RADIO TEST REPORT

Test Report No. 15116661S-B

Customer	**Nintendo Co., Ltd.**
Description of EUT	**Game controller**
Model Number of EUT	**BEE-012**
FCC ID	**BKEBEE012**
Test Regulation	**FCC Part 15 Subpart C**
Test Result	**Complied**
Issue Date	**August 8, 2024**
Remarks	**Bluetooth (BR / EDR) parts**

Representative Test Engineer	Approved By
Kazuya Noda Leader	Akio Hayashi Manager

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.: 15116661S-B

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15116661S-B	August 8, 2024	-

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	Nintendo Co., Ltd.
Address	11-1 Hokotate-cho, Kamitoba, Minami-ku, Kyoto 601-8501, Japan
Telephone Number	+81-75-662-9600
Contact Person	Yosuke Ishikawa

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	Game controller
Model Number	BEE-012
Serial Number	Refer to SECTION 4.2
Condition	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab.
Receipt Date	January 16, 2024
Test Date	June 18 to 25, 2024

2.2 Product Description

General Specification

Rating	DC 5 V (*.Supply voltage from connector) (*. DC 3.89 V from Re-chargeable Li-ion battery for the internal circuit)
Operating temperature	5 deg. C to 35 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 (Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	GFSK
Antenna Gain a)	0.69 dBi

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, π/4 DQPSK, 8 DPSK)
Antenna Gain a)	0.69 dBi

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

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

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

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	19.3 dB, 0.46339 MHz, AV, L1	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)			
20dB 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)	10.1 dB, 4804.000 Hz, AV, Vert., Mode: Tx, Hopping Off, 3DH5 2402 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)
This EUT provides the stable voltage constantly to RF Part regardless of input voltage.
Therefore, this EUT complies with the requirement.

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

3.3 Addition to Standard

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

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

3.4 Uncertainty

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

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

Item	Frequency range	Uncertainty (+/-)
Conducted Emission (AC Mains) LISN	150 kHz to 30 MHz	3.2 dB
Radiated Emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.3 dB
	30 MHz to 200 MHz	4.9 dB
	200 MHz to 1 GHz	6.2 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)	1.8 dB
Spurious Emission (Conducted) below 1 GHz	0.91 dB
Conducted Emissions Power Density Measurement 1 GHz to 3 GHz	1.3 dB
Conducted Emissions Power Density Measurement 3 GHz to 18 GHz	2.5 dB
Spurious Emission (Conducted) 18 GHz to 26.5 GHz	2.8 dB
Spurious Emission (Conducted) 26.5 GHz to 40 GHz	2.6 dB
Bandwidth Measurement	0.012 %
Duty Cycle and Time Measurement	0.27 %
Temperature	2.2 deg.C.
Humidity	4.0 %
Voltage	0.74 %

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: BDR : 5 dBm, EDR : 2 dBm
Software: InspectionFwPackage Version: V0.15.0
(Date: 2024.01 16, Storage location: EUT memory)

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

Details of Operating Mode(s)

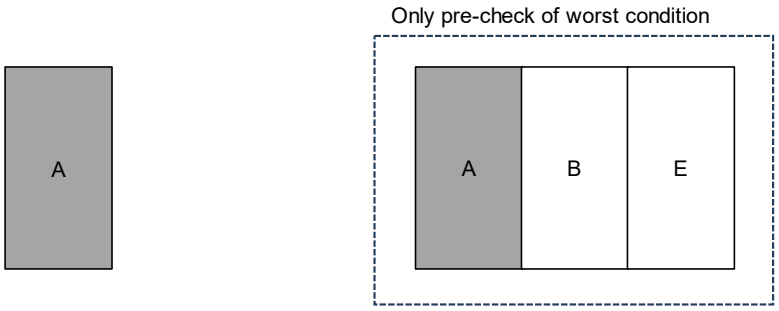
Test Item	Mode	Hopping	Tested Frequency
Conducted Emission, Radiated Spurious Emission (Below 1 GHz)	Tx DH5 *1)	Off	2402 MHz
Radiated Spurious Emission (Above 1 GHz), Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz
Carrier Frequency Separation	Tx DH5 Tx 3DH5	On	2402 MHz 2441 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) 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.

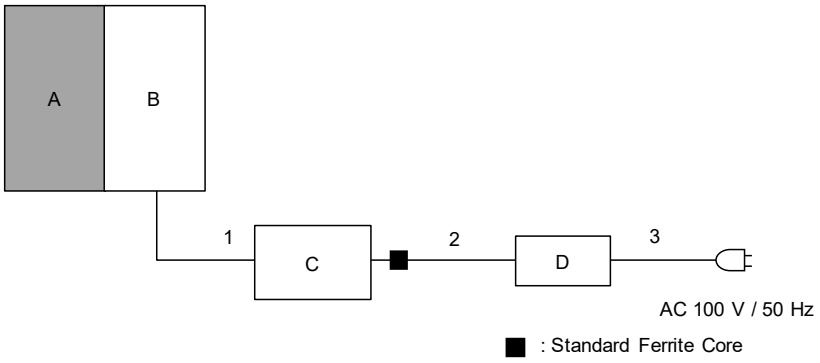
4.2 Configuration and Peripherals

Radiated Emission test

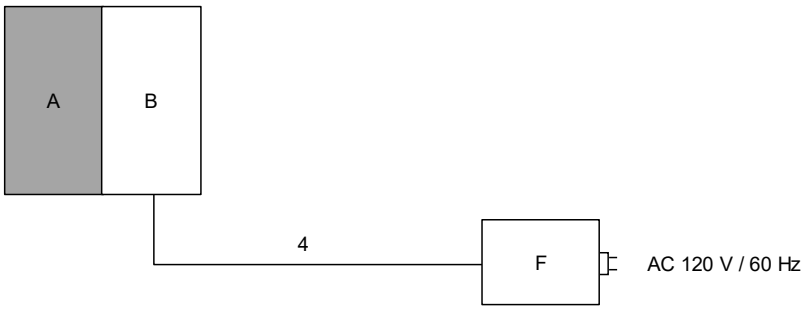


* The carrier level and noise levels were confirmed at each condition of standalone and connected by support equipment, and the test was made at the condition that has the maximum noise.

Antenna Terminal Conducted test



Conducted Emission test and



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
* As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 120 V of the worst voltage as representative.

Description of EUT and Support Equipment

No.	Item	Model Number	Serial Number	Manufacturer	Remarks
A	Controller	BEE-012	HBL01000089217 *1) HBL01000051689 *2)	Nintendo Co., Ltd.	EUT
B	Charging Grip	BEE-010	HDL04000004020 *1) B-0047 *2)	Nintendo Co., Ltd.	-
C	Laptop PC	CF-SZ6RDYVS	8KKSC50259	Panasonic	-
D	AC Adaptor	CF-AA64L2C M1	64L2CM118906341A	Panasonic	-
E	Controller	BEE-014	HCL01000090015	Nintendo Co., Ltd.	-
F	AC Adaptor	NGN-01	0A0000030	Nintendo Co., Ltd.	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	1.5	Shielded	Shielded	-
2	DC	1.0	Unshielded	Unshielded	-
3	AC	0.8	Unshielded	Unshielded	-
4	DC	1.5	Shielded	Shielded	-

*1) Used for Radiated Emission test and Conducted emission test.
*2) Used for Antenna Terminal Conducted test.

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 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.

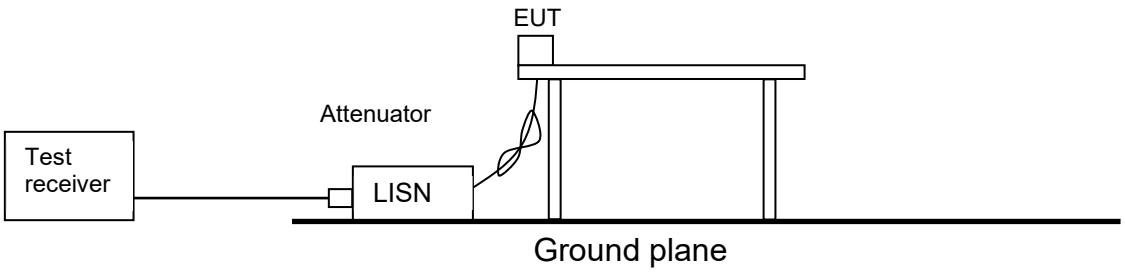
For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT 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 1.0 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

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

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

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

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

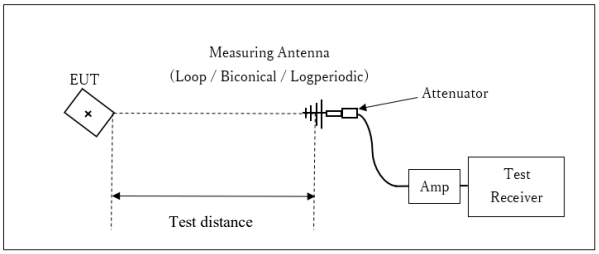
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer *a)		Spectrum Analyzer
Detector	QP	PK	AV	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 1/T (T: burst length, refer to Burst rate confirmation sheet) Detector: Peak	RBW: 100 kHz VBW: 300 kHz

*a) The Spectrum Analyzer was used in 3 dB resolution bandwidth.

Figure 2: Test Setup

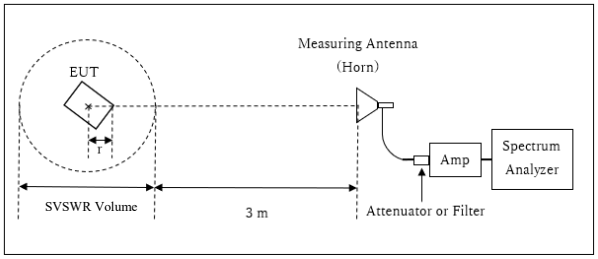
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

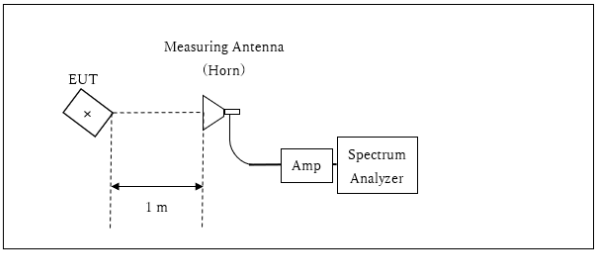


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.98 m / 3.0 m) = 2.46 dB
* Test Distance: (3 + SVSWR Volume /2) - r = 3.98 m

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.02 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.

