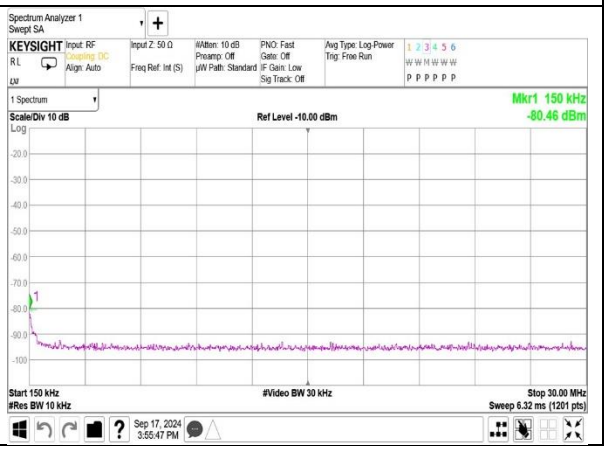
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	September 17, 2024
Temperature / Humidity	24 deg. C / 55 % RH
Engineer	Kenichi Adachi
Mode	Tx, BT LE, (1M-PHY) 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
144.24	-95.5	0.7	9.8	2.0	1.0	-82.9	300	6.0	-21.7	24.4	46.1	-
150.00	-80.5	0.7	9.8	2.0	1.0	-67.9	300	6.0	-6.7	24.0	30.7	-

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.

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	October 18, 2024	September 17, 2024
Temperature / Humidity	25 deg. C / 53 % RH	24 deg. C / 55 % RH
Engineer	Makoto Hosaka	Kenichi Adachi
Mode	Tx	

11b

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2410.322	-25.18	1.73	9.89	-13.56	8.00	21.56
2437	2436.054	-24.59	1.75	9.89	-12.95	8.00	20.95
2462	2462.884	-23.68	1.78	9.89	-12.01	8.00	20.01

11g

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2416.960	-28.43	1.73	9.89	-16.81	8.00	24.81
2437	2435.099	-28.40	1.75	9.89	-16.76	8.00	24.76
2462	2467.621	-27.33	1.78	9.89	-15.66	8.00	23.66

11n-20

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2412	2417.642	-27.76	1.73	9.89	-16.14	8.00	24.14
2437	2438.178	-28.72	1.75	9.89	-17.08	8.00	25.08
2462	2469.771	-28.26	1.78	9.89	-16.59	8.00	24.59

BT LE 1M-PHY

Frequency [MHz]	Measured Frequency [MHz]	Reading [dBm/3 kHz]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm/3 kHz]	Limit [dBm/3 kHz]	Margin [dB]
2402	2401.999	-16.66	1.71	9.89	-5.06	8.00	13.06
2440	2439.998	-16.50	1.76	9.89	-4.85	8.00	12.85
2480	2479.998	-16.36	1.78	9.89	-4.69	8.00	12.69

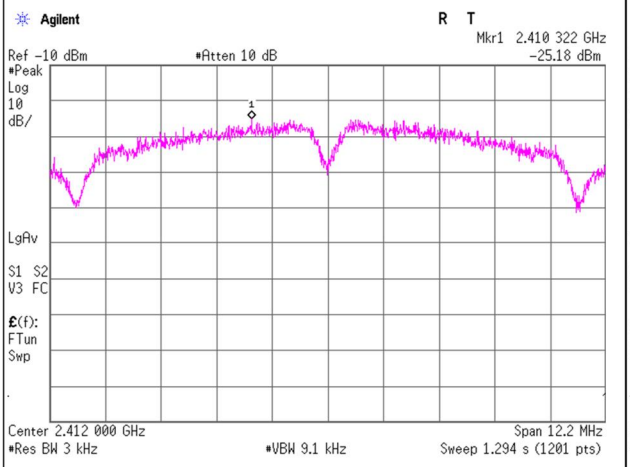
Sample Calculation:

