RADIO TEST REPORT

Test Report No. 15471317S-C-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	**Bluetooth (BR / EDR) parts**

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-C

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

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15471317S-C	April 14, 2025	-
1	15471317S-C-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 7, 2024 to February 7, 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	29.5 dB, 0.36523 MHz, QP, L1 Mode: Tx, 3DH5, 2480 MHz	Complied	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
Carrier Frequency Separation	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)	See data.	Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (b)			
20 dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (a)			
Number of Hopping Frequency	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Dwell time	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(a)(1)(iii)		Complied	Conducted
	ISED: -	**ISED:** RSS-247 5.1 (d)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(b)(1)		Complied	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4 (b)			
Spurious Emission & Band Edge Compliance	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	0.6 dB 9920.00 MHz, AV, Hori. Mode: Tx, Hopping Off, 3DH5 2480 MHz	Complied	Conducted/ 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).

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)

Mode	Remarks*
Bluetooth (BT)	BR / EDR, Payload: PRBS9
*EUT has the power settings by the software as follows; Power Setting: 9 (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.	

Details of Operating Mode(s)

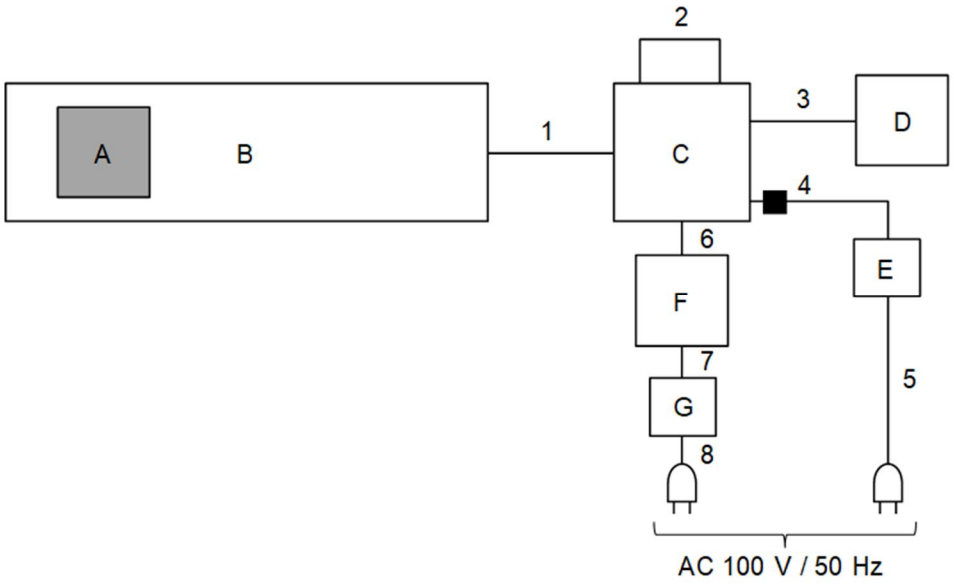
Test Item	Mode	Hopping	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5 *1)	Off	2480 MHz
Radiated Spurious Emission (Above 1 GHz), Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx DH5 Tx 3DH5	On	2402 MHz 2441 MHz 2480 MHz
20 dB Bandwidth	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Number of Hopping Frequency	Tx DH5 Tx 3DH5	On	-
Dwell time	Tx DH1, DH3, DH5 Tx 3DH1, 3DH3, 3DH5	On	-
Maximum Peak Output Power	Tx DH5 Tx 2DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Band Edge Compliance (Conducted)	Tx DH5 Tx 3DH5	On Off	2402 MHz 2480 MHz
99 % Occupied Bandwidth	Tx DH5 Tx 3DH5	On Off	2402 MHz 2441 MHz 2480 MHz
*As a result of preliminary test, the formal test was performed with the above modes, which had the maximum payload length (except Dwell time test) *2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative. *It is considered that the non-tested packet type (e.g. inquiry) can be omitted as it is complied with above all the test items based on Bluetooth Core specification.			
*1) 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 3DH5 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.

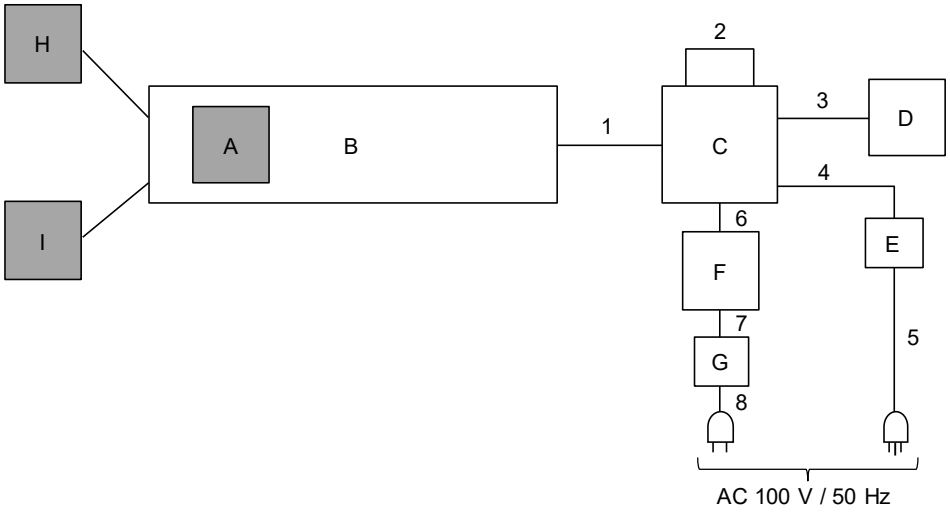
Description of EUT and Support Equipment

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

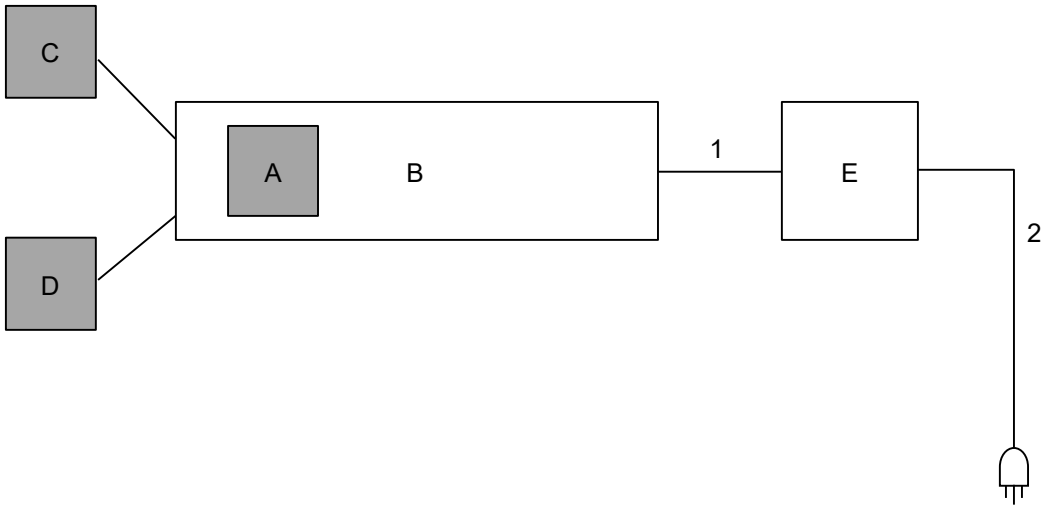
No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	Communication module	Type1VY-002	#002	Murata Manufacturing Co., Ltd.	EUT
B	Jig Board	P2ML11773	#002	Murata Manufacturing Co., Ltd.	-
C	Mini personal computer	Brix	No.i5-32	GIGABYTE	-
D	SSD	SSD370S	F3559-2490	Transcend	-
E	Power Supply (DC)	PAN35-10A	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 80 cm 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.

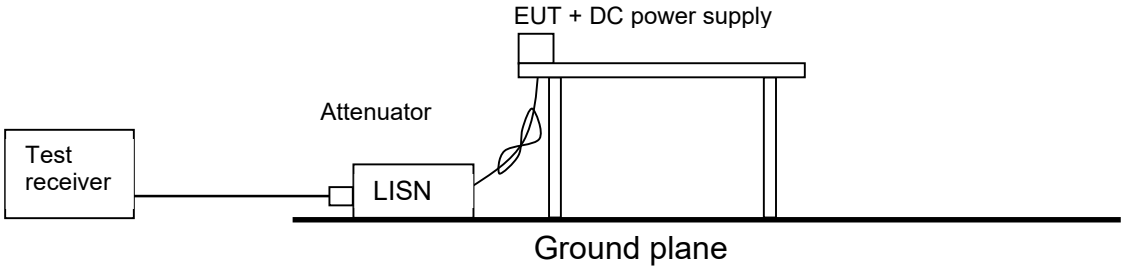
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

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

[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.

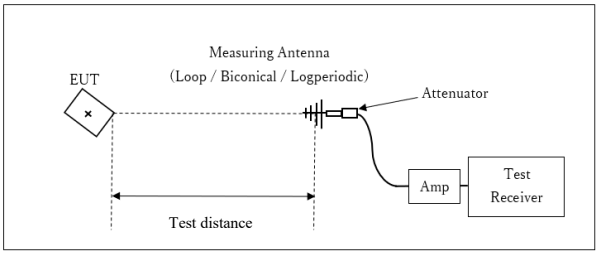
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces Duty factor was added to the 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

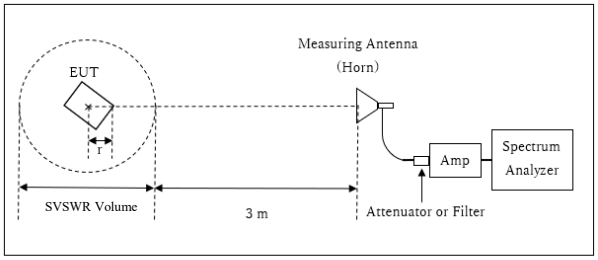
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

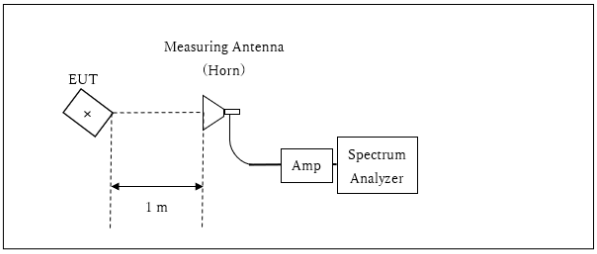


r : Radius of an outer periphery of EUT
× : Center of turn table

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.

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)
EUT	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
20 dB Bandwidth	3 MHz	30 kHz	100 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 *1)	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Carrier Frequency Separation	3 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Number of Hopping Frequency	30 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
Dwell Time	Zero Span	100 kHz, 1 MHz	300 kHz, 3 MHz	As necessary capture the entire dwell time per hopping channel	Peak	Clear Write	Spectrum Analyzer
Conducted Spurious Emission *3) *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				
	30 MHz to 25 GHz	100 kHz	300 kHz				
Conducted Spurious Emission Band Edge compliance	10 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) The measurement was performed with Max Hold since the duty cycle was not 100 %. Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
*4) The limits in CFR 47, Part 15, Subpart C, paragraph 15.209(a), are identical to those in RSS-Gen section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377 Ohmes. For example, the measurement at frequency 9 kHz resulted in a level of 45.5 dBuV/m, which is equivalent to 45.5 – 51.5 = -6.0 dBuA/m, which has the same margin, 3 dB, to the corresponding RSS-Gen Table 6 limit as it has to 15.209(a) limit.