	Below 1 GHz	1 GHz to 2.8 GHz	2.8 GHz to 10 GHz	Above 10 GHz
Horizontal	Axis-X	Axis-X	Axis-Z	Axis-X
Vertical	Axis-X	Axis-Y	Axis-Y	Axis-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	-	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	300 kHz	1 MHz	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 *2) *3)	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) 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)*3) 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

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.1 Shielded Room
Date : 2024/06/25

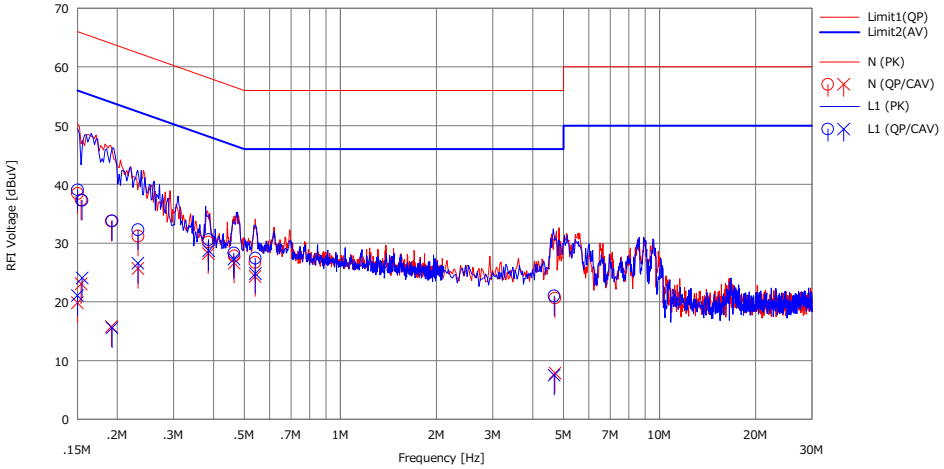
Mode : Tx, DH5, 2402 MHz

Power : AC 120 V / 60 Hz (AC Adapter)
Temp./Humi. : 23 deg.C / 53 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Yusuke Tanikawara



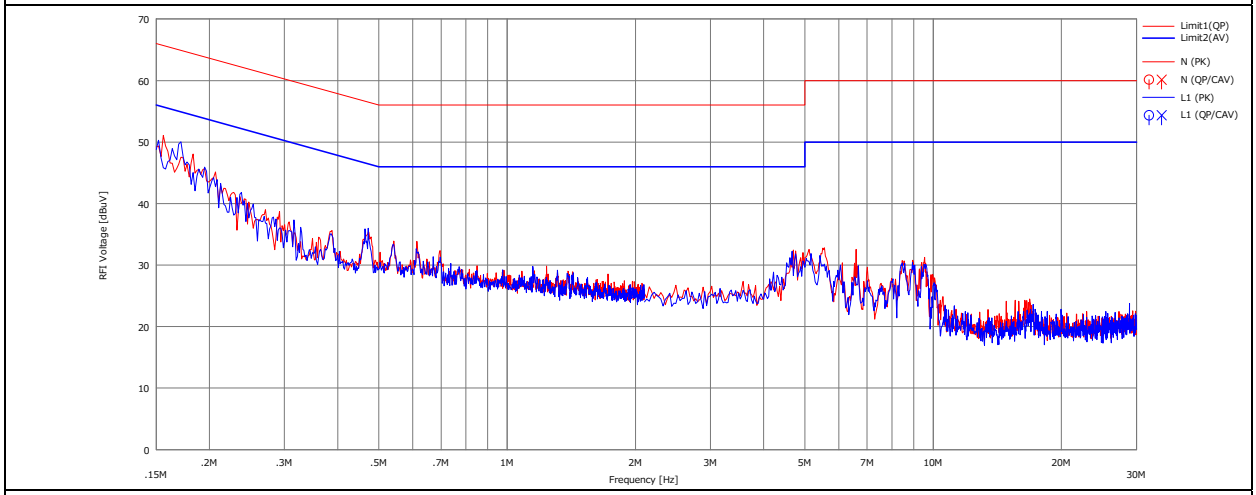
No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	25.90	7.30	12.55	38.45	19.85	66.00	56.00	27.5	36.1	N	
2	0.15401	24.80	10.50	12.56	37.36	23.06	65.78	55.78	28.4	32.7	N	
3	0.19158	21.20	3.20	12.57	33.77	15.77	63.97	53.97	30.2	38.2	N	
4	0.23207	18.60	13.10	12.57	31.17	25.67	62.38	52.38	31.2	26.7	N	
5	0.38536	17.60	15.60	12.60	30.20	28.20	58.16	48.16	27.9	19.9	N	
6	0.46448	15.20	14.00	12.61	27.81	26.61	56.61	46.61	28.8	20.0	N	
7	0.54004	14.10	11.70	12.62	26.72	24.32	56.00	46.00	29.2	21.6	N	
8	4.69913	7.60	-5.20	13.05	20.65	7.85	56.00	46.00	35.3	38.1	N	
9	0.15000	26.50	8.50	12.57	39.07	21.07	66.00	56.00	26.9	34.9	L1	
10	0.15503	24.70	11.50	12.57	37.27	24.07	65.73	55.73	28.4	31.6	L1	
11	0.19247	21.20	3.00	12.58	33.78	15.58	63.93	53.93	30.1	38.3	L1	
12	0.23198	19.70	14.00	12.57	32.27	26.57	62.38	52.38	30.1	25.8	L1	
13	0.38616	18.00	16.10	12.60	30.60	28.70	58.15	48.15	27.5	19.4	L1	
14	0.46339	15.70	14.70	12.61	28.31	27.31	56.63	46.63	28.3	19.3	L1	
15	0.54080	14.80	12.20	12.61	27.41	24.81	56.00	46.00	28.5	21.1	L1	
16	4.67028	8.00	-5.50	13.00	21.00	7.50	56.00	46.00	35.0	38.5	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN):145539

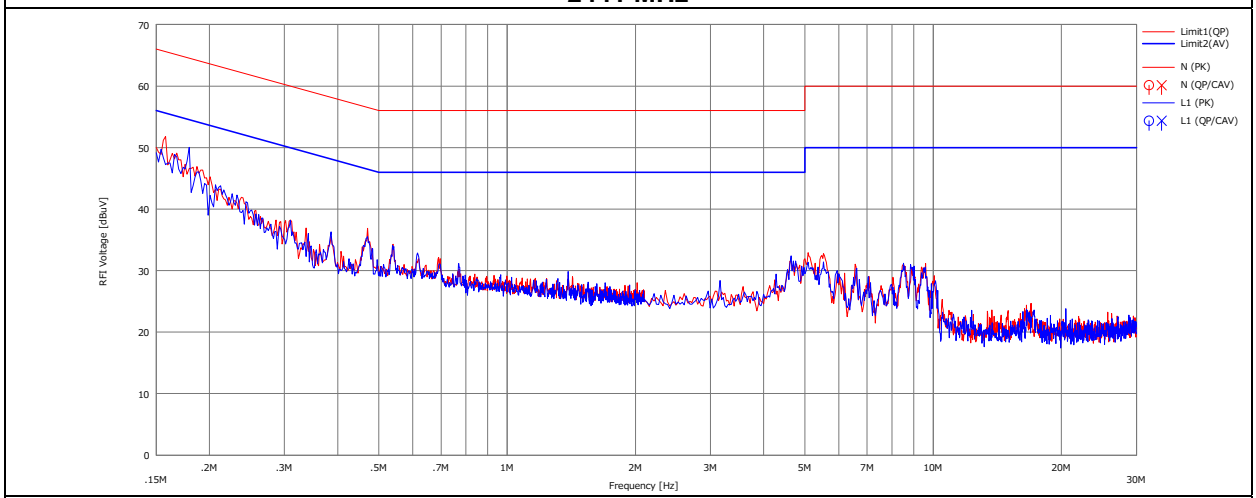
Conducted Emission

Test place	Shonan EMC Lab. No.1 Shielded Room
Date	June 25, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Yusuke Tanikawara
Mode	Tx, Hopping Off, DH5

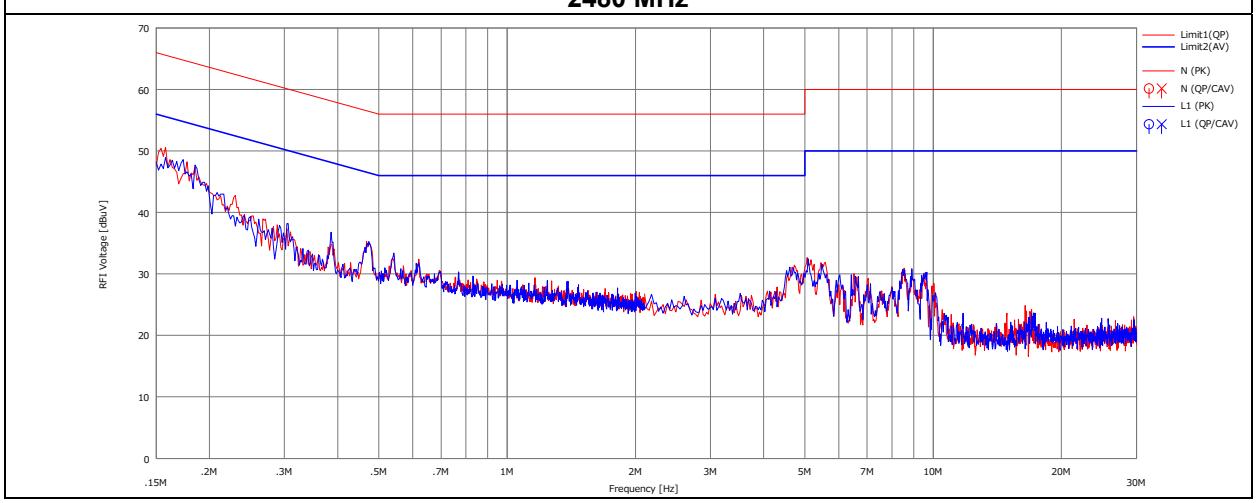
2402 MHz



2441 MHz



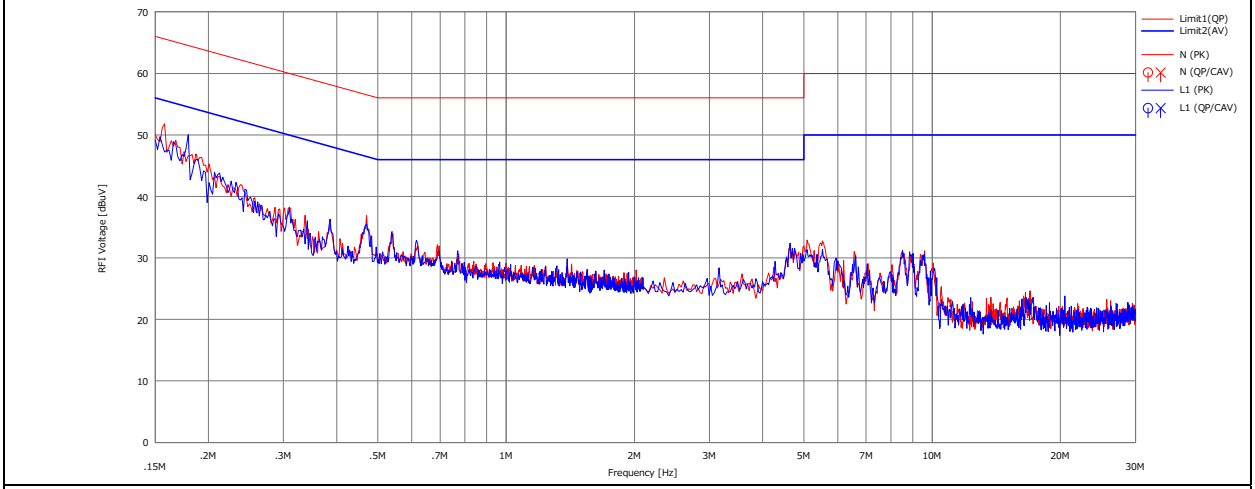
2480 MHz



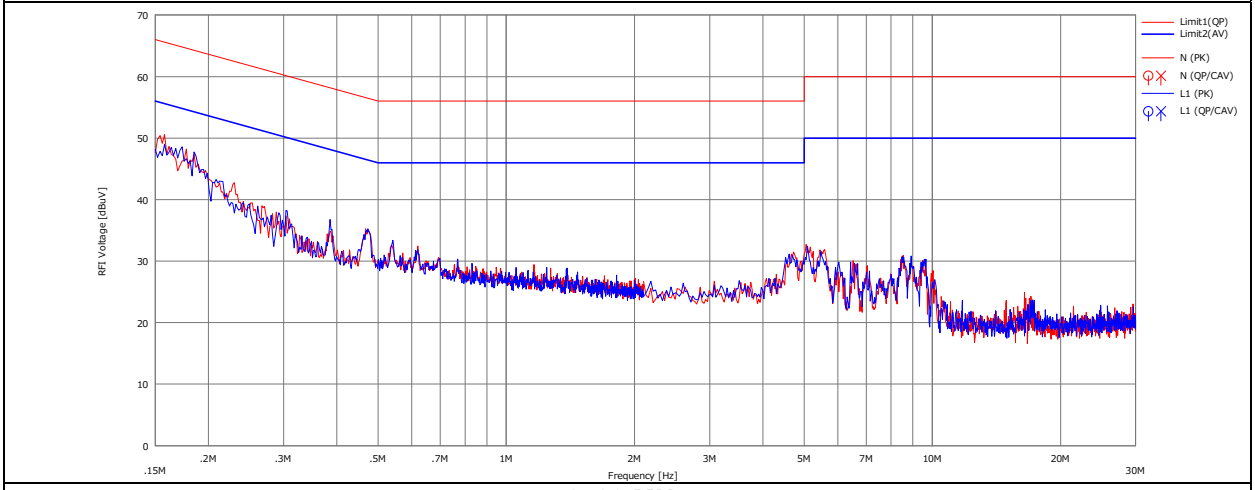
Conducted Emission

Test place	Shonan EMC Lab. No.1 Shielded Room
Date	June 25, 2024
Temperature / Humidity	23 deg. C / 53 % RH
Engineer	Yusuke Tanikawara
Mode	Tx, Hopping Off, 3DH5