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

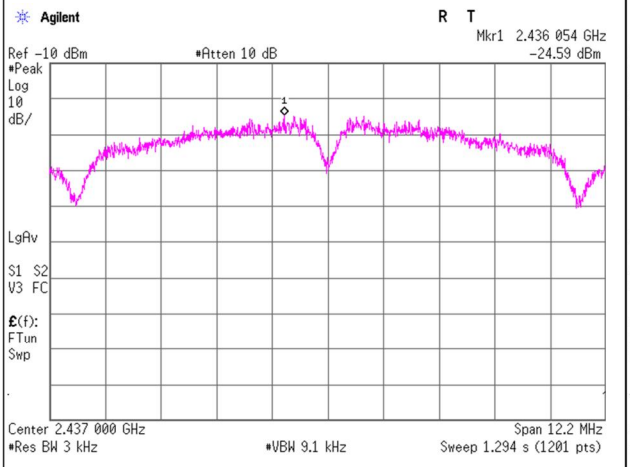
Power Density

11b

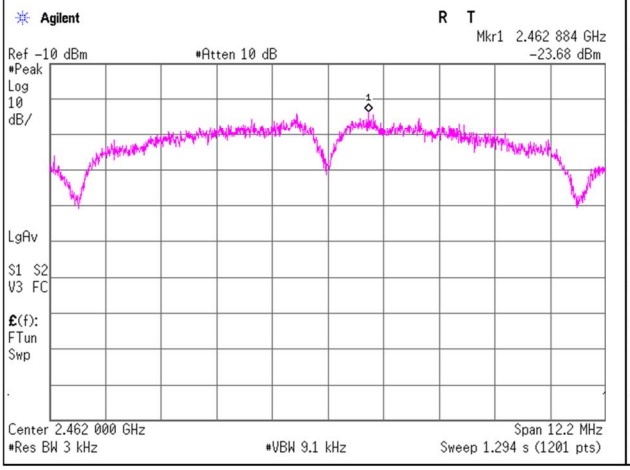
2412 MHz



2437 MHz

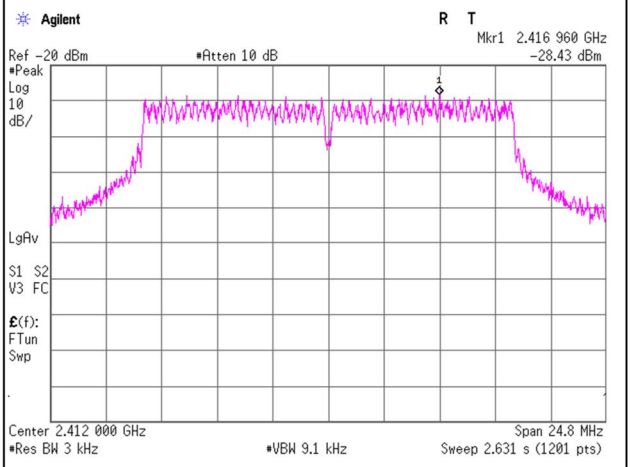


2462 MHz

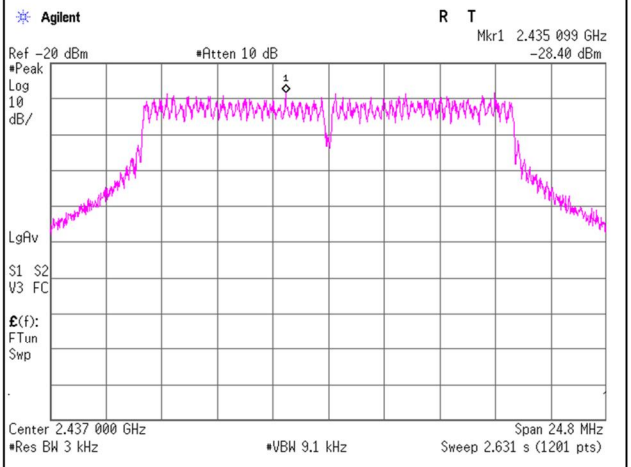


11g

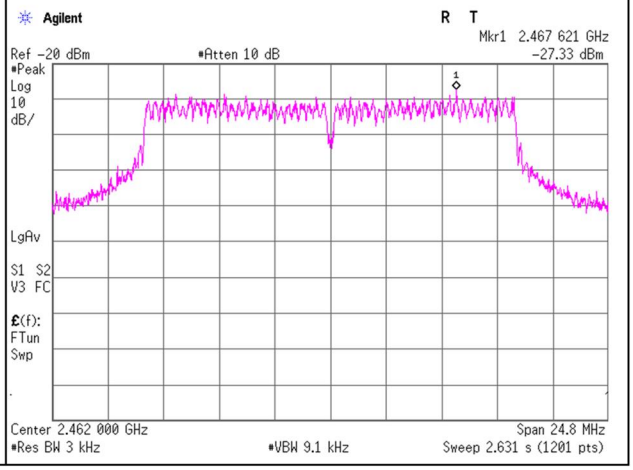
2412 MHz



2437 MHz



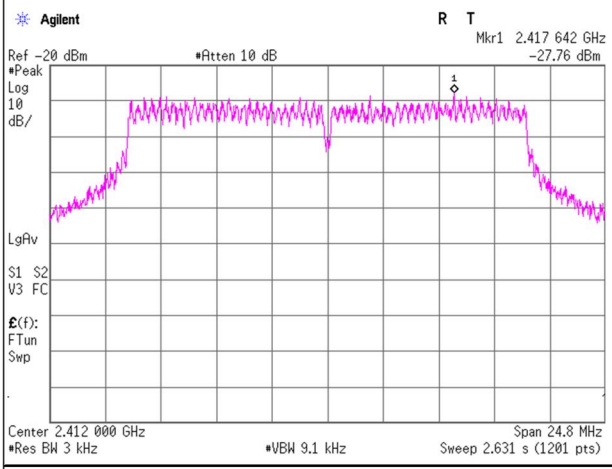
2462 MHz



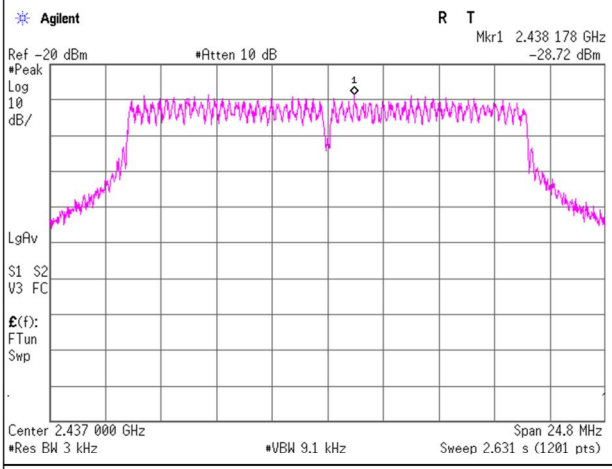
Power Density

11n-20

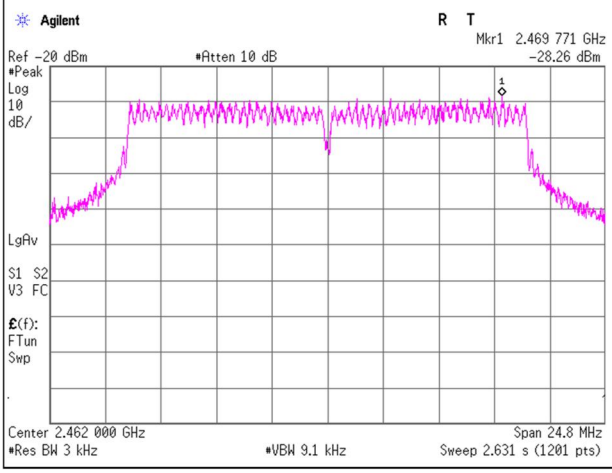
2412 MHz



2437 MHz



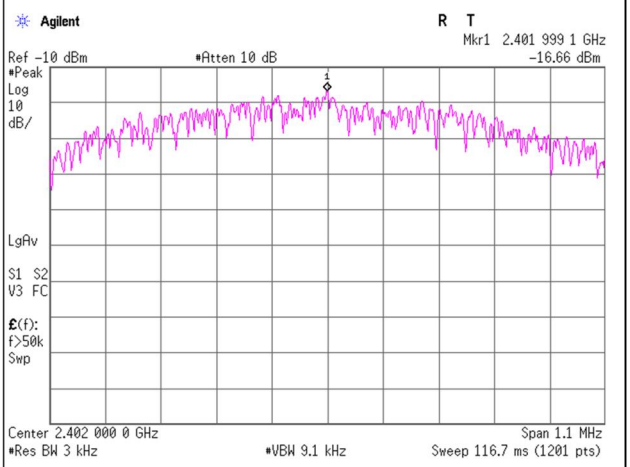
2462 MHz



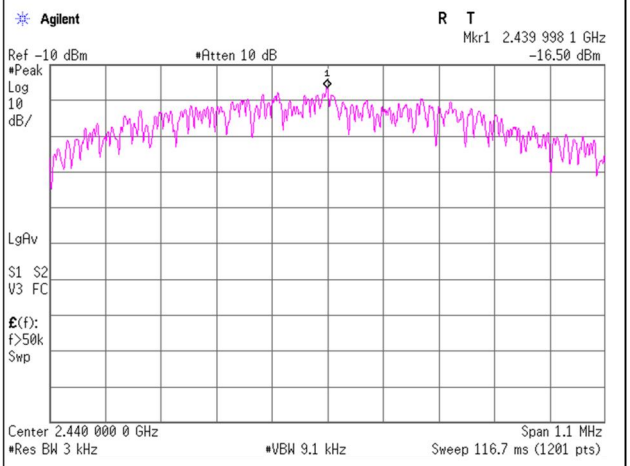
Power Density

BT LE 1M-PHY

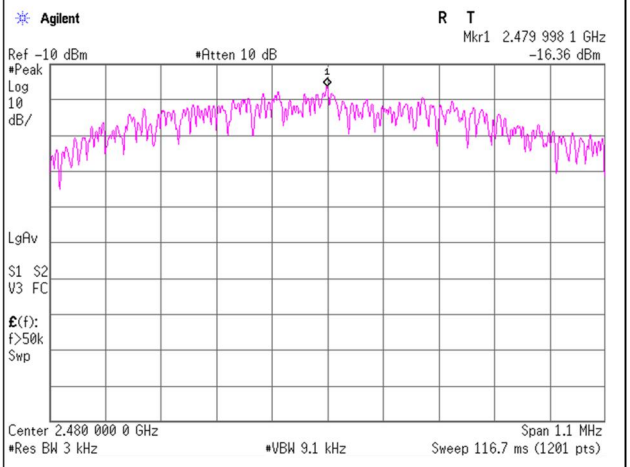
2402 MHz



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
AT	145111	Digital Tester	SANWA	PC500	7019232	2024/09/24	12
AT	145801	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY48250152	2024/08/29	12
AT	160494	Attenuator	Weinschel Corp.	54A-10	83420	2024/12/03	12
AT	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2024/09/11	12
AT	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2024/09/11	12