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

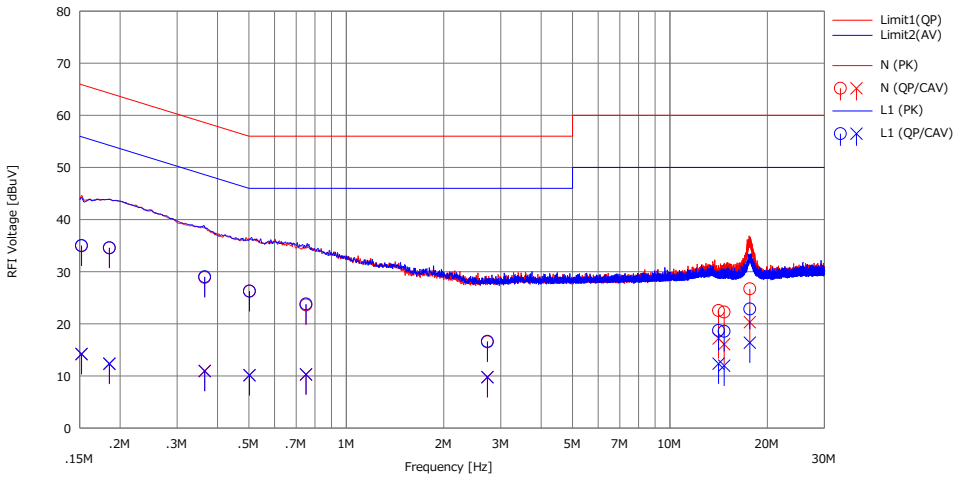
Test Data : APPENDIX
Test Result : Pass

APPENDIX 1: Test data

Conducted Emission

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, Hopping Off, 3DH5 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	0.15198	19.62	-1.25	15.41	35.03	14.16	65.89	55.89	30.8	41.7	N	
2	0.18528	19.18	-3.12	15.41	34.59	12.29	64.25	54.25	29.6	41.9	N	
3	0.36523	13.47	-4.46	15.43	28.90	10.97	58.61	48.61	29.7	37.6	N	
4	0.50232	10.78	-5.32	15.46	26.24	10.14	56.00	46.00	29.7	35.8	N	
5	0.75060	8.13	-5.21	15.48	23.61	10.27	56.00	46.00	32.3	35.7	N	
6	2.73042	0.93	-5.87	15.61	16.54	9.74	56.00	46.00	39.4	36.2	N	
7	14.13735	6.36	1.00	16.19	22.55	17.19	60.00	50.00	37.4	32.8	N	
8	14.71291	6.05	-0.12	16.21	22.26	16.09	60.00	50.00	37.7	33.9	N	
9	17.65823	10.36	3.96	16.34	26.70	20.30	60.00	50.00	33.3	29.7	N	
10	0.15198	19.55	-1.19	15.42	34.97	14.23	65.89	55.89	30.9	41.6	L1	
11	0.18528	19.15	-3.05	15.42	34.57	12.37	64.25	54.25	29.6	41.8	L1	
12	0.36523	13.60	-4.51	15.43	29.03	10.92	58.61	48.61	29.5	37.6	L1	
13	0.50232	10.83	-5.33	15.45	26.28	10.12	56.00	46.00	29.7	35.8	L1	
14	0.75060	8.32	-5.18	15.48	23.80	10.30	56.00	46.00	32.2	35.7	L1	
15	2.73042	1.03	-5.82	15.60	16.63	9.78	56.00	46.00	39.3	36.2	L1	
16	14.13735	2.66	-3.71	16.06	18.72	12.35	60.00	50.00	41.2	37.6	L1	
17	14.71291	2.48	-4.11	16.08	18.56	11.97	60.00	50.00	41.4	38.0	L1	
18	17.65823	6.66	0.20	16.17	22.83	16.37	60.00	50.00	37.1	33.6	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN): 145542

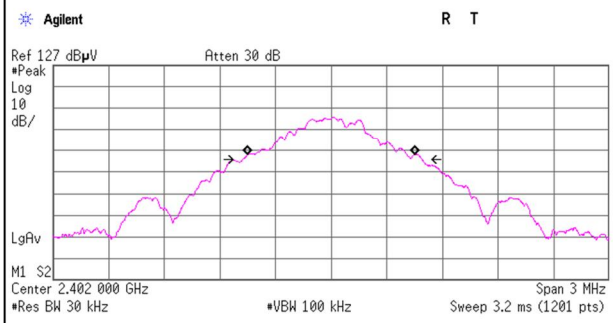
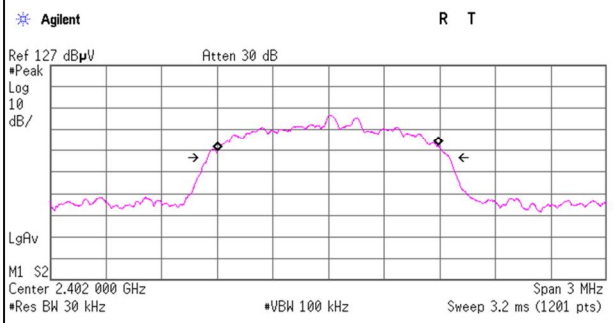
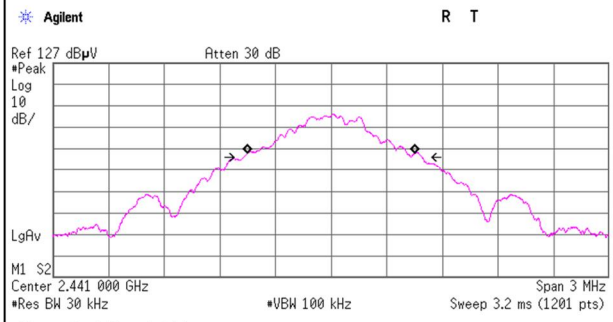
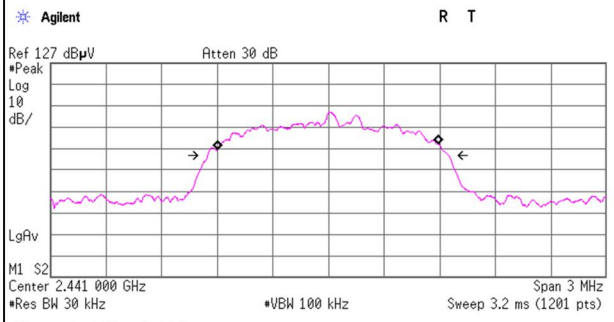
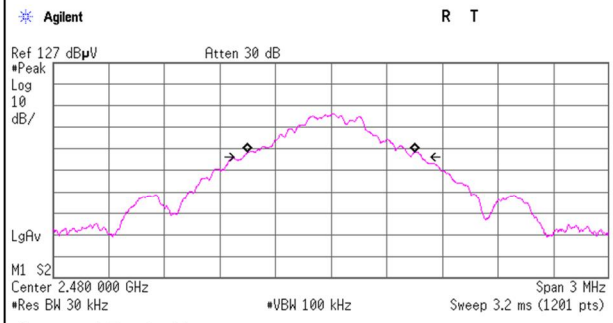
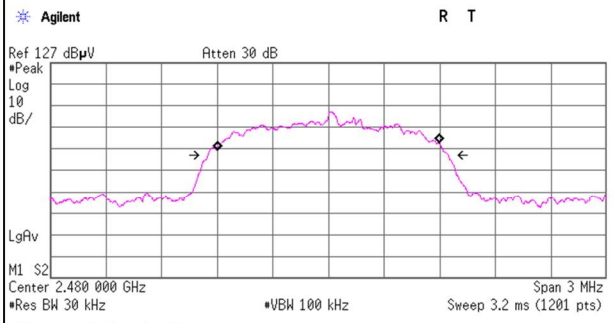
20 dB Bandwidth, 99 % Occupied Bandwidth and Carrier Frequency Separation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping Off, Tx, Hopping On

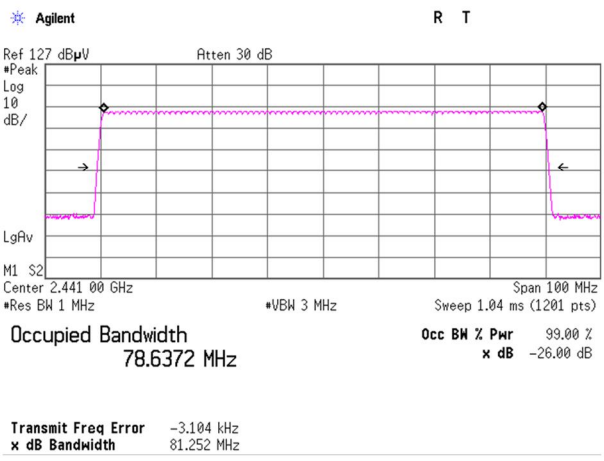
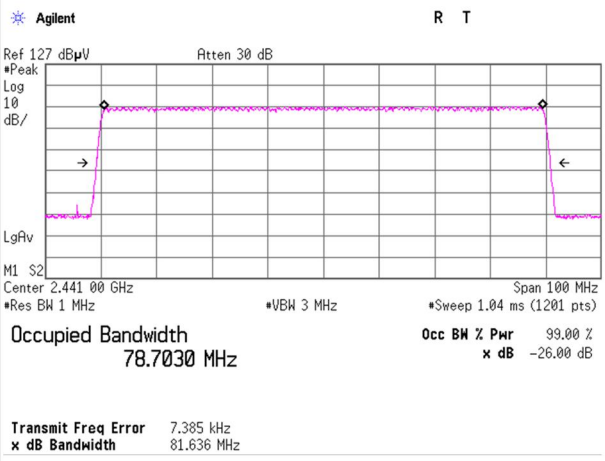
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402	0.964	904.1	1.000	>= 0.643
DH5	2441	0.961	903.9	1.000	>= 0.641
DH5	2480	0.961	902.1	1.000	>= 0.641
DH5	Hopping On	-	78637.2	-	-
3DH5	2402	1.304	1188.3	1.000	>= 0.869
3DH5	2441	1.302	1189.1	1.000	>= 0.868
3DH5	2480	1.297	1192.3	1.000	>= 0.865
3DH5	Hopping On	-	78703.0	-	-

Limit: Two-thirds of 20 dB Bandwidth or 25 kHz (whichever is greater).
No limit applies to 20 dB Bandwidth.