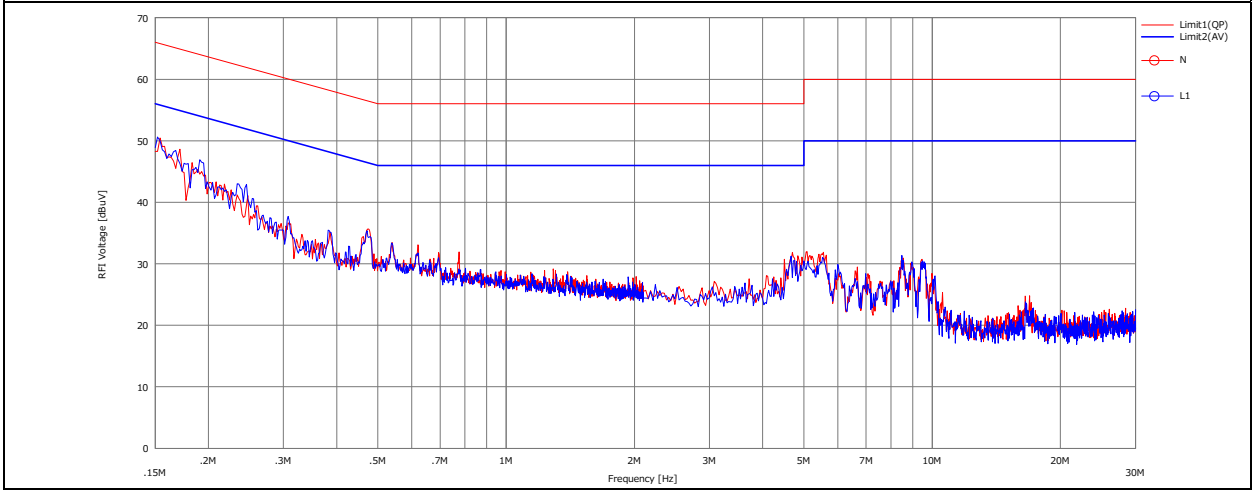
2402 MHz



2441 MHz



2480 MHz



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

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	June 18, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, Tx, Hopping On

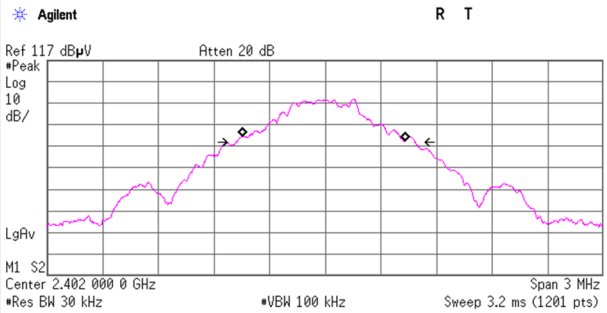
Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.962	874.2	1.000	>= 0.641
DH5	2441.0	0.966	874.2	1.000	>= 0.644
DH5	2480.0	0.963	869.7	1.000	>= 0.642
DH5	Hopping On	-	78641.9	-	-
3DH5	2402.0	1.269	1154.0	1.000	>= 0.846
3DH5	2441.0	1.270	1154.1	1.000	>= 0.847
3DH5	2480.0	1.270	1153.8	1.000	>= 0.847
3DH5	Hopping On	-	78595.9	-	-

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

20 dB Bandwidth and 99 % Occupied Bandwidth

DH5

2402 MHz

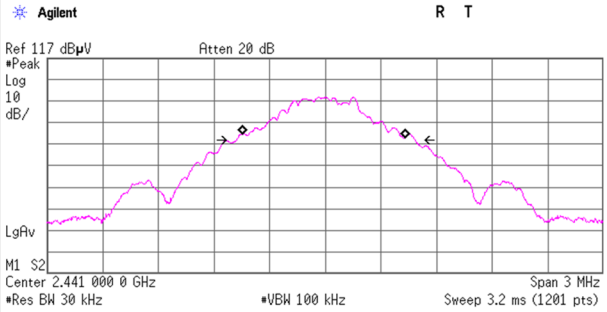


Occupied Bandwidth
874.1574 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -6.701 kHz
x dB Bandwidth 962.267 kHz

2441 MHz

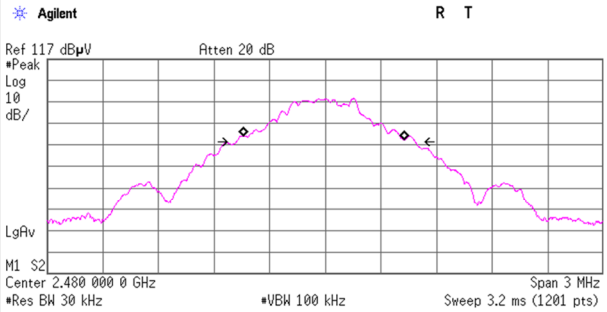


Occupied Bandwidth
874.2453 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -7.860 kHz
x dB Bandwidth 965.878 kHz

2480 MHz



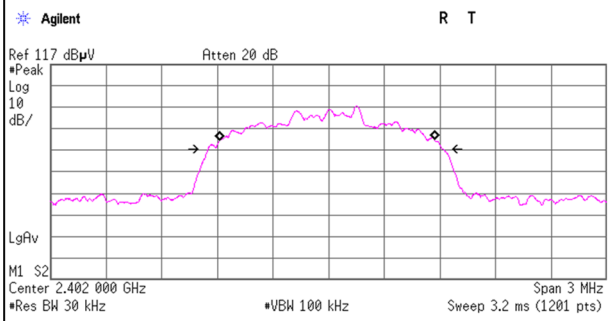
Occupied Bandwidth
869.6515 kHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -8.307 kHz
x dB Bandwidth 963.124 kHz

3DH5

2402 MHz

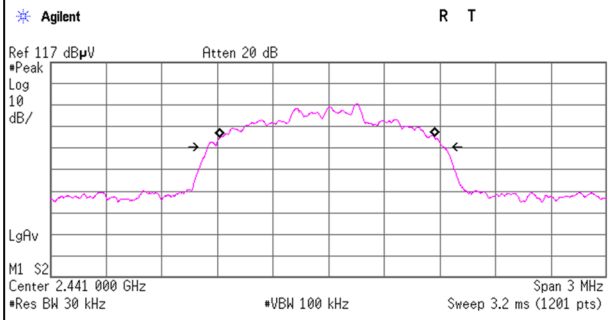


Occupied Bandwidth
1.1540 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -7.756 kHz
x dB Bandwidth 1.269 MHz

2441 MHz

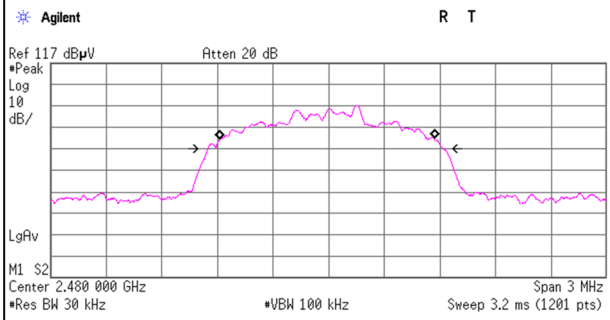


Occupied Bandwidth
1.1541 MHz

Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -8.107 kHz
x dB Bandwidth 1.270 MHz

2480 MHz

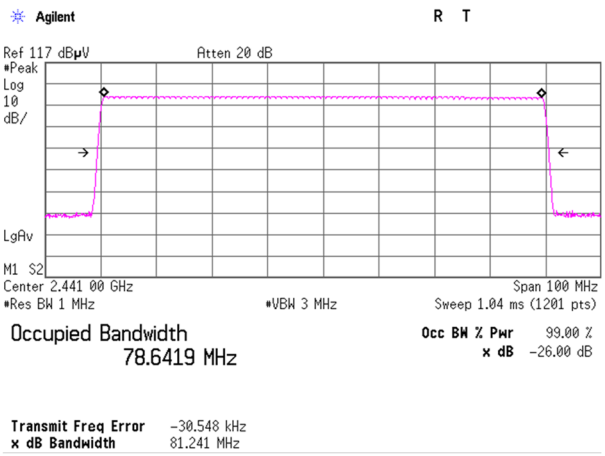
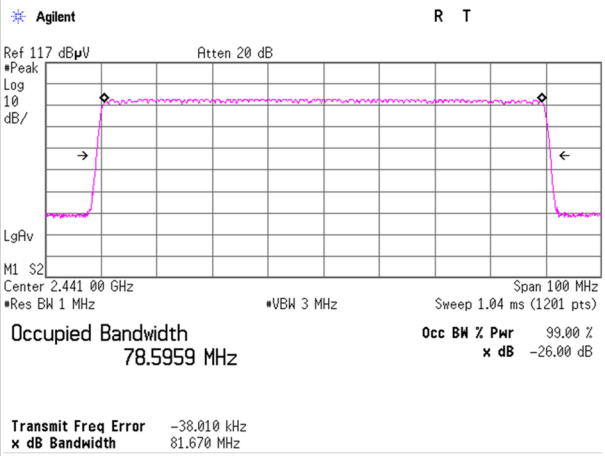