AT	175822	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2024/08/11	12
AT	191847	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2024/08/12	12
AT	197395	Microwave cable	RS Pro	R-132G7210 100CO	-	2024/04/10	12
AT	204924	Terminator	Weinschel - API Technologies Corp	M1459A	110107	2024/02/14	12
AT	236410	Spectrum Analyzer	Keysight Technologies Inc	N9030B	MY63050151	2024/04/26	12
AT	239653	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	2001221/2	2024/08/20	12
AT	242066	Attenuator	Weinschel Corp.	54A-10	120521	2024/11/06	12
AT	245174	Coaxial Cable	Hayashi-Repic co., Ltd.	KMS020B-GL140sE-KMS020B-2.0m	49334-01-01	2024/02/14	12
AT	249685	Terminator	To-Conne Co., Ltd.	SMA50-SP 1W	-	-	-
AT,CE	146212	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997828	2024/09/24	12
CE	175822	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	-	2024/08/11	12
CE	145033	Coaxial Cable	Fujikura Shoji Co., LTD	5D2W	-	2024/04/10	12
CE	145336	Tape Measure	PROMART	SEN1935	-	-	-
CE	145542	LISN	Rohde & Schwarz	ENV216	100516	2024/02/06	12
CE	199786	Attenuator	JFW	50HF-006N	-	2024/06/14	12
CE,RE	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	Ver 3.1.0546	-	-