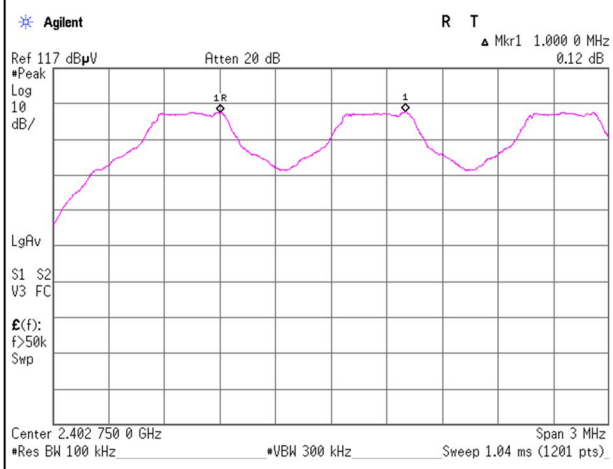
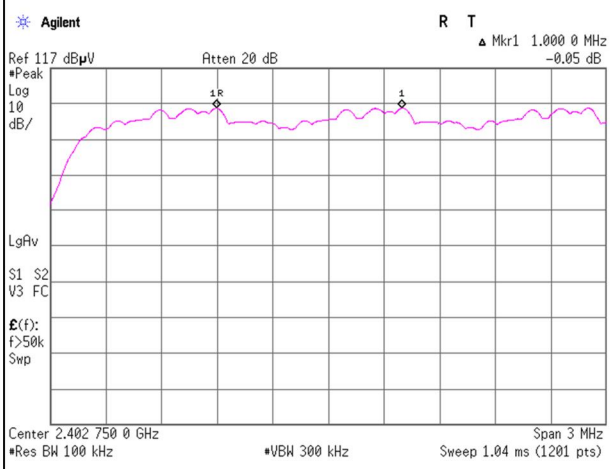
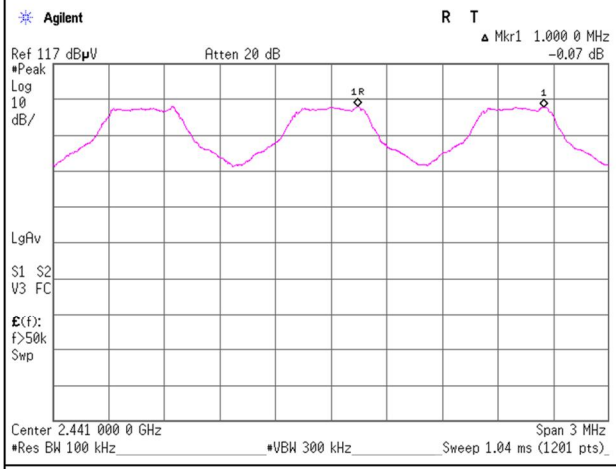
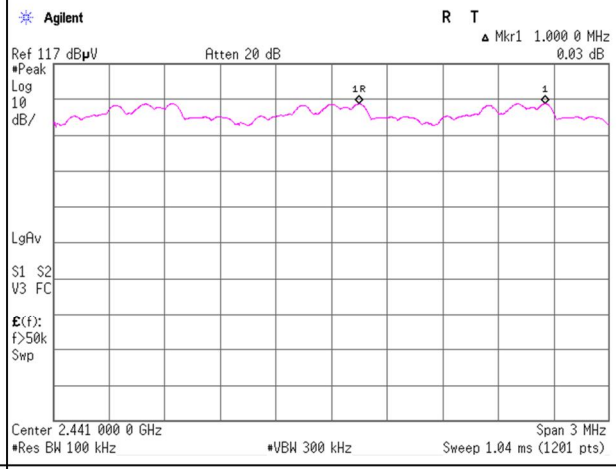
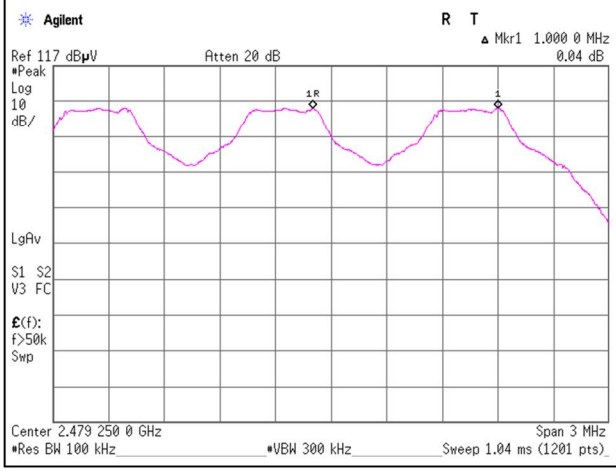
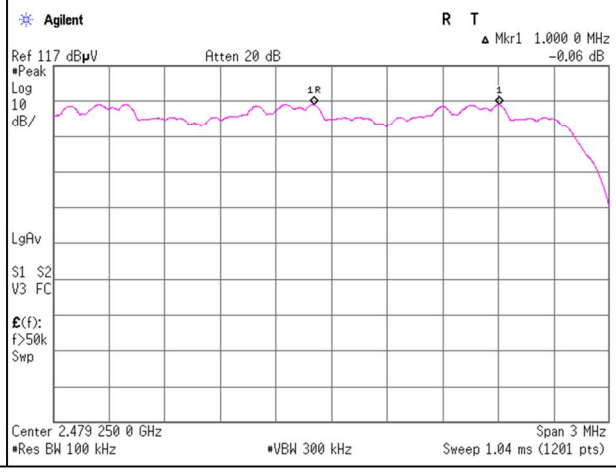
20 dB Bandwidth & 99 % Occupied Bandwidth

DH5	3DH5
2402 MHz	**2402 MHz**
	
2441 MHz	**2441 MHz**
	
2480 MHz	**2480 MHz**
	

20 dB Bandwidth & 99 % Occupied Bandwidth

DH5	3DH5
Hopping On	Hopping On
	

Carrier Frequency Separation

DH5	3DH5
2402 MHz	2402 MHz
	
2441 MHz	2441 MHz
	
2480 MHz	2480 MHz
	

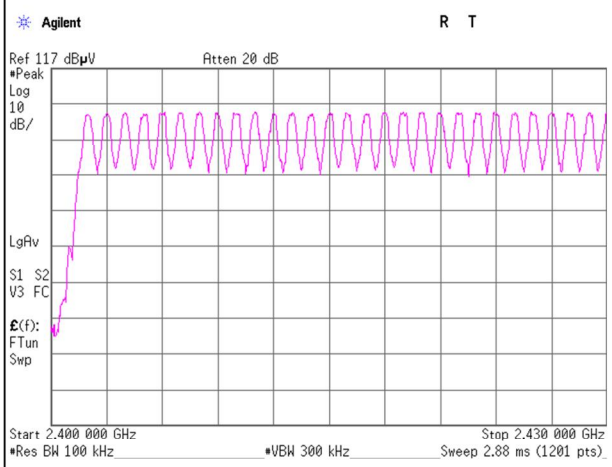
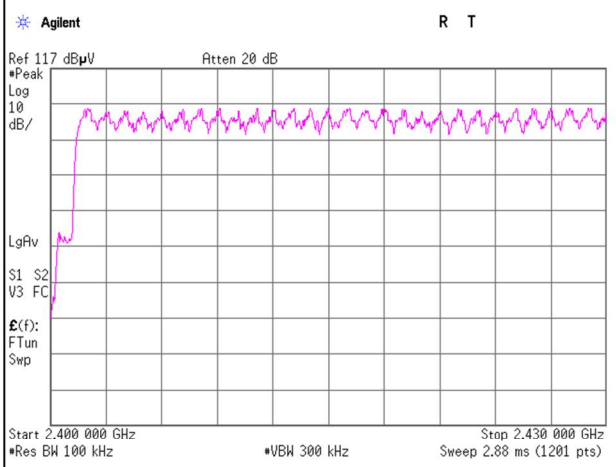
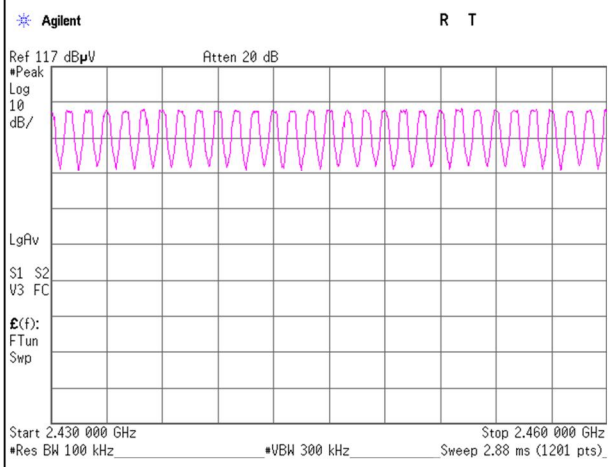
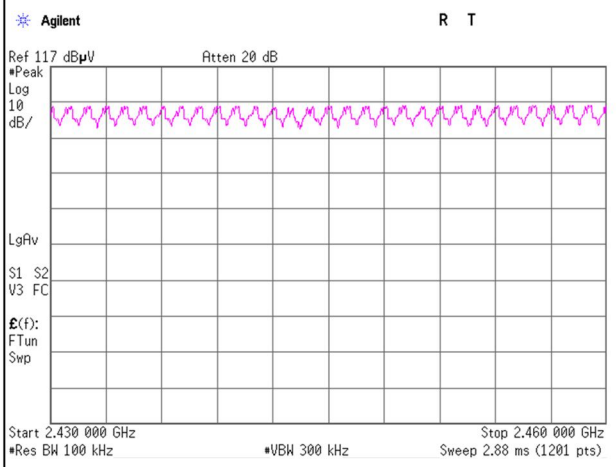
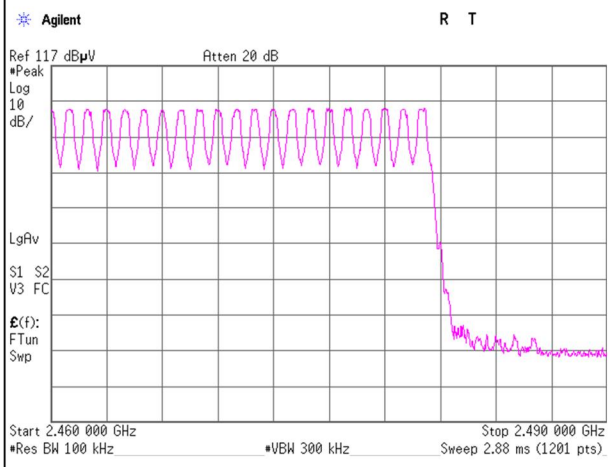
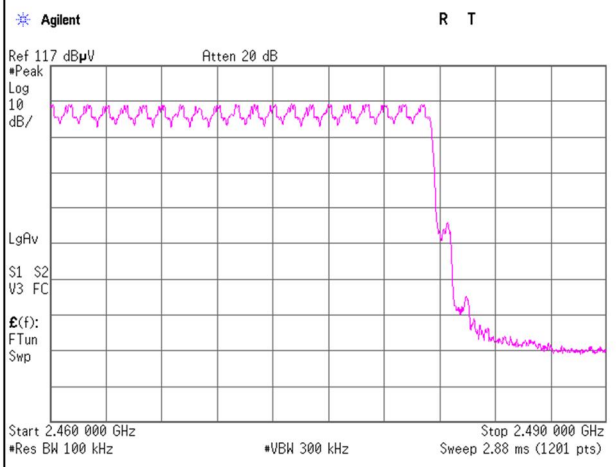
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping On

Mode	Number of channel [channels]	Limit [channels]
DH5	79	>= 15
3DH5	79	>= 15

Test was not performed at AFH mode whose number of hopping channel is 20 channels because this Bluetooth radio is in compliance of Bluetooth Specification.