Occupied Bandwidth
1.1538 MHz

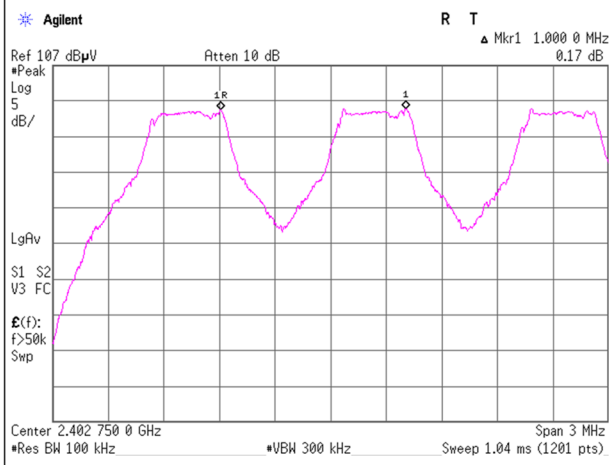
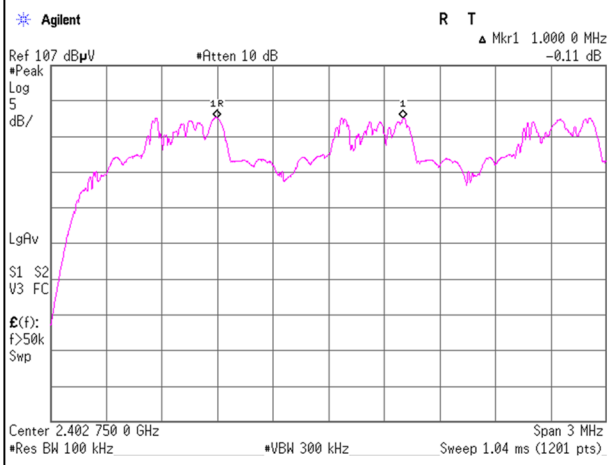
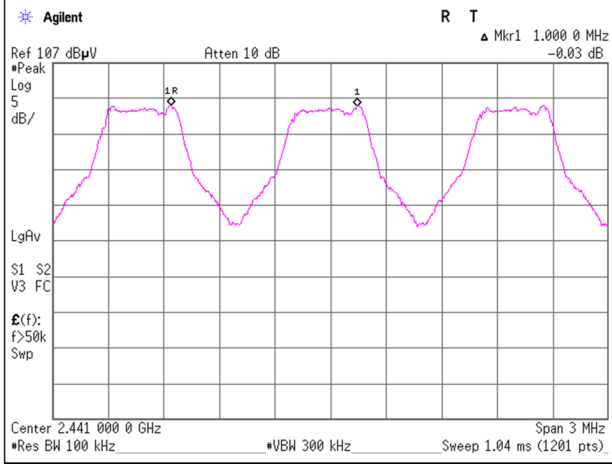
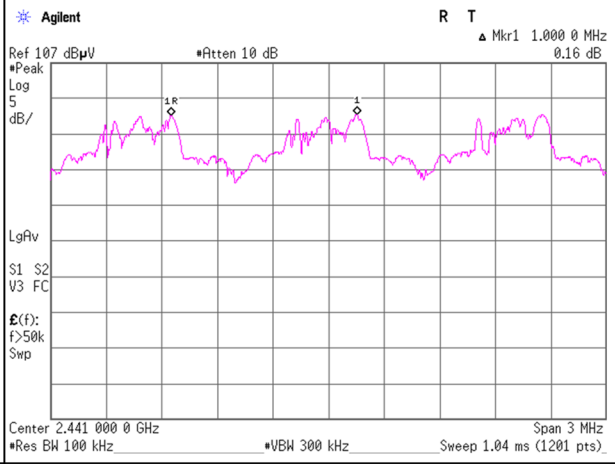
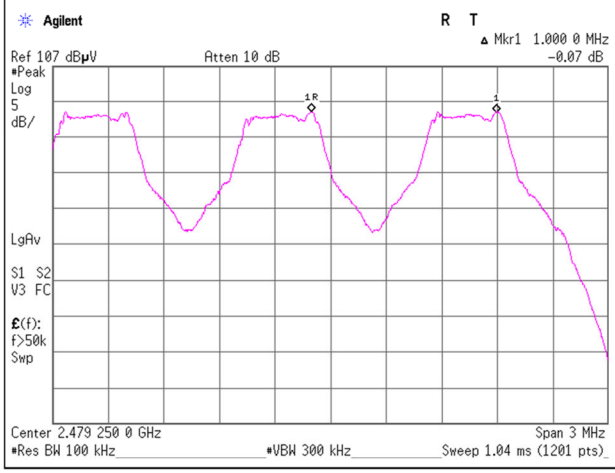
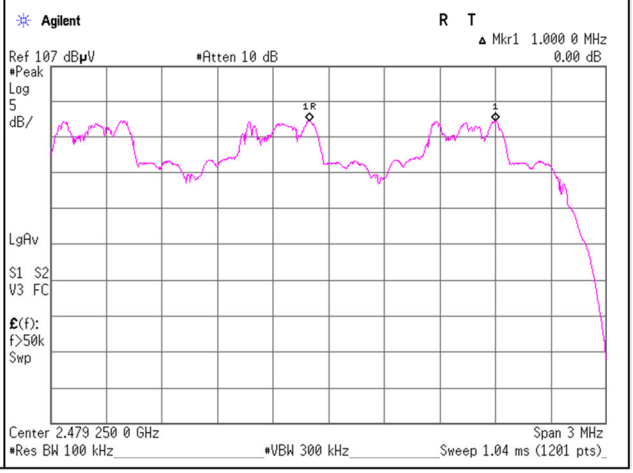
Occ BW % Pwr 99.00 %
x dB -20.00 dB

Transmit Freq Error -8.108 kHz
x dB Bandwidth 1.270 MHz

20 dB Bandwidth and 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
	

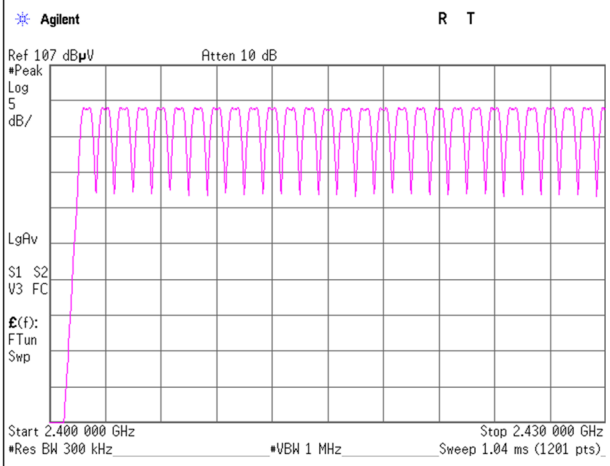
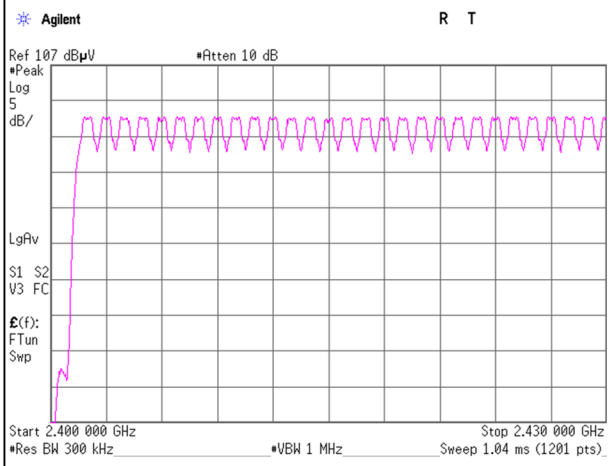
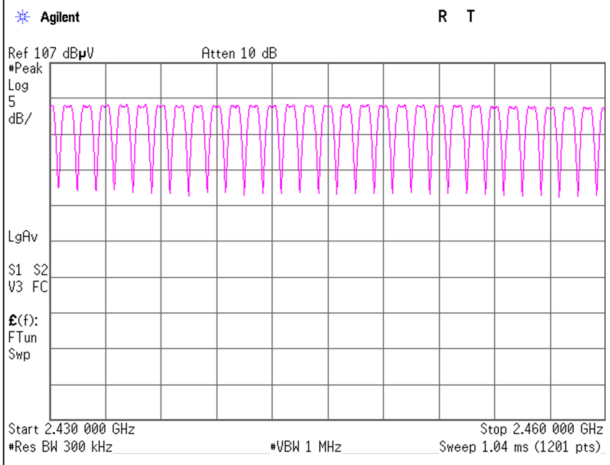
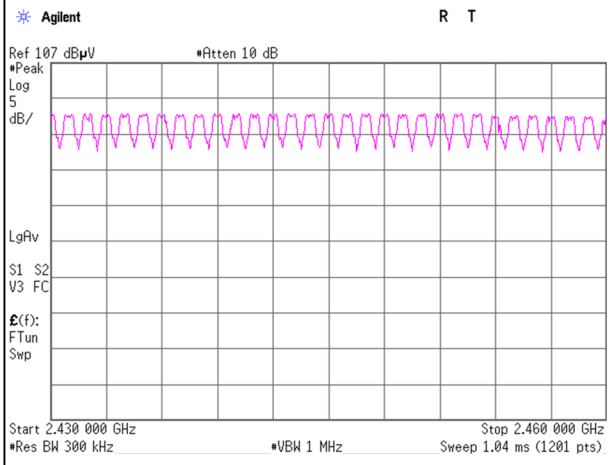
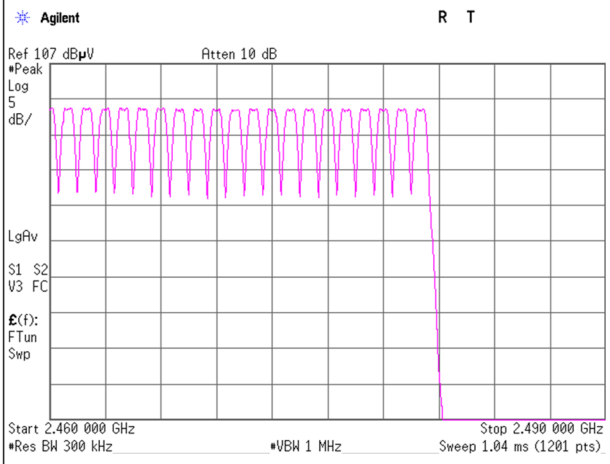
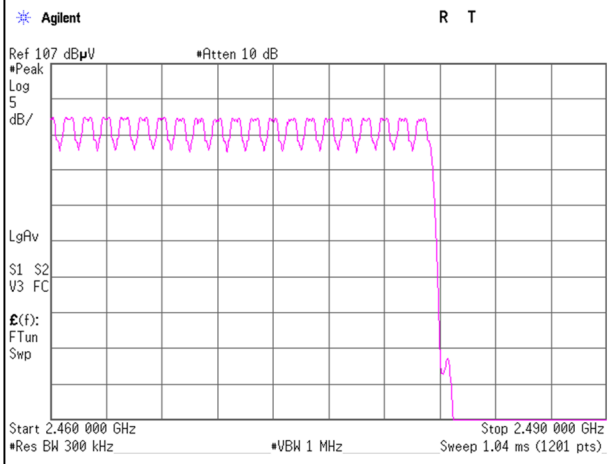
Number of Hopping Frequency

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	June 18, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Kazuya Noda
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.1 Measurement Room
Date	June 18, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Kazuya Noda
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	51.2 times / 5 s x 31.6 s = 324 times	0.400	130	400
DH3	29.0 times / 5 s x 31.6 s = 184 times	1.673	308	400
DH5	20.8 times / 5 s x 31.6 s = 132 times	2.907	384	400
3DH1	50.6 times / 5 s x 31.6 s = 320 times	0.404	129	400
3DH3	25.0 times / 5 s x 31.6 s = 158 times	1.665	263	400
3DH5	21.2 times / 5 s x 31.6 s = 134 times	2.917	391	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