CE,RE	235267	Test Receiver	Rohde & Schwarz	ESW44	103018	2024/03/05	12
RE	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2024/08/21	12
RE	145176	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	2024/08/21	12
RE	145512	Horn Antenna	ETS-Lindgren	3160-09	00094868	2024/06/20	12
RE	145514	Horn Antenna	ETS-Lindgren	3160-10	00092383	2024/06/20	12
RE	145527	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	193	2024/04/10	12
RE	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2024/03/05	12
RE	199784	Attenuator	JFW	50HF-006N	-	2024/06/14	12
RE	207280	Tape Measure	ASKUL	-	-	-	-
RE	235639	DIGITAL MULTIMETER	HIOKI E.E. CORPORATION	DT4261	230313156	2024/05/29	12
RE	235735	Thermo-Hygrometer	CUSTOM. Inc	CTH-230	-	2024/04/28	12
RE	236212	Semi-Anechoic Chamber	TDK	SWAC-01(NSA)	1	2024/05/09	12
RE	236616	Semi-Anechoic Chamber	TDK	SWAC-01(SVSWR)	1	2024/06/04	12
RE	236686	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	787	2024/04/19	12
RE	236708	Coaxial Cable	Hayashi-Repic co., Ltd.	NMS079B-GL310C-SMS117B-2m	47256-02-03	2024/05/09	12
RE	236710	Coaxial Cable	Hayashi-Repic co., Ltd.	KMS020B-GL140sE-KMS020B-7.0m	47256-03-01	2024/05/09	12