Number of Hopping Frequency

DH5	3DH5
Hopping On (1/3)	Hopping On (1/3)
	
Hopping On (2/3)	Hopping On (2/3)
	
Hopping On (3/3)	Hopping On (3/3)
	

Dwell time

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping On

Mode	Number of transmission in a 31.6 (79 Hopping x 0.4)	Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	50.6 times / 5 s x 31.6 s = 320 times	0.399	128	400
DH3	24.6 times / 5 s x 31.6 s = 156 times	1.656	258	400
DH5	20.6 times / 5 s x 31.6 s = 131 times	2.904	380	400
3DH1	49.6 times / 5 s x 31.6 s = 314 times	0.404	127	400
3DH3	25.2 times / 5 s x 31.6 s = 160 times	1.657	265	400
3DH5	21.4 times / 5 s x 31.6 s = 136 times	2.908	395	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	51	51	51	50	50.6
DH3	27	24	24	22	26	24.6
DH5	20	20	20	20	23	20.6
3DH1	50	47	51	50	50	49.6
3DH3	21	28	28	24	25	25.2
3DH5	20	22	23	19	23	21.4

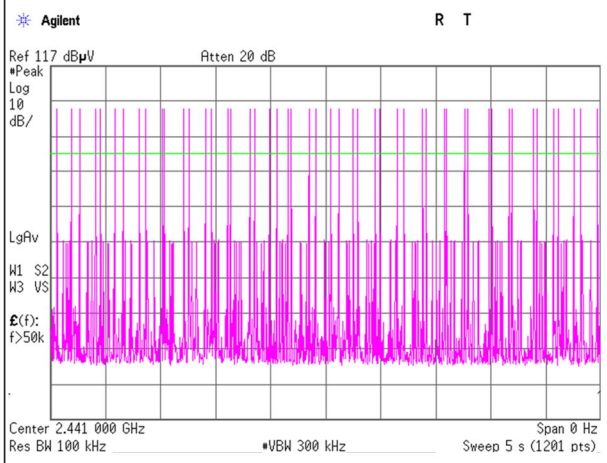
Sample Calculation

Average = Summation (Sampling 1 to 5) / 5

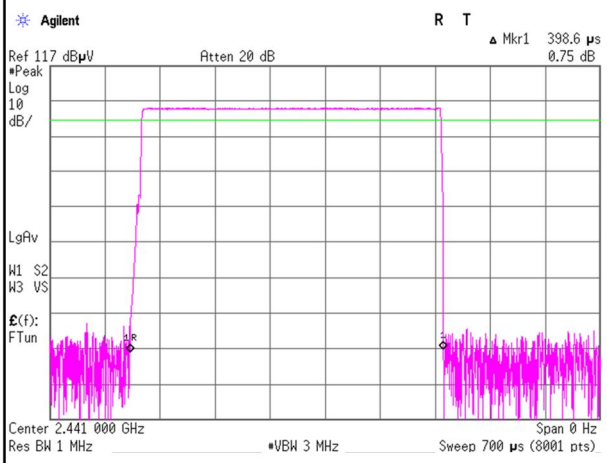
This device complies with the Bluetooth protocol for FHSS operation, employing a pseudo random channel selection and hopping rate to ensure that the occupancy time in N x 0.4 s, where N is the number of channels being used in the hopping sequence ($20 \leq N \leq 79$), is always less than 0.4 s regardless of packet size. This is confirmed in the test report for N = 79.

Dwell time

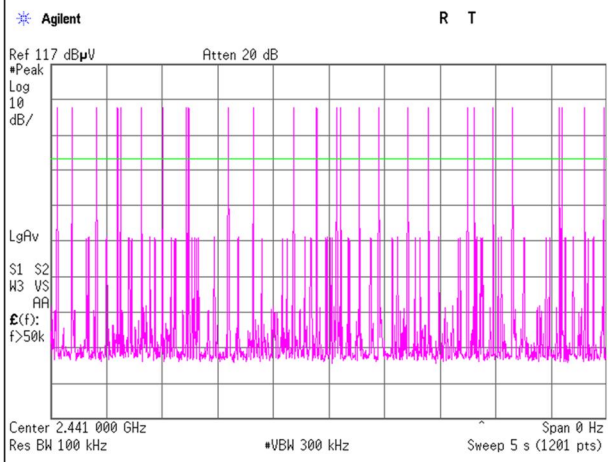
DH1 (1/2)
(Representative chart)



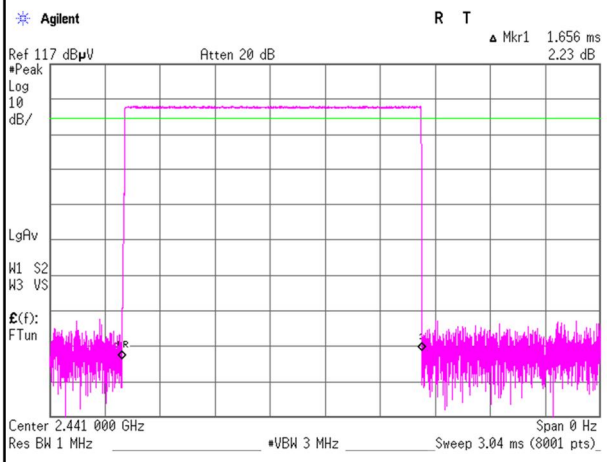
DH1 (2/2)



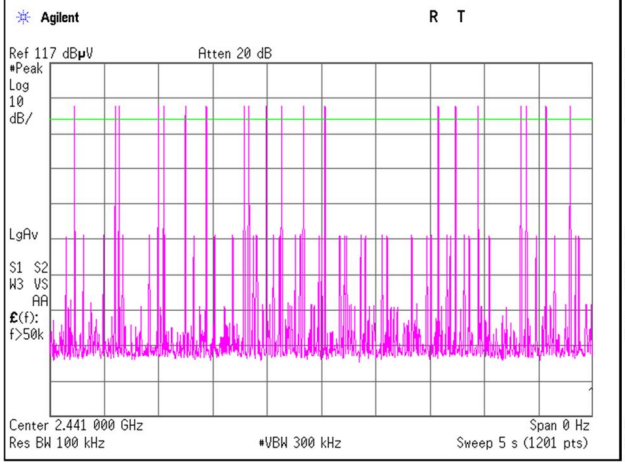
DH3 (1/2)
(Representative chart)



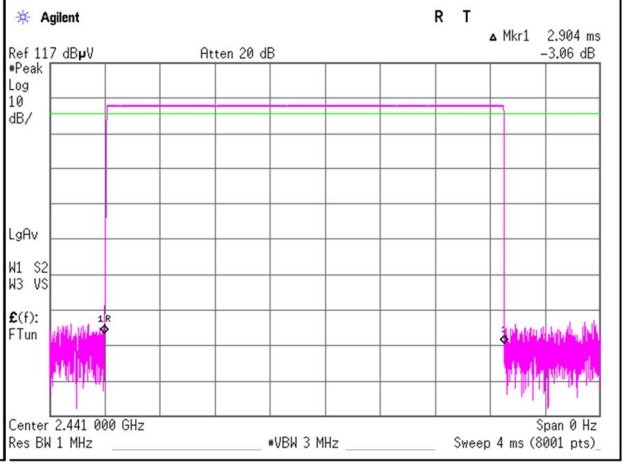
DH3 (2/2)



DH5 (1/2)
(Representative chart)

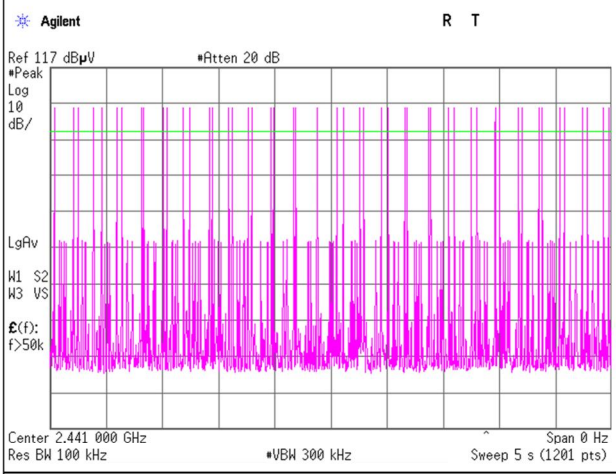


DH5 (2/2)

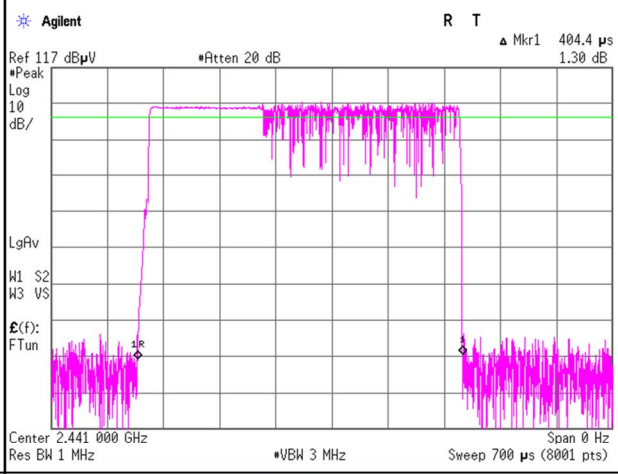


Dwell time

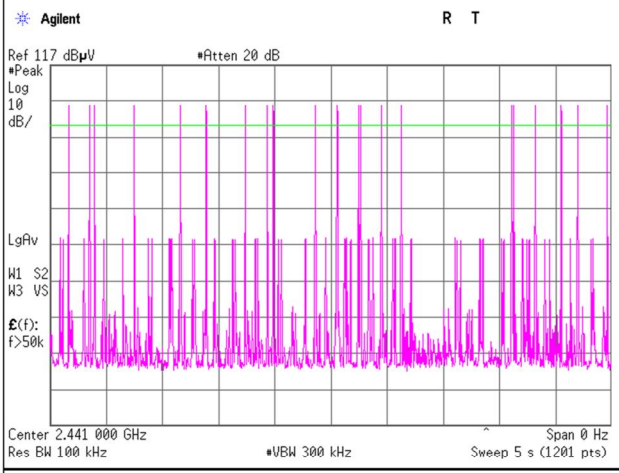
3DH1 (1/2)
(Representative chart)



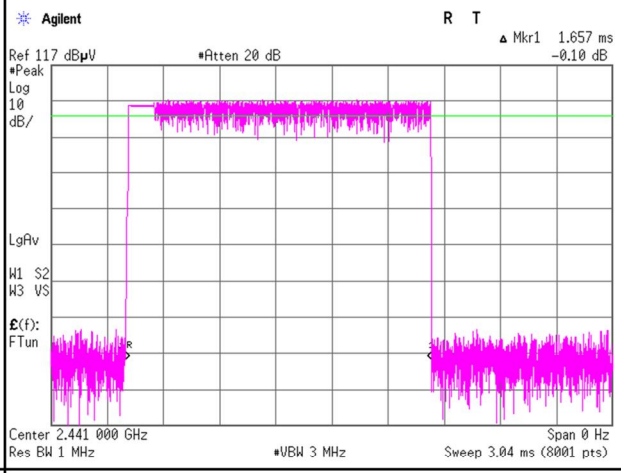
3DH1 (2/2)