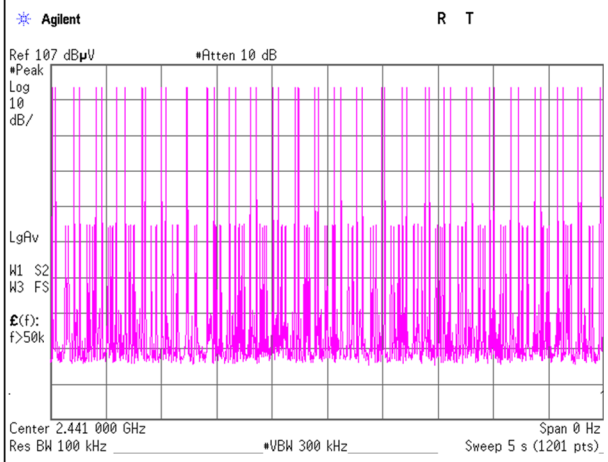
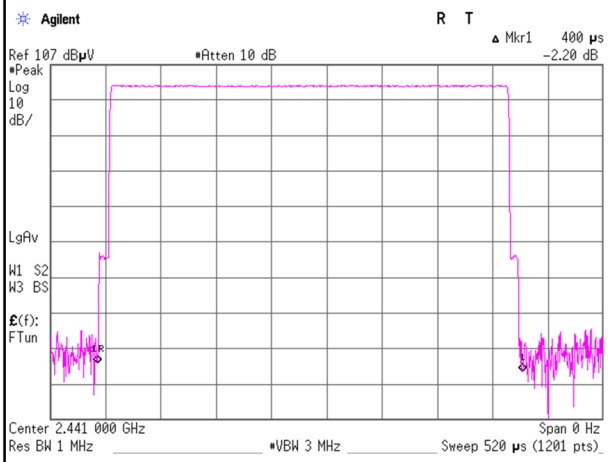
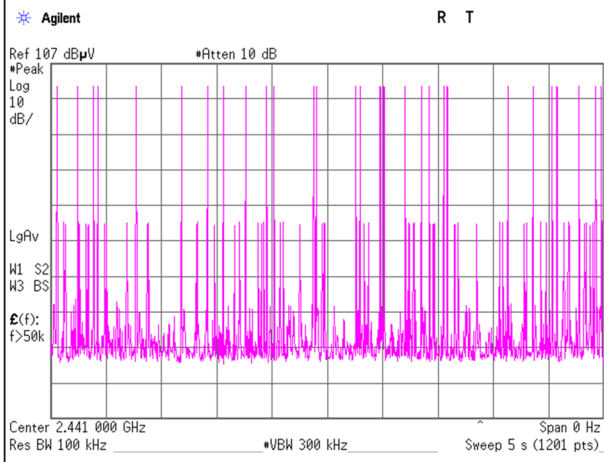
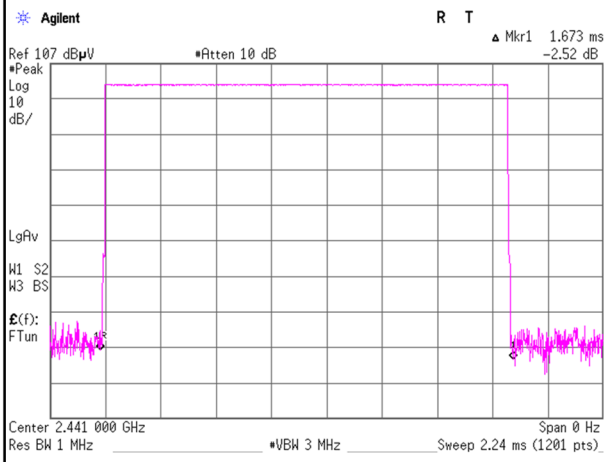
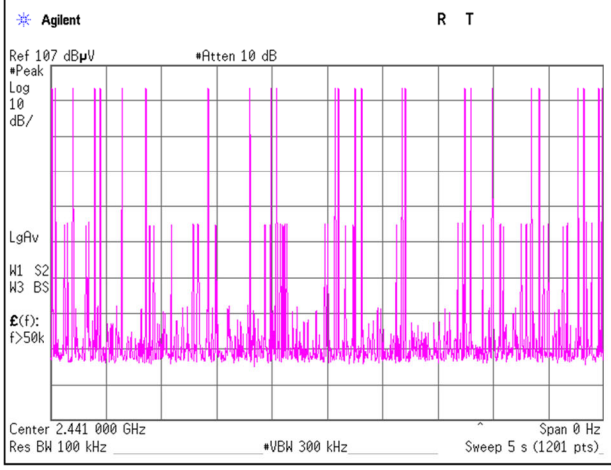
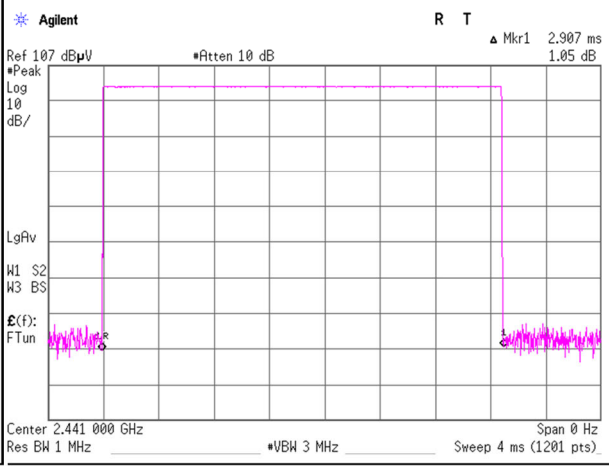
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	52	50	51	52	51	51.2
DH3	29	32	28	29	27	29
DH5	26	19	21	21	17	20.8
3DH1	50	50	51	52	50	50.6
3DH3	22	31	24	22	26	25
3DH5	24	20	22	21	19	21.2

Sample Calculation

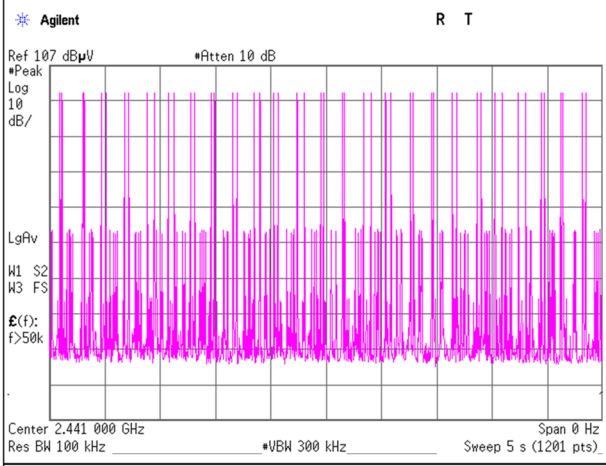
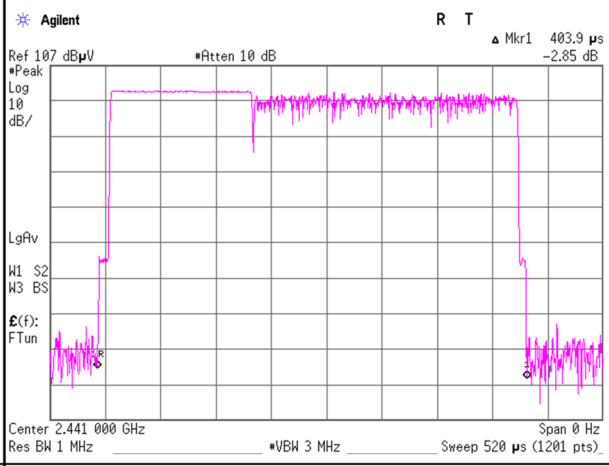
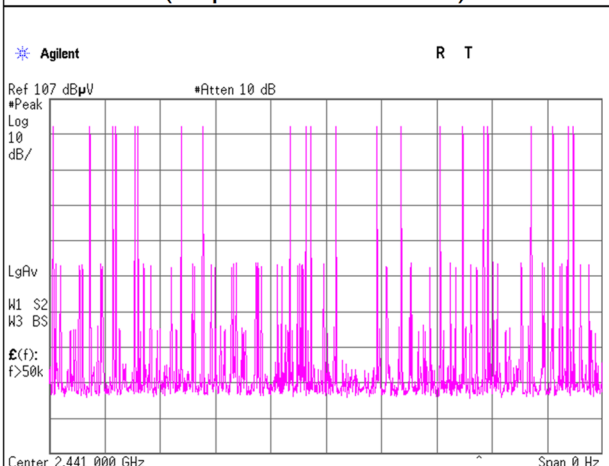
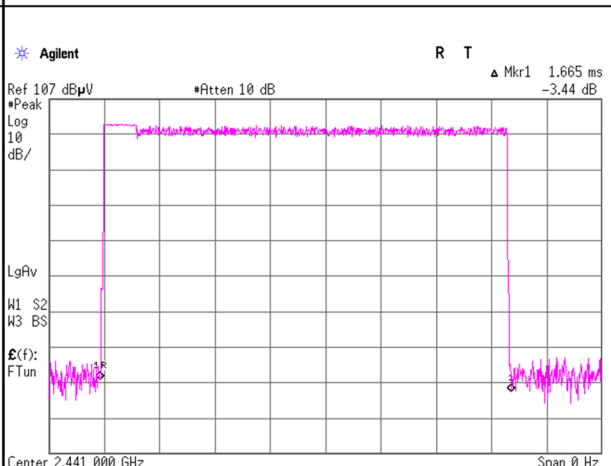
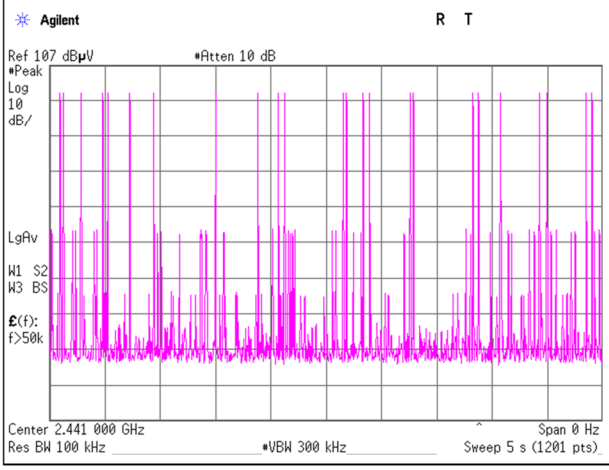
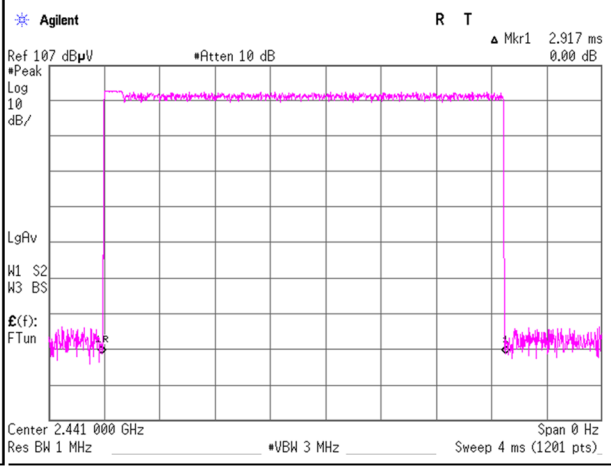
Average = Summation (Sampling 1 to 5) / 5

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.1 Measurement Room
Date	June 19, 2024
Temperature / Humidity	25 deg. C / 50 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off

					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	-5.65	1.62	9.94	5.91	3.90	20.97	125	15.06	0.69	6.60	4.57	36.02	4000	29.42
DH5	2441	-5.71	1.63	9.94	5.86	3.85	20.97	125	15.11	0.69	6.55	4.52	36.02	4000	29.47
DH5	2480	-6.07	1.63	9.94	5.50	3.55	20.97	125	15.47	0.69	6.19	4.16	36.02	4000	29.83
2DH5	2402	-6.92	1.62	9.94	4.64	2.91	20.97	125	16.33	0.69	5.33	3.41	36.02	4000	30.69
2DH5	2441	-6.97	1.63	9.94	4.60	2.88	20.97	125	16.37	0.69	5.29	3.38	36.02	4000	30.73
2DH5	2480	-7.37	1.63	9.94	4.20	2.63	20.97	125	16.77	0.69	4.89	3.08	36.02	4000	31.13
3DH5	2402	-6.75	1.62	9.94	4.81	3.03	20.97	125	16.16	0.69	5.50	3.55	36.02	4000	30.52
3DH5	2441	-6.81	1.63	9.94	4.76	2.99	20.97	125	16.21	0.69	5.45	3.51	36.02	4000	30.57
3DH5	2480	-7.21	1.63	9.94	4.36	2.73	20.97	125	16.61	0.69	5.05	3.20	36.02	4000	30.97

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.