RE	236723	Coaxial Cable	Hayashi-Repic co., Ltd.	SF106(HUBER+SUHNER)/LMR400UF/GL310C/GL310C	2000429/47753-1/47256-01-03/47256-01-01	2024/05/09	12
RE	236769	Horn Antenna	AINFO Inc.	LB-8180-NF	2030013000111	2024/04/19	12

Test Equipment[2/2]

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	236966	Pre Amplifier	TSJ (Techno Science Japan)	MLA-9K01-L01	23050009	2024/06/14	12
RE	237784	RF RELAY MATRIX with preamplifier	TSJ (Techno Science Japan)	RFM-E221261R	07795	2024/11/12	12
RE	239643	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	2306S021	2024/08/20	12
RE	239786	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124+BBA9106	01895	2024/08/10	12
RE	243209	Coaxial Cable	Hayashi-Repic co., Ltd.	SMS13-13A26-NFS13-1.0m	49190-01-01	2024/12/05	12
RE	243687	Coaxial Cable	Hayashi-Repic co., Ltd.	NMS079B-GL310C-NMS079B-6.0m	49373-01-01	2024/12/05	12
RE	243689	Coaxial Cable	Huber+Suhner	GL310C(Hayashi-Repic)/SF106/SF106	49373-01-01/2000781/2001160	2024/12/17	12

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

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