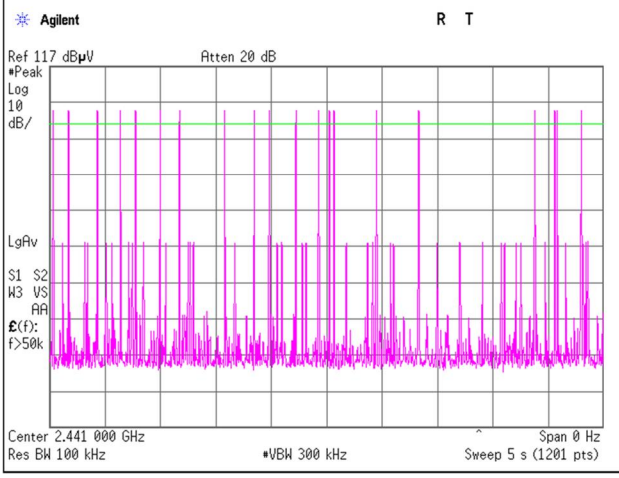
3DH3 (1/2)
(Representative chart)



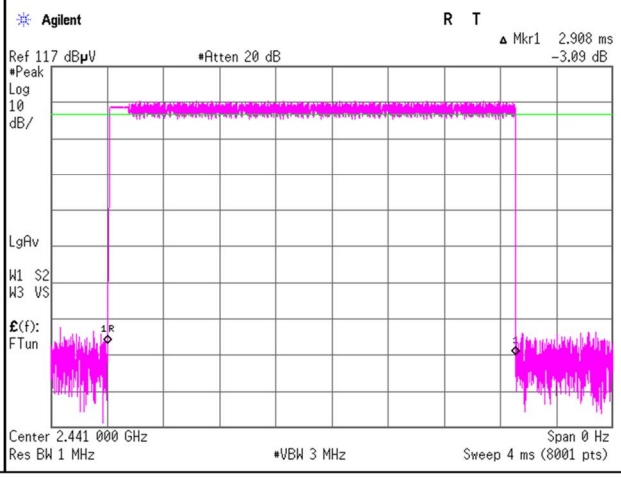
3DH3 (2/2)



3DH5 (1/2)
(Representative chart)



3DH5 (2/2)



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	September 17, 2024	October 11, 2024
Temperature / Humidity	24 deg. C / 55 % RH	25 deg. C / 51 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx, Hopping Off	

Maximum peak output power

					Conducted Power					e.i.r.p. for RSS-247					
Mode	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]
DH5	2402	-2.03	1.71	9.89	9.57	9.06	20.97	125	11.40	0.82	10.39	10.95	36.02	4000	25.63
DH5	2441	-1.97	1.76	9.89	9.68	9.29	20.97	125	11.29	0.82	10.50	11.22	36.02	4000	25.52
DH5	2480	-1.81	1.78	9.89	9.86	9.67	20.97	125	11.11	0.82	10.68	11.68	36.02	4000	25.34
2DH5	2402	0.25	1.71	9.89	11.85	15.32	20.97	125	9.12	0.82	12.67	18.50	36.02	4000	23.35
2DH5	2441	0.33	1.76	9.89	11.98	15.78	20.97	125	8.99	0.82	12.80	19.05	36.02	4000	23.22
2DH5	2480	0.51	1.78	9.89	12.18	16.51	20.97	125	8.79	0.82	13.00	19.94	36.02	4000	23.02
3DH5	2402	0.60	1.71	9.89	12.20	16.61	20.97	125	8.77	0.82	13.02	20.06	36.02	4000	23.00
3DH5	2441	0.65	1.76	9.89	12.30	16.98	20.97	125	8.67	0.82	13.12	20.51	36.02	4000	22.90
3DH5	2480	0.80	1.78	9.89	12.47	17.65	20.97	125	8.50	0.82	13.29	21.31	36.02	4000	22.73

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

Test was not performed at AFH mode, because the decrease of number of channel (min: 20 ch) at AFH mode does not influence on the output power and bandwidth of the EUT.
As this device had AFH mode and frequency separation could not meet the requirement of over 20 dB BW without 2/3 relaxation, 125 mW power limit was applied to it.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room	
Date	September 17, 2024	October 11, 2024
Temperature / Humidity	24 deg. C / 55 % RH	25 deg. C / 51 % RH
Engineer	Kenichi Adachi	Kenichi Adachi
Mode	Tx, Hopping Off	

(*1)

Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
	[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
DH5	2402	-2.23	1.71	9.89	9.37	8.65	0.00	9.37	8.65
DH5	2441	-2.15	1.76	9.89	9.50	8.91	0.00	9.50	8.91
DH5	2480	-2.02	1.78	9.89	9.65	9.22	0.00	9.65	9.22
2DH5	2402	-2.06	1.71	9.89	9.54	9.00	0.00	9.54	9.00
2DH5	2441	-1.97	1.76	9.89	9.68	9.29	0.00	9.68	9.29
2DH5	2480	-1.77	1.78	9.89	9.90	9.76	0.00	9.90	9.76
3DH5	2402	-2.05	1.71	9.89	9.55	9.02	0.00	9.55	9.02
3DH5	2441	-1.97	1.76	9.89	9.68	9.29	0.00	9.68	9.29
3DH5	2480	-1.77	1.78	9.89	9.90	9.76	0.00	9.90	9.76

(*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

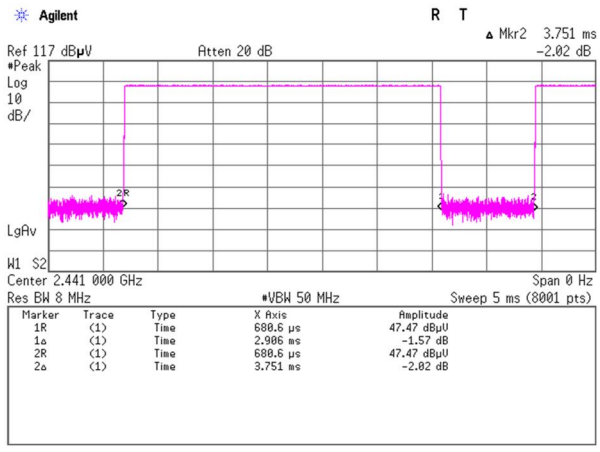
Result (Burst power average) = Result (Time average) + Duty factor

Burst Rate Confirmation

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping Off

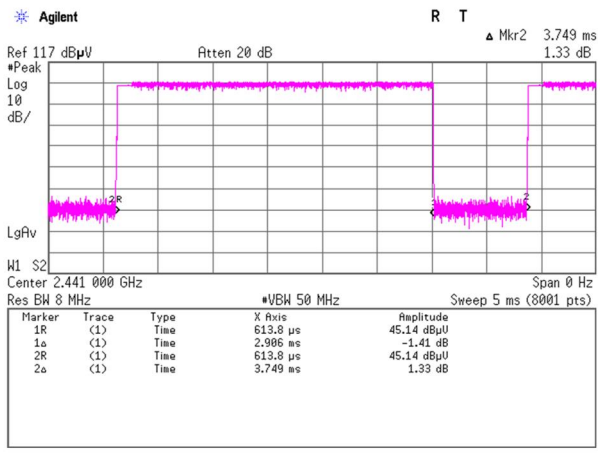
DH5

Tx on / (Tx on + Tx off) =	0.775
Tx on / (Tx on + Tx off) * 100 =	77.5 %
Duty factor = 10 * log (3.751 / 2.906) =	1.11 dB



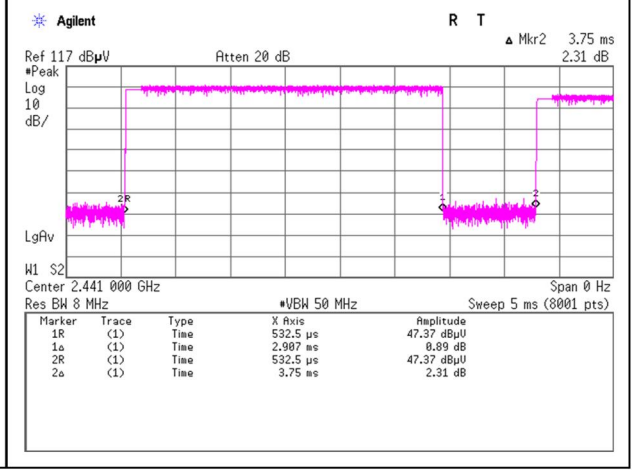
2DH5

Tx on / (Tx on + Tx off) =	0.775
Tx on / (Tx on + Tx off) * 100 =	77.5 %
Duty factor = 10 * log (3.749 / 2.906) =	1.11 dB



3DH5

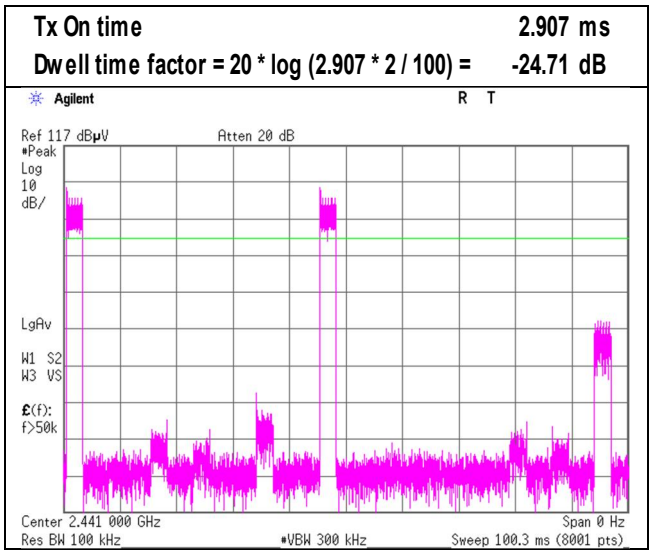
Tx on / (Tx on + Tx off) =	0.775
Tx on / (Tx on + Tx off) * 100 =	77.5 %
Duty factor = 10 * log (3.75 / 2.907) =	1.11 dB



Duty cycle correction factor
(For Simultaneous transmission)

Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping On

3DH5



* As for Tx On time, refer to "Burst Rate Confirmation

Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC1	WAC1	WAC1
Date	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, DH5 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	50.16	27.85	-28.23	-	2.19	51.97	73.9	21.9	141	85	-
Hori.	4804.000	PK	46.79	31.97	-35.72	-	2.19	45.23	73.9	28.6	142	41	-
Hori.	7206.000	PK	46.67	36.23	-34.11	-	2.19	50.98	73.9	22.9	150	0	Floor Noise
Hori.	9608.000	PK	45.14	37.93	-31.67	-	2.19	53.59	73.9	20.3	142	41	-
Hori.	7206.000	AV	35.97	36.23	-34.11	-	2.19	40.28	53.9	13.6	150	0	Floor Noise
Vert.	2390.000	PK	50.30	27.85	-28.23	-	2.19	52.11	73.9	21.7	173	163	-
Vert.	4804.000	PK	46.84	31.97	-35.72	-	2.19	45.28	73.9	28.6	157	63	-
Vert.	7206.000	PK	45.96	36.23	-34.11	-	2.19	50.27	73.9	23.6	150	0	Floor Noise
Vert.	9608.000	PK	46.23	37.93	-31.67	-	2.19	54.68	73.9	19.2	157	63	-
Vert.	7206.000	AV	35.13	36.23	-34.11	-	2.19	39.44	53.9	14.4	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.	2390.000	AV	36.54	27.85	-28.23	-	1.11	2.19	39.46	53.9	14.4	*1)
Hori.	4804.000	AV	37.63	31.97	-35.72	-	1.11	2.19	37.18	53.9	16.7	-
Hori.	9608.000	AV	35.95	37.93	-31.67	-	1.11	2.19	45.51	53.9	8.3	-
Vert.	2390.000	AV	36.56	27.85	-28.23	-	1.11	2.19	39.48	53.9	14.4	*1)
Vert.	4804.000	AV	36.01	31.97	-35.72	-	1.11	2.19	35.56	53.9	18.3	-
Vert.	9608.000	AV	36.07	37.93	-31.67	-	1.11	2.19	45.63	53.9	**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) + 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)