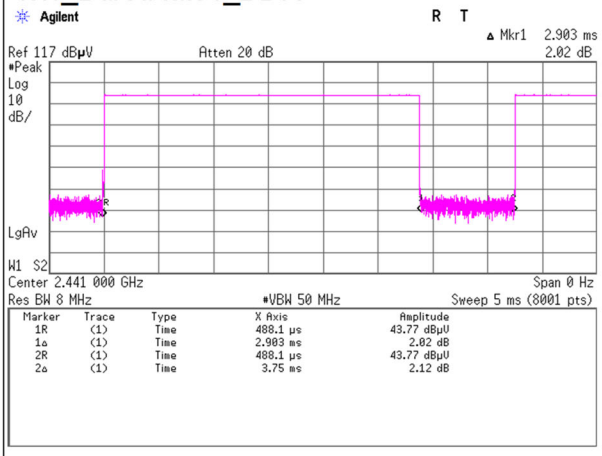
Burst Rate Confirmation

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	June 18, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off

DH5

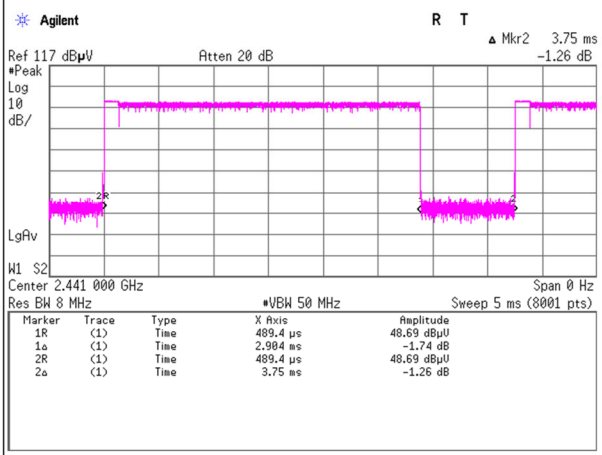
Tx on / (Tx on + Tx off) =	0.774
Tx on / (Tx on + Tx off) * 100 =	77.4 %
Duty factor = 10 * log (3.75 / 2.903) =	1.11 dB
VBW: 1 / on time = 344.46 Hz <	500.00 Hz

Tx1_BurstRate1_BDR



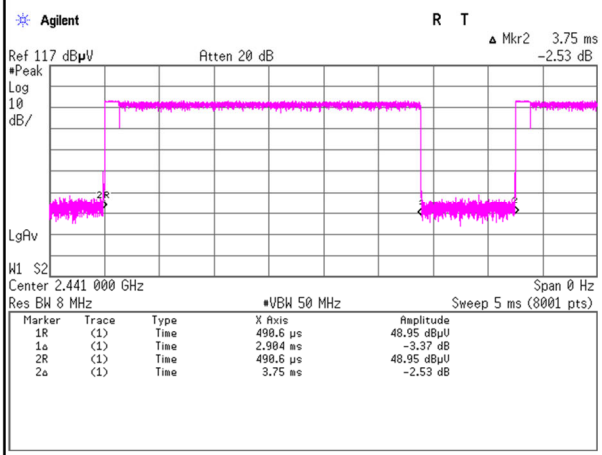
2DH5

Tx on / (Tx on + Tx off) =	0.774
Tx on / (Tx on + Tx off) * 100 =	77.4 %
Duty factor = 10 * log (3.75 / 2.904) =	1.11 dB
VBW: 1 / on time = 344.31 Hz <	500.00 Hz



3DH5

Tx on / (Tx on + Tx off) =	0.774
Tx on / (Tx on + Tx off) * 100 =	77.4 %
Duty factor = 10 * log (3.75 / 2.904) =	1.11 dB
VBW: 1 / on time = 344.38 Hz <	500.00 Hz



Radiated Spurious Emission

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC2	WAC2	WAC2
Date	June 24, 2024	June 19, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 59 % RH	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Kouki Yamada	Hiromasa Sato	Yusuke Tanikawara
	(Below 1 GHz)	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	55.793	QP	22.90	9.71	6.44	33.11	0.00	5.94	40.0	34.0	100	95	-
Hori.	195.692	QP	22.60	14.26	7.16	33.07	0.00	10.95	43.5	32.5	100	111	-
Hori.	952.436	QP	19.60	22.08	8.98	30.06	0.00	20.60	46.0	25.4	100	74	-
Hori.	2390.000	PK	47.92	27.75	-28.27	-	2.46	49.86	73.9	24.0	126	219	-
Hori.	4802.232	PK	51.05	31.55	-36.04	-	2.46	49.02	73.9	24.8	352	355	-
Hori.	4804.000	PK	51.77	31.56	-36.04	-	2.46	49.75	73.9	24.1	122	347	-
Hori.	7206.000	PK	46.64	36.21	-34.48	-	2.46	50.83	73.9	23.0	150	0	Floor noise
Hori.	9608.000	PK	45.84	38.14	-31.55	-	2.46	54.89	73.9	19.0	150	0	Floor noise
Hori.	2390.000	AV	33.85	27.75	-28.27	-	2.46	35.79	53.9	18.1	126	219	VBW : 500 Hz
Hori.	4802.232	AV	35.54	31.55	-36.04	-	2.46	33.51	53.9	20.3	352	355	VBW : 500 Hz
Hori.	4804.000	AV	41.44	31.56	-36.04	-	2.46	39.42	53.9	14.4	122	347	VBW : 500 Hz
Hori.	7206.000	AV	33.34	36.21	-34.48	-	2.46	37.53	53.9	16.3	150	0	VBW : 500 Hz,Floor noise
Hori.	9608.000	AV	32.18	38.14	-31.55	-	2.46	41.23	53.9	12.6	150	0	VBW : 500 Hz,Floor noise
Vert.	33.920	QP	22.40	12.73	6.29	32.78	0.00	8.64	40.0	31.3	100	23	-
Vert.	45.123	QP	22.10	10.67	6.43	33.00	0.00	6.20	40.0	33.8	100	128	-
Vert.	56.283	QP	22.80	9.69	6.44	33.11	0.00	5.82	40.0	34.1	100	117	-
Vert.	75.506	QP	26.20	9.11	6.64	33.19	0.00	8.77	40.0	31.2	100	174	-
Vert.	185.724	QP	22.60	13.69	7.28	33.09	0.00	10.48	43.5	33.0	100	211	-
Vert.	877.102	QP	20.40	22.04	8.86	30.54	0.00	20.76	46.0	25.2	100	32	-
Vert.	2390.000	PK	47.88	27.75	-28.27	-	2.46	49.82	73.9	24.0	351	89	-
Vert.	4802.232	PK	50.81	31.55	-36.04	-	2.46	48.78	73.9	25.1	151	154	-
Vert.	4804.000	PK	51.95	31.56	-36.04	-	2.46	49.93	73.9	23.9	211	148	-
Vert.	7206.000	PK	46.14	36.21	-34.48	-	2.46	50.33	73.9	23.5	150	0	Floor noise
Vert.	9608.000	PK	45.92	38.14	-31.55	-	2.46	54.97	73.9	18.9	150	0	Floor noise
Vert.	2390.000	AV	33.62	27.75	-28.27	-	2.46	35.56	53.9	18.3	351	89	VBW : 500 Hz
Vert.	4802.232	AV	36.77	31.55	-36.04	-	2.46	34.74	53.9	19.1	151	154	VBW : 500 Hz
Vert.	4804.000	AV	44.73	31.56	-36.04	-	2.46	42.71	53.9	**11.1**	211	148	VBW : 500 Hz
Vert.	7206.000	AV	33.29	36.21	-34.48	-	2.46	37.48	53.9	16.4	150	0	VBW : 500 Hz,Floor noise
Vert.	9608.000	AV	32.23	38.14	-31.55	-	2.46	41.28	53.9	12.6	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Other bands : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

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

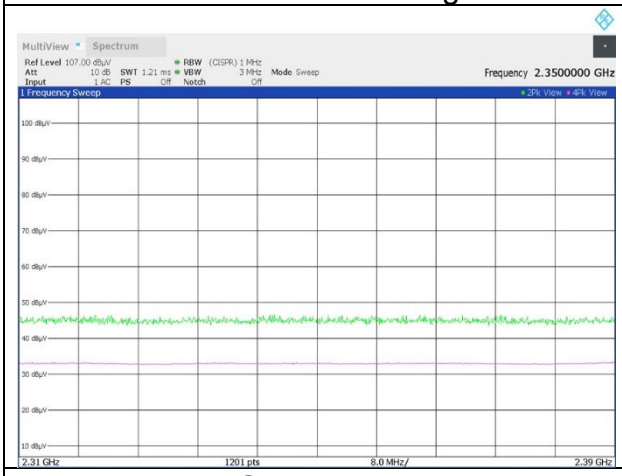
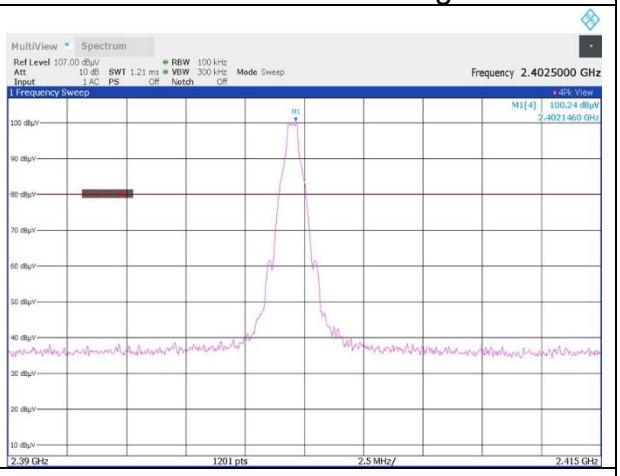
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	100.24	27.77	-28.26	-	2.46	102.21	-	-	Carrier
Hori.	2400.000	PK	42.36	27.77	-28.26	-	2.46	44.33	82.2	37.8	-
Vert.	2402.000	PK	99.35	27.77	-28.26	-	2.46	101.32	-	-	Carrier
Vert.	2400.000	PK	42.09	27.77	-28.26	-	2.46	44.06	81.3	37.2	-

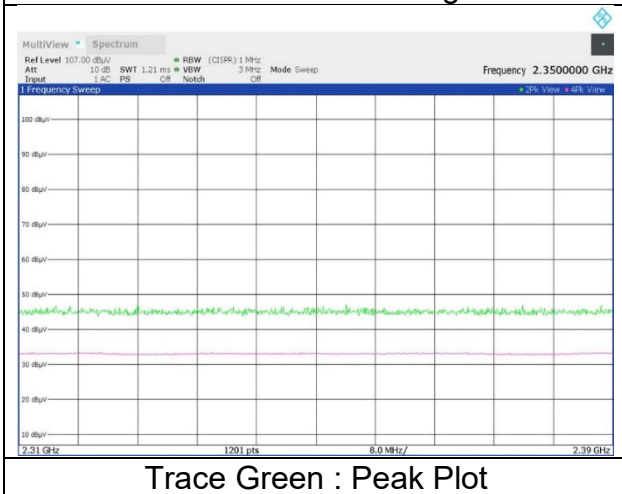
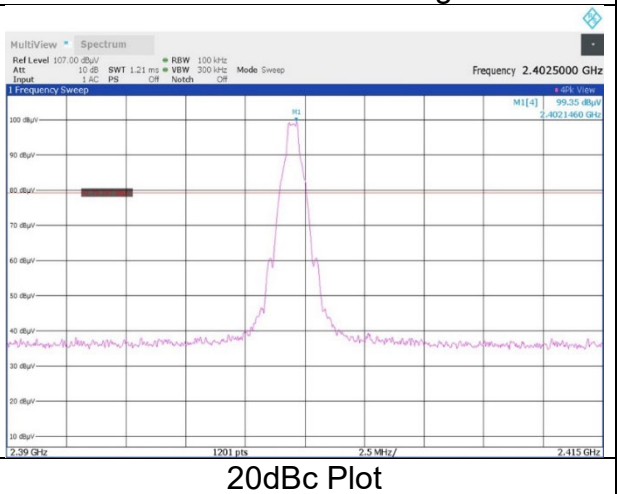
1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Hiromasa Sato
	(1 GHz to 10 GHz)
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	WAC2	WAC2
Date	June 19, 2024	June 21, 2024
Temperature / Humidity	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Hiromasa Sato	Yusuke Tanikawara
	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4802.228	PK	49.81	31.55	-36.04	-	2.46	47.78	73.9	26.1	347	322	-
Hori.	4882.000	PK	50.25	31.96	-36.00	-	2.46	48.67	73.9	25.2	142	224	-
Hori.	7323.000	PK	46.36	36.67	-34.24	-	2.46	51.25	73.9	22.6	150	0	Floor noise
Hori.	9764.000	PK	48.95	38.10	-31.32	-	2.46	58.19	73.9	15.7	150	0	Floor noise
Hori.	4802.228	AV	35.61	31.55	-36.04	-	2.46	33.58	53.9	20.3	347	322	VBW : 500 Hz
Hori.	4882.000	AV	42.24	31.96	-36.00	-	2.46	40.66	53.9	13.2	142	224	VBW : 500 Hz
Hori.	7323.000	AV	33.53	36.67	-34.24	-	2.46	38.42	53.9	15.4	150	0	VBW : 500 Hz,Floor noise
Hori.	9764.000	AV	32.99	38.10	-31.32	-	2.46	42.23	53.9	11.6	150	0	VBW : 500 Hz,Floor noise
Vert.	4802.228	PK	50.93	31.55	-36.04	-	2.46	48.90	73.9	25.0	148	151	-
Vert.	4882.000	PK	51.88	31.96	-36.00	-	2.46	50.30	73.9	23.6	224	141	-
Vert.	7323.000	PK	46.29	36.67	-34.24	-	2.46	51.18	73.9	22.7	150	0	Floor noise
Vert.	9764.000	PK	48.80	38.10	-31.32	-	2.46	58.04	73.9	15.8	150	0	Floor noise
Vert.	4802.228	AV	36.93	31.55	-36.04	-	2.46	34.90	53.9	19.0	148	151	VBW : 500 Hz
Vert.	4882.000	AV	44.65	31.96	-36.00	-	2.46	43.07	53.9	**10.8**	224	141	VBW : 500 Hz
Vert.	7323.000	AV	33.47	36.67	-34.24	-	2.46	38.36	53.9	15.5	150	0	VBW : 500 Hz,Floor noise
Vert.	9764.000	AV	32.86	38.10	-31.32	-	2.46	42.10	53.9	11.8	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	WAC2	WAC2
Date	June 19, 2024	June 21, 2024
Temperature / Humidity	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Hiromasa Sato	Yusuke Tanikawara
	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	50.53	27.80	-28.21	-	2.46	52.58	73.9	21.3	117	213	-
Hori.	4802.221	PK	50.05	31.55	-36.04	-	2.46	48.02	73.9	25.8	362	344	-
Hori.	4960.000	PK	50.32	32.23	-35.97	-	2.46	49.04	73.9	24.8	115	350	-
Hori.	7440.000	PK	45.81	36.81	-33.99	-	2.46	51.09	73.9	22.8	150	0	Floor noise
Hori.	9920.000	PK	45.94	38.04	-31.10	-	2.46	55.34	73.9	18.5	150	0	Floor noise
Hori.	2483.500	AV	34.51	27.80	-28.21	-	2.46	36.56	53.9	17.3	117	213	VBW : 500 Hz
Hori.	4802.221	AV	35.36	31.55	-36.04	-	2.46	33.33	53.9	20.5	362	344	VBW : 500 Hz
Hori.	4960.000	AV	42.37	32.23	-35.97	-	2.46	41.09	53.9	12.8	115	350	VBW : 500 Hz
Hori.	7440.000	AV	32.63	36.81	-33.99	-	2.46	37.91	53.9	15.9	150	0	VBW : 500 Hz,Floor noise
Hori.	9920.000	AV	32.17	38.04	-31.10	-	2.46	41.57	53.9	12.3	150	0	VBW : 500 Hz,Floor noise
Vert.	2483.500	PK	49.01	27.80	-28.21	-	2.46	51.06	73.9	22.8	248	277	-
Vert.	4802.221	PK	51.38	31.55	-36.04	-	2.46	49.35	73.9	24.5	149	152	-
Vert.	4960.000	PK	52.02	32.23	-35.97	-	2.46	50.74	73.9	23.1	141	333	-
Vert.	7440.000	PK	46.17	36.81	-33.99	-	2.46	51.45	73.9	22.4	150	0	Floor noise
Vert.	9920.000	PK	45.99	38.04	-31.10	-	2.46	55.39	73.9	18.5	150	0	Floor noise
Vert.	2483.500	AV	34.55	27.80	-28.21	-	2.46	36.60	53.9	17.3	248	277	VBW : 500 Hz
Vert.	4802.221	AV	36.75	31.55	-36.04	-	2.46	34.72	53.9	19.1	149	152	VBW : 500 Hz
Vert.	4960.000	AV	44.09	32.23	-35.97	-	2.46	42.81	53.9	**11.0**	141	333	VBW : 500 Hz
Vert.	7440.000	AV	33.52	36.81	-33.99	-	2.46	38.80	53.9	15.1	150	0	VBW : 500 Hz,Floor noise
Vert.	9920.000	AV	32.28	38.04	-31.10	-	2.46	41.68	53.9	12.2	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor

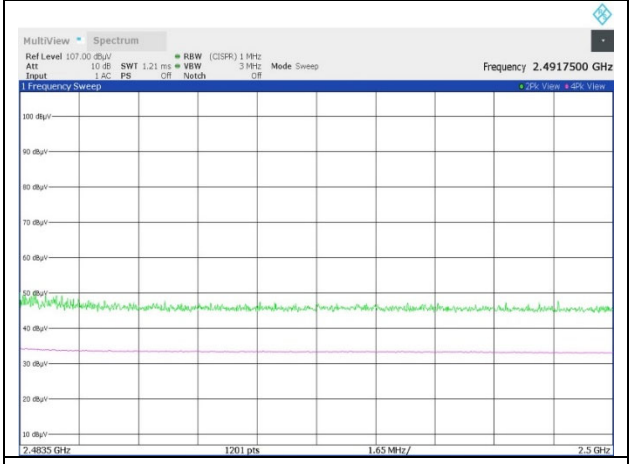
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

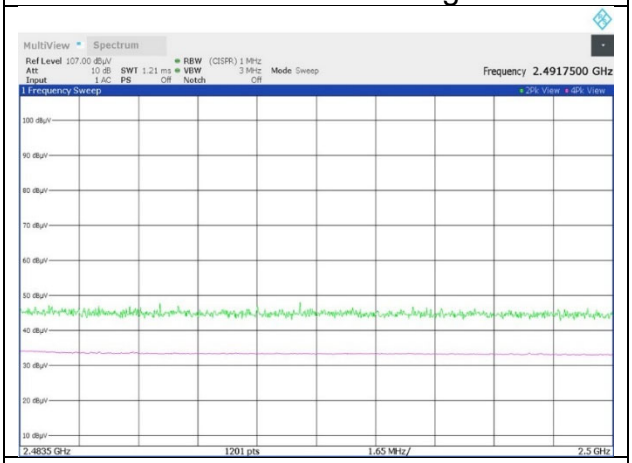
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for bandto edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Hiromasa Sato
	(1 GHz to 10 GHz)
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	WAC2	WAC2
Date	June 19, 2024	June 21, 2024
Temperature / Humidity	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Hiromasa Sato	Yusuke Tanikawara
	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	47.75	27.75	-28.27	-	2.46	49.69	73.9	24.2	133	214	-
Hori.	4802.216	PK	50.11	31.55	-36.04	-	2.46	48.08	73.9	25.8	368	350	-
Hori.	4804.000	PK	50.73	31.56	-36.04	-	2.46	48.71	73.9	25.1	141	342	-
Hori.	7206.000	PK	46.82	36.21	-34.48	-	2.46	51.01	73.9	22.8	150	0	Floor noise
Hori.	9608.000	PK	45.80	38.14	-31.55	-	2.46	54.85	73.9	19.0	150	0	Floor noise
Hori.	2390.000	AV	34.07	27.75	-28.27	-	2.46	36.01	53.9	17.8	133	214	VBW : 500 Hz
Hori.	4802.216	AV	35.56	31.55	-36.04	-	2.46	33.53	53.9	20.3	368	350	VBW : 500 Hz
Hori.	4804.000	AV	41.67	31.56	-36.04	-	2.46	39.65	53.9	14.2	141	342	VBW : 500 Hz
Hori.	7206.000	AV	33.22	36.21	-34.48	-	2.46	37.41	53.9	16.4	150	0	VBW : 500 Hz,Floor noise
Hori.	9608.000	AV	32.14	38.14	-31.55	-	2.46	41.19	53.9	12.7	150	0	VBW : 500 Hz,Floor noise
Vert.	2390.000	PK	47.86	27.75	-28.27	-	2.46	49.80	73.9	24.1	382	295	-
Vert.	4802.216	PK	51.07	31.55	-36.04	-	2.46	49.04	73.9	24.8	151	155	-
Vert.	4804.000	PK	52.34	31.56	-36.04	-	2.46	50.32	73.9	23.5	185	329	-
Vert.	7206.000	PK	46.73	36.21	-34.48	-	2.46	50.92	73.9	22.9	150	0	Floor noise
Vert.	9608.000	PK	46.02	38.14	-31.55	-	2.46	55.07	73.9	18.8	150	0	Floor noise
Vert.	2390.000	AV	33.86	27.75	-28.27	-	2.46	35.80	53.9	18.1	382	295	VBW : 500 Hz
Vert.	4802.216	AV	36.94	31.55	-36.04	-	2.46	34.91	53.9	18.9	151	155	VBW : 500 Hz
Vert.	4804.000	AV	45.76	31.56	-36.04	-	2.46	43.74	53.9	**10.1**	185	329	VBW : 500 Hz
Vert.	7206.000	AV	33.10	36.21	-34.48	-	2.46	37.29	53.9	16.6	150	0	VBW : 500 Hz,Floor noise
Vert.	9608.000	AV	32.29	38.14	-31.55	-	2.46	41.34	53.9	12.5	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
*These results have sufficient margin without taking account Duty cycle correction factor.