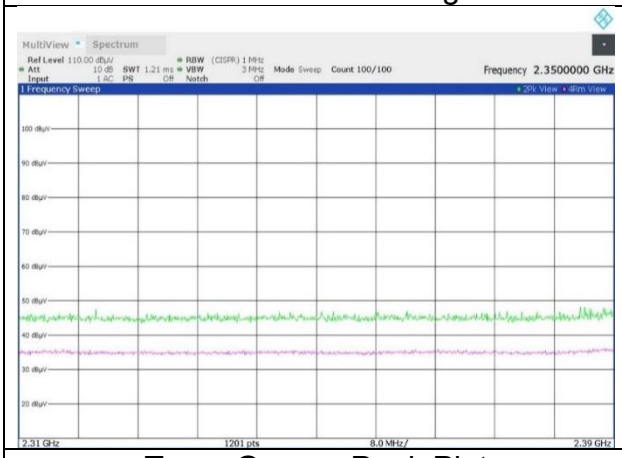
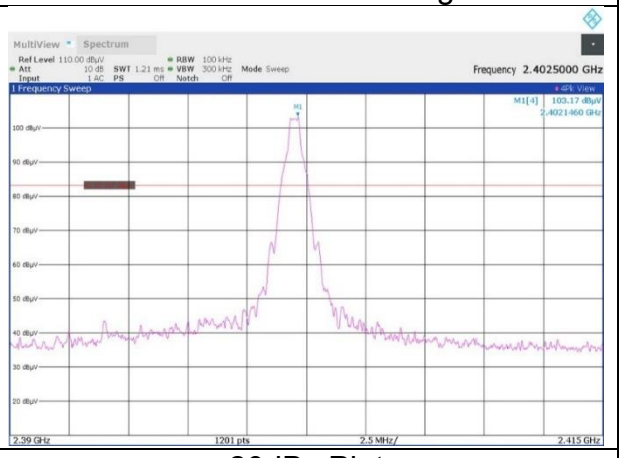
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

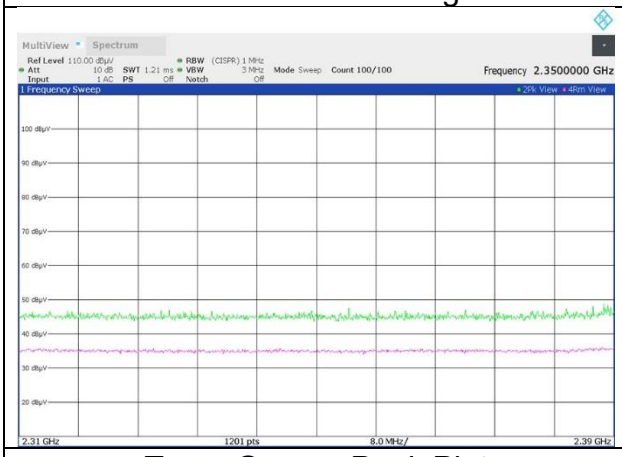
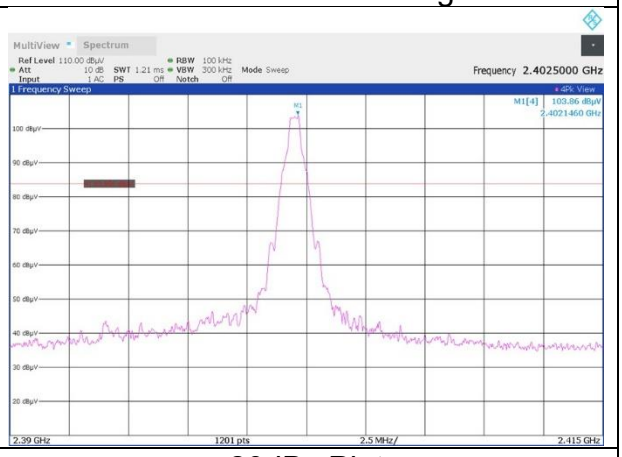
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	103.17	27.89	-28.22	-	2.19	105.03	-	-	Carrier
Hori.	2400.000	PK	47.46	27.89	-28.22	-	2.19	49.32	85.0	35.6	-
Vert.	2402.000	PK	103.86	27.89	-28.22	-	2.19	105.72	-	-	Carrier
Vert.	2400.000	PK	47.37	27.89	-28.22	-	2.19	49.23	85.7	36.4	-

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 12, 2024
Temperature / Humidity	22 deg.C, 43 %RH
Engineer	Akihiro Oda
Mode	Tx, Hopping Off, DH5 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
Date	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 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.	4882.000	PK	47.15	32.34	-35.79	-	2.19	45.89	73.9	28.0	156	54	-
Hori.	7323.000	PK	47.03	36.63	-33.90	-	2.19	51.95	73.9	21.9	150	0	Floor Noise
Hori.	9764.000	PK	48.94	37.93	-31.49	-	2.19	57.57	73.9	16.3	156	54	-
Hori.	7323.000	AV	36.29	36.63	-33.90	-	2.19	41.21	53.9	12.6	150	0	Floor Noise
Vert.	4882.000	PK	46.77	32.34	-35.79	-	2.19	45.51	73.9	28.3	150	156	-
Vert.	7323.000	PK	46.87	36.63	-33.90	-	2.19	51.79	73.9	22.1	150	0	Floor Noise
Vert.	9764.000	PK	45.62	37.93	-31.49	-	2.19	54.25	73.9	19.6	150	156	-
Vert.	7323.000	AV	36.42	36.63	-33.90	-	2.19	41.34	53.9	12.5	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.	4882.000	AV	36.35	32.34	-35.79	-	1.11	2.19	36.20	53.9	17.7	-
Hori.	9764.000	AV	37.77	37.93	-31.49	-	1.11	2.19	47.51	53.9	**6.3**	-
Vert.	4882.000	AV	36.23	32.34	-35.79	-	1.11	2.19	36.08	53.9	17.8	-
Vert.	9764.000	AV	35.73	37.93	-31.49	-	1.11	2.19	45.47	53.9	8.4	-

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) + 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 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, DH5 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.	2483.500	PK	56.52	27.96	-28.18	-	2.19	58.49	73.9	15.4	150	92	-
Hori.	4960.000	PK	46.21	32.62	-35.88	-	2.19	45.14	73.9	28.7	150	229	-
Hori.	7440.000	PK	43.98	36.69	-33.68	-	2.19	49.18	73.9	24.7	150	0	Floor Noise
Hori.	9920.000	PK	48.81	37.93	-31.31	-	2.19	57.62	73.9	16.2	150	229	-
Hori.	7440.000	AV	36.13	36.69	-33.68	-	2.19	41.33	53.9	12.5	150	0	Floor Noise
Vert.	2483.500	PK	57.20	27.96	-28.18	-	2.19	59.17	73.9	14.7	162	165	-
Vert.	4960.000	PK	47.27	32.62	-35.88	-	2.19	46.20	73.9	27.7	167	62	-
Vert.	7440.000	PK	46.07	36.69	-33.68	-	2.19	51.27	73.9	22.6	150	0	Floor Noise
Vert.	9920.000	PK	46.00	37.93	-31.31	-	2.19	54.81	73.9	19.0	167	62	-
Vert.	7440.000	AV	35.83	36.69	-33.68	-	2.19	41.03	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]

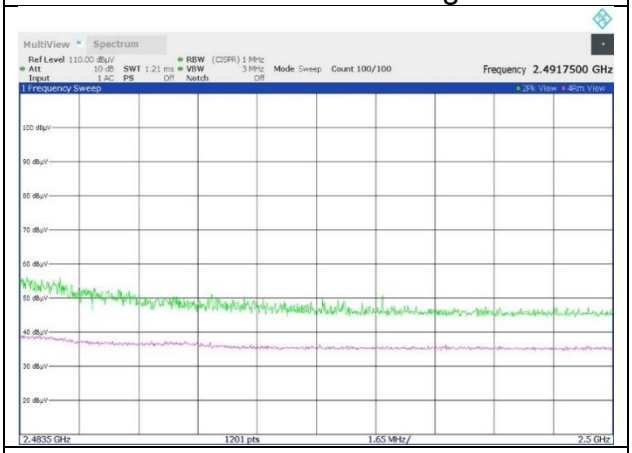
Average measurement value with Duty Factor

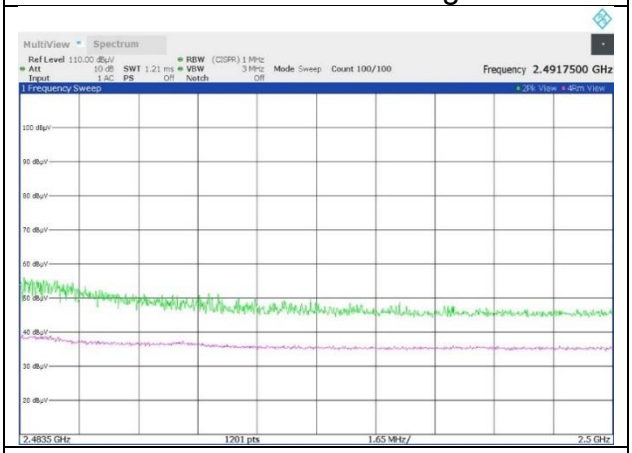
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	39.25	27.96	-28.18	-	1.11	2.19	42.33	53.9	11.5	*1)
Hori.	4960.000	AV	36.24	32.62	-35.88	-	1.11	2.19	36.28	53.9	17.6	-
Hori.	9920.000	AV	40.35	37.93	-31.31	-	1.11	2.19	50.27	53.9	**3.6**	-
Vert.	2483.500	AV	39.83	27.96	-28.18	-	1.11	2.19	42.91	53.9	10.9	*1)
Vert.	4960.000	AV	36.00	32.62	-35.88	-	1.11	2.19	36.04	53.9	17.8	-
Vert.	9920.000	AV	36.68	37.93	-31.31	-	1.11	2.19	46.60	53.9	7.3	-

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, Hopping Off, DH5 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
Date	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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	53.86	27.85	-28.23	-	2.19	55.67	73.9	18.2	167	88	-
Hori.	4804.000	PK	47.65	31.97	-35.72	-	2.19	46.09	73.9	27.8	156	54	-
Hori.	7206.000	PK	46.31	36.23	-34.11	-	2.19	50.62	73.9	23.2	150	0	Floor Noise
Hori.	9608.000	PK	46.90	37.93	-31.67	-	2.19	55.35	73.9	18.5	156	54	-
Hori.	7206.000	AV	35.75	36.23	-34.11	-	2.19	40.06	53.9	13.8	150	0	Floor Noise
Vert.	2390.000	PK	53.43	27.85	-28.23	-	2.19	55.24	73.9	18.6	157	167	-
Vert.	4804.000	PK	46.46	31.97	-35.72	-	2.19	44.90	73.9	29.0	145	206	-
Vert.	7206.000	PK	46.45	36.23	-34.11	-	2.19	50.76	73.9	23.1	150	0	Floor Noise
Vert.	9608.000	PK	46.10	37.93	-31.67	-	2.19	54.55	73.9	19.3	145	206	-
Vert.	7206.000	AV	36.11	36.23	-34.11	-	2.19	40.42	53.9	13.4	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.	2390.000	AV	36.68	27.85	-28.23	-	1.11	2.19	39.60	53.9	14.3	*1)
Hori.	4804.000	AV	37.40	31.97	-35.72	-	1.11	2.19	36.95	53.9	16.9	-
Hori.	9608.000	AV	36.27	37.93	-31.67	-	1.11	2.19	45.83	53.9	**8.0**	-
Vert.	2390.000	AV	36.98	27.85	-28.23	-	1.11	2.19	39.90	53.9	14.0	*1)
Vert.	4804.000	AV	35.82	31.97	-35.72	-	1.11	2.19	35.37	53.9	18.5	-
Vert.	9608.000	AV	35.09	37.93	-31.67	-	1.11	2.19	44.65	53.9	9.2	-

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)

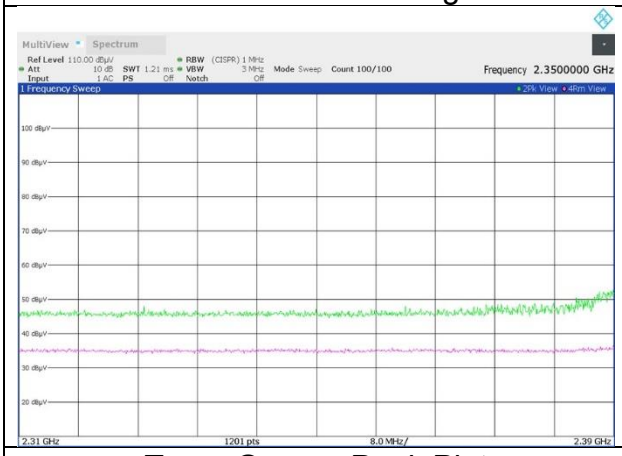
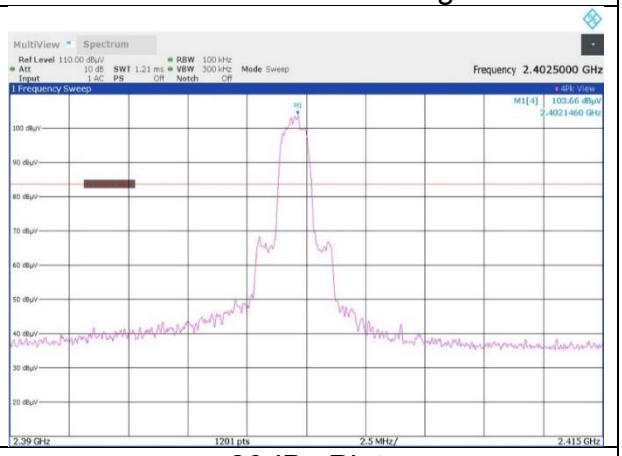
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

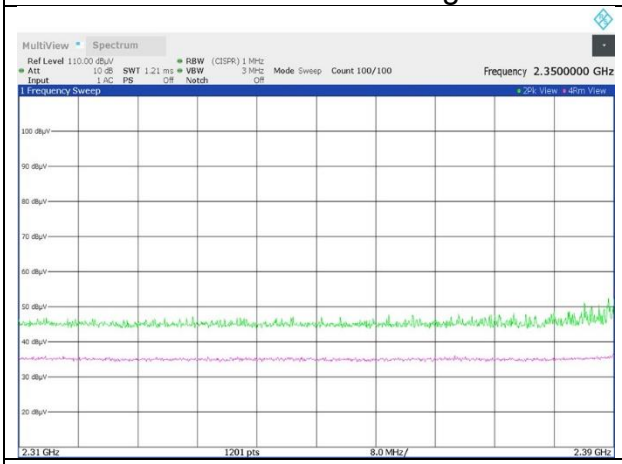
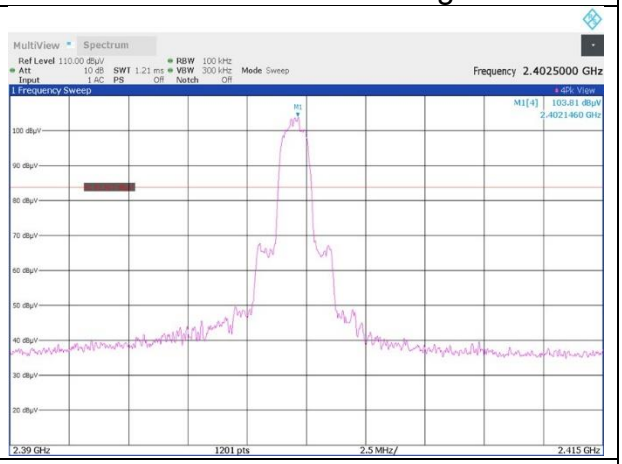
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	103.66	27.89	-28.22	-	2.19	105.52	-	-	Carrier
Hori.	2400.000	PK	48.64	27.89	-28.22	-	2.19	50.50	85.5	35.0	-
Vert.	2402.000	PK	103.81	27.89	-28.22	-	2.19	105.67	-	-	Carrier
Vert.	2400.000	PK	48.85	27.89	-28.22	-	2.19	50.71	85.6	34.8	-

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) + 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, Hopping Off, 3DH5 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
Date	October 12, 2024	October 13, 2024	October 15, 2024
Temperature / Humidity	22 deg.C, 43 %RH	23 deg.C, 45 %RH	24 deg.C, 54 %RH
Engineer	Akihiro Oda	Yohsuke Matsuzawa	Yuta Shiba
	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 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.	4882.000	PK	46.88	32.34	-35.79	-	2.19	45.62	73.9	28.2	150	56	-
Hori.	7323.000	PK	46.18	36.63	-33.90	-	2.19	51.10	73.9	22.8	150	0	Floor Noise
Hori.	9764.000	PK	50.21	37.93	-31.49	-	2.19	58.84	73.9	15.0	150	56	-
Hori.	7323.000	AV	36.15	36.63	-33.90	-	2.19	41.07	53.9	12.8	150	0	Floor Noise
Vert.	4882.000	PK	46.86	32.34	-35.79	-	2.19	45.60	73.9	28.3	154	182	-
Vert.	7323.000	PK	47.49	36.63	-33.90	-	2.19	52.41	73.9	21.4	150	0	Floor Noise
Vert.	9764.000	PK	45.50	37.93	-31.49	-	2.19	54.13	73.9	19.7	154	182	-
Vert.	7323.000	AV	36.10	36.63	-33.90	-	2.19	41.02	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.	4882.000	AV	36.26	32.34	-35.79	-	1.11	2.19	36.11	53.9	17.7	-
Hori.	9764.000	AV	39.76	37.93	-31.49	-	1.11	2.19	49.50	53.9	**4.4**	-
Vert.	4882.000	AV	36.28	32.34	-35.79	-	1.11	2.19	36.13	53.9	17.7	-
Vert.	9764.000	AV	35.15	37.93	-31.49	-	1.11	2.19	44.89	53.9	9.0	-

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 to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 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.	479.987	QP	42.30	17.18	8.00	32.45	0.00	35.03	46.0	10.9	100	138	-
Hori.	499.996	QP	40.70	17.76	8.04	32.38	0.00	34.12	46.0	11.8	100	36	-
Hori.	959.971	QP	36.30	22.25	8.93	30.34	0.00	37.14	46.0	8.8	100	165	-
Hori.	2483.500	PK	58.75	27.96	-28.18	-	2.19	60.72	73.9	13.1	149	88	-
Hori.	4960.000	PK	46.93	32.62	-35.88	-	2.19	45.86	73.9	28.0	137	48	-
Hori.	7440.000	PK	46.93	36.69	-33.68	-	2.19	52.13	73.9	21.7	150	0	Floor Noise
Hori.	9920.000	PK	53.29	37.93	-31.31	-	2.19	62.10	73.9	11.8	137	48	-
Hori.	7440.000	AV	36.21	36.69	-33.68	-	2.19	41.41	53.9	12.4	150	0	Floor Noise
Vert.	40.407	QP	38.30	11.40	6.34	32.94	0.00	23.10	40.0	16.9	100	359	-
Vert.	57.060	QP	42.20	9.62	6.40	33.14	0.00	25.08	40.0	14.9	100	156	-
Vert.	60.003	QP	44.90	9.49	6.38	33.16	0.00	27.61	40.0	12.3	100	47	-
Vert.	499.995	QP	41.40	17.76	8.04	32.38	0.00	34.82	46.0	11.1	112	107	-
Vert.	503.998	QP	39.40	17.77	8.05	32.37	0.00	32.85	46.0	13.1	126	330	-
Vert.	2483.500	PK	59.47	27.96	-28.18	-	2.19	61.44	73.9	12.4	159	166	-
Vert.	4960.000	PK	47.07	32.62	-35.88	-	2.19	46.00	73.9	27.9	166	64	-
Vert.	7440.000	PK	46.66	36.69	-33.68	-	2.19	51.86	73.9	22.0	150	0	Floor Noise
Vert.	9920.000	PK	48.58	37.93	-31.31	-	2.19	57.39	73.9	16.5	166	64	-
Vert.	7440.000	AV	36.11	36.69	-33.68	-	2.19	41.31	53.9	12.5	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]

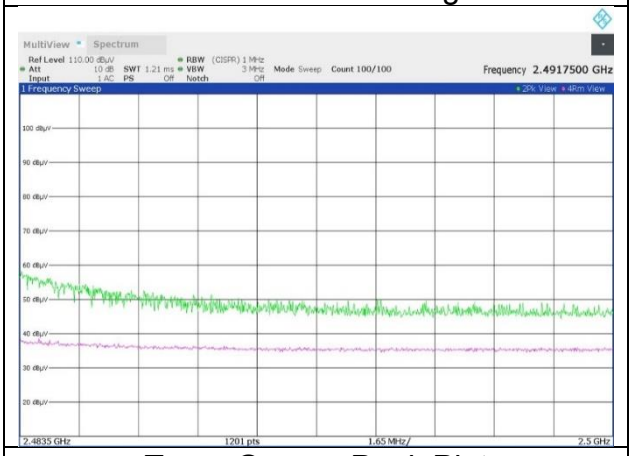
Average measurement value with Duty Factor

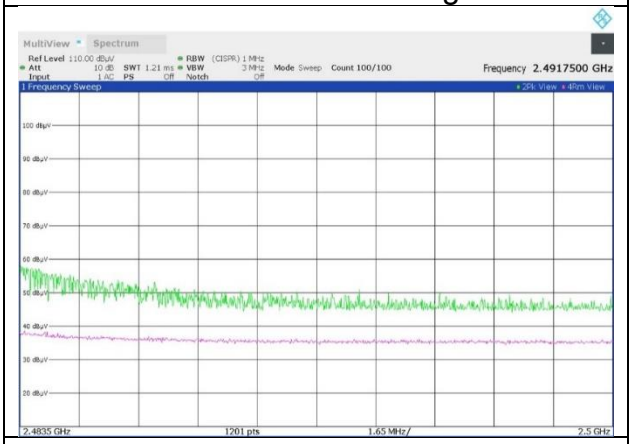
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Fac. [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.17	27.96	-28.18	-	1.11	2.19	43.25	53.9	10.6	*1)
Hori.	4960.000	AV	36.30	32.62	-35.88	-	1.11	2.19	36.34	53.9	17.5	-
Hori.	9920.000	AV	43.38	37.93	-31.31	-	1.11	2.19	53.30	53.9	**0.6**	-
Vert.	2483.500	AV	40.12	27.96	-28.18	-	1.11	2.19	43.20	53.9	10.7	*1)
Vert.	4960.000	AV	36.12	32.62	-35.88	-	1.11	2.19	36.16	53.9	17.7	-
Vert.	9920.000	AV	38.39	37.93	-31.31	-	1.11	2.19	48.31	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.
*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, Hopping Off, 3DH5 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 7, 2025	December 16, 2024	December 16, 2024
Temperature / Humidity	17 deg.C, 43 %RH	20 deg.C, 22 %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, Hopping Off, 3DH5 2480 MHz with WLAN 11ac-40 5550 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.	81.655	QP	23.20	9.02	6.79	33.23	0.00	5.78	40.0	34.2	100	0	-
Hori.	110.049	QP	22.90	10.11	6.86	33.24	0.00	6.63	43.5	36.8	100	0	-
Hori.	434.051	QP	22.20	16.14	7.89	32.58	0.00	13.65	46.0	32.3	100	0	-
Hori.	882.083	QP	20.80	21.97	8.82	30.84	0.00	20.75	46.0	25.2	100	0	-
Hori.	2483.500	PK	58.27	27.96	-27.94	-	2.19	60.48	73.9	13.4	152	53	-
Hori.	4960.000	PK	68.34	32.62	-35.50	-	2.19	67.65	73.9	**6.2**	151	60	-
Hori.	7440.000	PK	53.80	36.69	-33.66	-	2.19	59.02	73.9	14.8	106	43	-
Hori.	9920.000	PK	51.29	37.93	-31.18	-	2.19	60.23	73.9	13.6	133	53	-
Vert.	62.016	QP	25.30	9.45	6.38	33.17	0.00	7.96	40.0	32.0	100	245	-
Vert.	92.406	QP	22.73	9.23	6.93	33.24	0.00	5.65	43.5	37.8	100	0	-
Vert.	132.115	QP	28.70	11.28	6.79	33.22	0.00	13.55	43.5	29.9	101	135	-
Vert.	421.722	QP	22.50	16.01	7.86	32.60	0.00	13.77	46.0	32.2	100	0	-
Vert.	2483.500	PK	57.16	27.96	-27.94	-	2.19	59.37	73.9	14.5	183	42	-
Vert.	4960.000	PK	56.51	32.62	-35.50	-	2.19	55.82	73.9	18.0	249	1	-
Vert.	7440.000	PK	48.96	36.69	-33.66	-	2.19	54.18	73.9	19.7	355	53	-
Vert.	9920.000	PK	49.72	37.93	-31.18	-	2.19	58.66	73.9	15.2	399	61	-

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	58.27	27.96	-27.94	-	-24.71	2.19	35.77	53.9	18.1	*1)
Hori.	4960.000	PK	68.34	32.62	-35.50	-	-24.71	2.19	42.94	53.9	10.9	-
Hori.	7440.000	PK	53.80	36.69	-33.66	-	-24.71	2.19	34.31	53.9	19.5	-
Hori.	9920.000	PK	51.29	37.93	-31.18	-	-24.71	2.19	35.52	53.9	18.3	-
Vert.	2483.500	PK	57.16	27.96	-27.94	-	-24.71	2.19	34.66	53.9	19.2	*1)
Vert.	4960.000	PK	56.51	32.62	-35.50	-	-24.71	2.19	31.11	53.9	22.7	-
Vert.	7440.000	PK	48.96	36.69	-33.66	-	-24.71	2.19	29.47	53.9	24.4	-
Vert.	9920.000	PK	49.72	37.93	-31.18	-	-24.71	2.19	33.95	53.9	19.9	-

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.

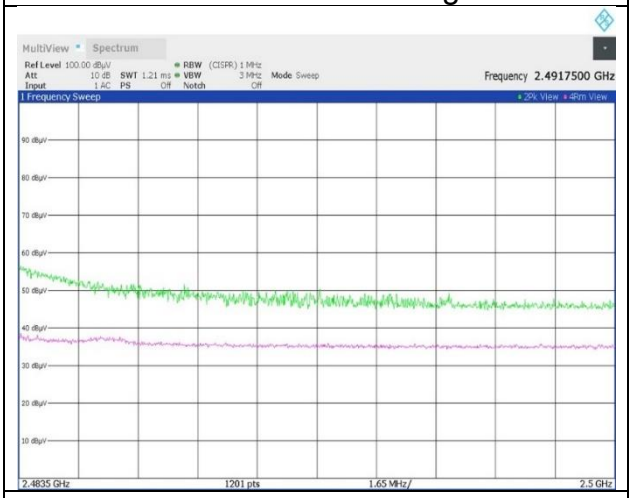
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC1
Date	February 7, 2025
Temperature / Humidity	20 deg.C, 22 %RH
Engineer	Takayuki Kobayashi
Mode	Tx, Hopping Off, 3DH5 2480 MHz with WLAN 11ac-40 5550 MHz

Horizontal

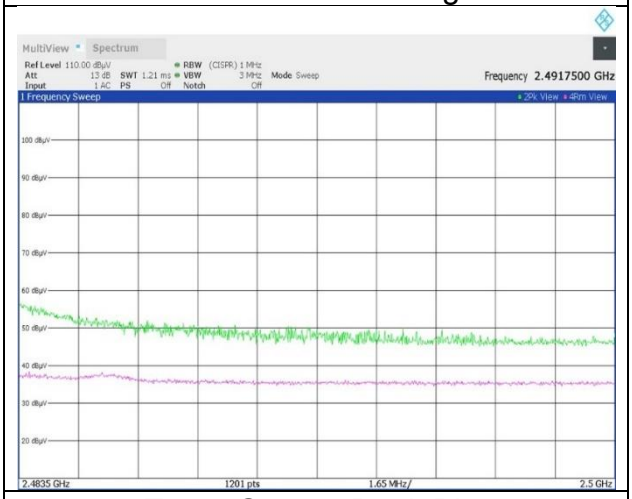
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

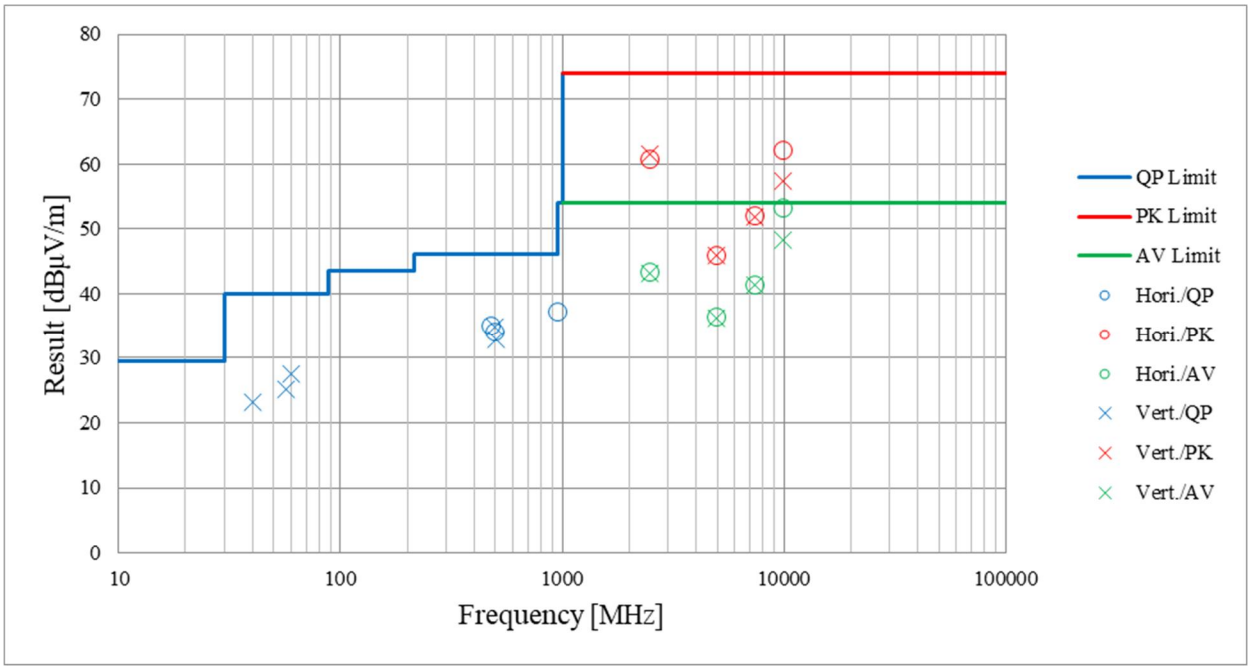


Trace Green : Peak Plot
Trace Purple : Average Plot

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

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

Test place	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 to 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 18 GHz)	(18 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz			



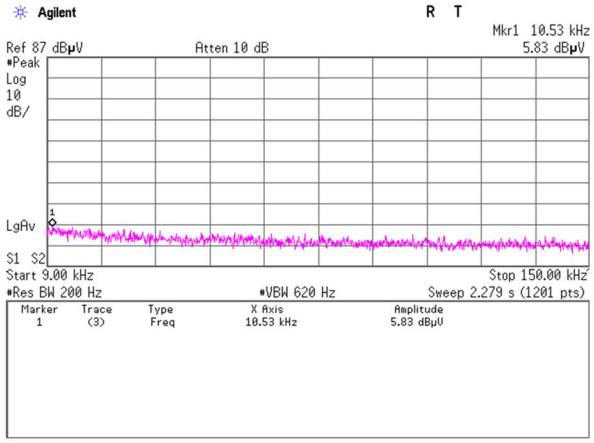
*These plots data contain sufficient number to show the trend of characteristic features for EUT.

Conducted Spurious Emission

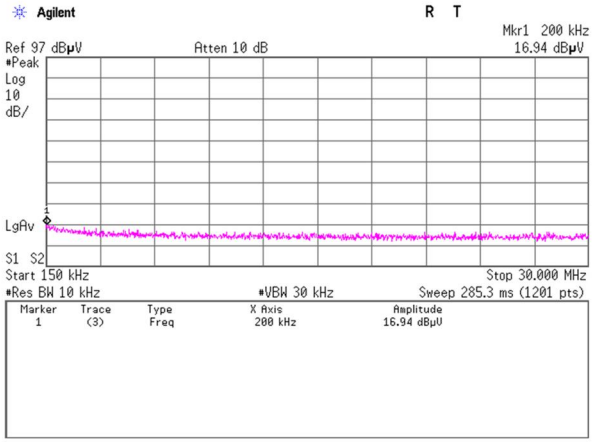
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 16, 2024
Temperature / Humidity	25 deg. C / 54 % RH
Engineer	Yosuke Murakami
Mode	Tx, Hopping Off, DH5

2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



30 MHz - 25 GHz