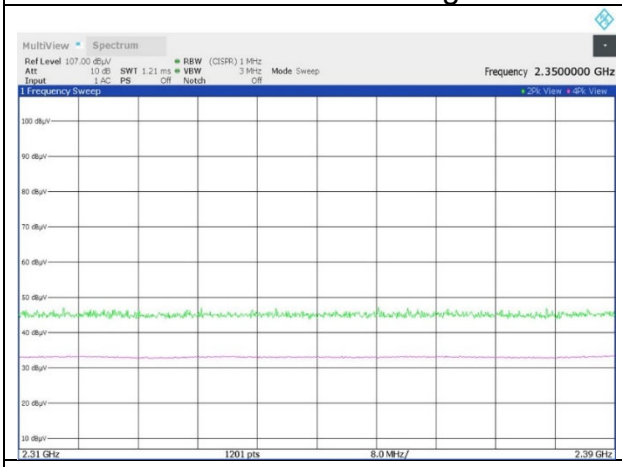
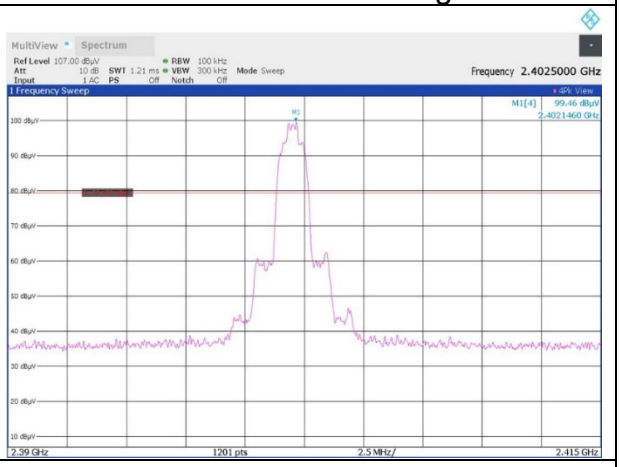
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

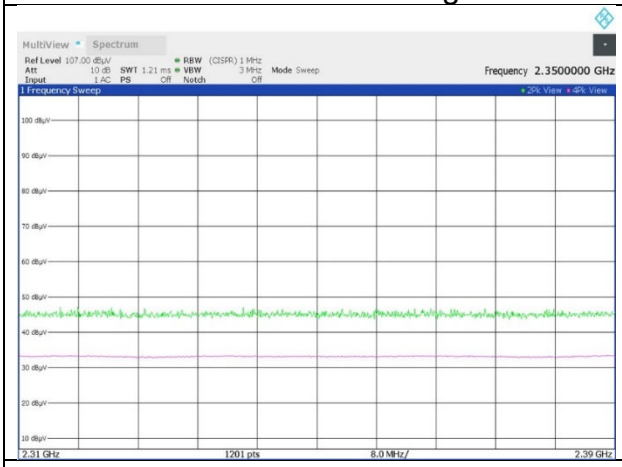
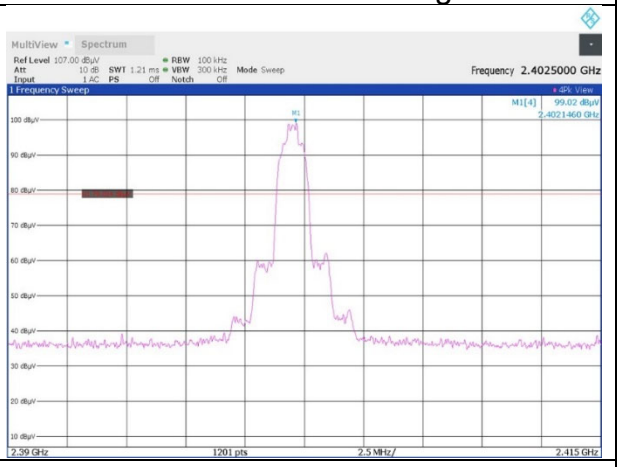
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.46	27.77	-28.26	-	2.46	101.43	-	-	Carrier
Hori.	2400.000	PK	44.80	27.77	-28.26	-	2.46	46.77	81.4	34.6	-
Vert.	2402.000	PK	99.02	27.77	-28.26	-	2.46	100.99	-	-	Carrier
Vert.	2400.000	PK	44.20	27.77	-28.26	-	2.46	46.17	80.9	34.7	-

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Hiromasa Sato
	(1 GHz to 10 GHz)
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	WAC2	WAC2
Date	June 19, 2024	June 21, 2024
Temperature / Humidity	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Hiromasa Sato	Yusuke Tanikawara
	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4802.224	PK	49.37	31.55	-36.04	-	2.46	47.34	73.9	26.5	379	344	-
Hori.	4882.000	PK	49.91	31.96	-36.00	-	2.46	48.33	73.9	25.5	101	359	-
Hori.	7323.000	PK	46.67	36.67	-34.24	-	2.46	51.56	73.9	22.3	150	0	Floor noise
Hori.	9764.000	PK	46.04	38.10	-31.32	-	2.46	55.28	73.9	18.6	150	0	Floor noise
Hori.	4802.224	AV	35.69	31.55	-36.04	-	2.46	33.66	53.9	20.2	379	344	VBW : 500 Hz
Hori.	4882.000	AV	42.01	31.96	-36.00	-	2.46	40.43	53.9	13.4	101	359	VBW : 500 Hz
Hori.	7323.000	AV	33.60	36.67	-34.24	-	2.46	38.49	53.9	15.4	150	0	VBW : 500 Hz,Floor noise
Hori.	9764.000	AV	32.40	38.10	-31.32	-	2.46	41.64	53.9	12.2	150	0	VBW : 500 Hz,Floor noise
Vert.	4802.224	PK	50.74	31.55	-36.04	-	2.46	48.71	73.9	25.1	151	156	-
Vert.	4882.000	PK	51.64	31.96	-36.00	-	2.46	50.06	73.9	23.8	216	142	-
Vert.	7323.000	PK	46.47	36.67	-34.24	-	2.46	51.36	73.9	22.5	150	0	Floor noise
Vert.	9764.000	PK	46.15	38.10	-31.32	-	2.46	55.39	73.9	18.5	150	0	Floor noise
Vert.	4802.224	AV	36.65	31.55	-36.04	-	2.46	34.62	53.9	19.2	151	156	VBW : 500 Hz
Vert.	4882.000	AV	44.39	31.96	-36.00	-	2.46	42.81	53.9	**11.0**	216	142	VBW : 500 Hz
Vert.	7323.000	AV	32.96	36.67	-34.24	-	2.46	37.85	53.9	16.0	150	0	VBW : 500 Hz,Floor noise
Vert.	9764.000	AV	32.33	38.10	-31.32	-	2.46	41.57	53.9	12.3	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	WAC2	WAC2
Date	June 19, 2024	June 21, 2024
Temperature / Humidity	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Hiromasa Sato	Yusuke Tanikawara
	(1 GHz to 10 GHz)	(10 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 Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	53.34	27.80	-28.21	-	2.46	55.39	73.9	18.5	141	213	-
Hori.	4802.218	PK	50.33	31.55	-36.04	-	2.46	48.30	73.9	25.6	364	351	-
Hori.	4960.000	PK	50.64	32.23	-35.97	-	2.46	49.36	73.9	24.5	139	359	-
Hori.	7440.000	PK	45.70	36.81	-33.99	-	2.46	50.98	73.9	22.9	150	0	Floor noise
Hori.	9920.000	PK	45.85	38.04	-31.10	-	2.46	55.25	73.9	18.6	150	0	Floor noise
Hori.	2483.500	AV	35.99	27.80	-28.21	-	2.46	38.04	53.9	15.8	141	213	VBW : 500 Hz
Hori.	4802.218	AV	35.36	31.55	-36.04	-	2.46	33.33	53.9	20.5	364	351	VBW : 500 Hz
Hori.	4960.000	AV	41.51	32.23	-35.97	-	2.46	40.23	53.9	13.6	139	359	VBW : 500 Hz
Hori.	7440.000	AV	33.54	36.81	-33.99	-	2.46	38.82	53.9	15.0	150	0	VBW : 500 Hz,Floor noise
Hori.	9920.000	AV	32.14	38.04	-31.10	-	2.46	41.54	53.9	12.3	150	0	VBW : 500 Hz,Floor noise
Vert.	2483.500	PK	52.87	27.80	-28.21	-	2.46	54.92	73.9	18.9	319	121	-
Vert.	4802.228	PK	51.03	31.55	-36.04	-	2.46	49.00	73.9	24.9	151	152	-
Vert.	4960.000	PK	51.30	32.23	-35.97	-	2.46	50.02	73.9	23.8	218	148	-
Vert.	7440.000	PK	45.64	36.81	-33.99	-	2.46	50.92	73.9	22.9	150	0	Floor noise
Vert.	9920.000	PK	45.83	38.04	-31.10	-	2.46	55.23	73.9	18.6	150	0	Floor noise
Vert.	2483.500	AV	35.93	27.80	-28.21	-	2.46	37.98	53.9	15.9	319	121	VBW : 500 Hz
Vert.	4802.228	AV	36.93	31.55	-36.04	-	2.46	34.90	53.9	19.0	151	152	VBW : 500 Hz
Vert.	4960.000	AV	44.01	32.23	-35.97	-	2.46	42.73	53.9	**11.1**	218	148	VBW : 500 Hz
Vert.	7440.000	AV	33.27	36.81	-33.99	-	2.46	38.55	53.9	15.3	150	0	VBW : 500 Hz,Floor noise
Vert.	9920.000	AV	32.20	38.04	-31.10	-	2.46	41.60	53.9	12.3	150	0	VBW : 500 Hz,Floor noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor

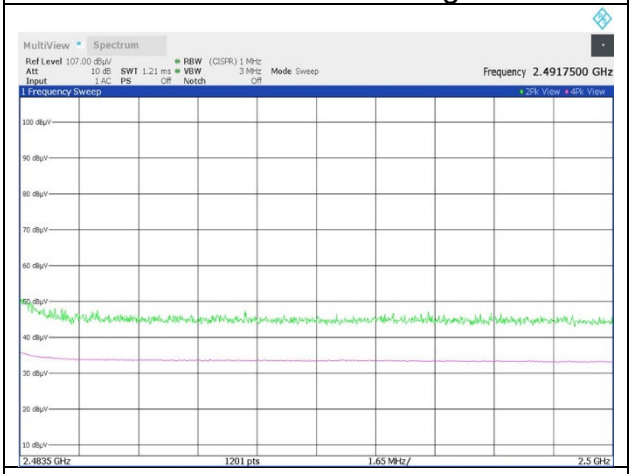
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

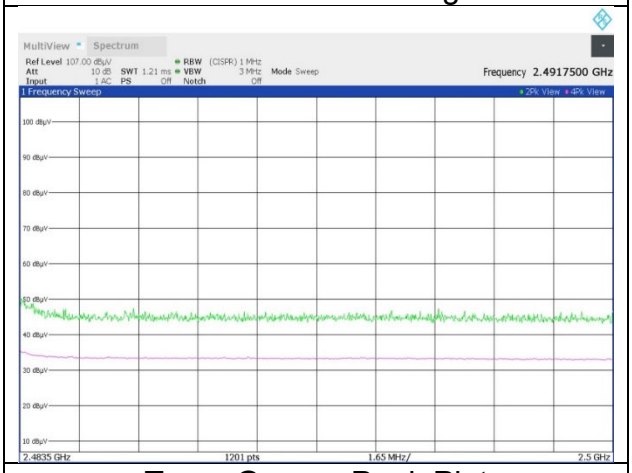
10 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for band-edge)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	June 19, 2024
Temperature / Humidity	21 deg. C / 59 % RH
Engineer	Hiromasa Sato
	(1 GHz to 10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz

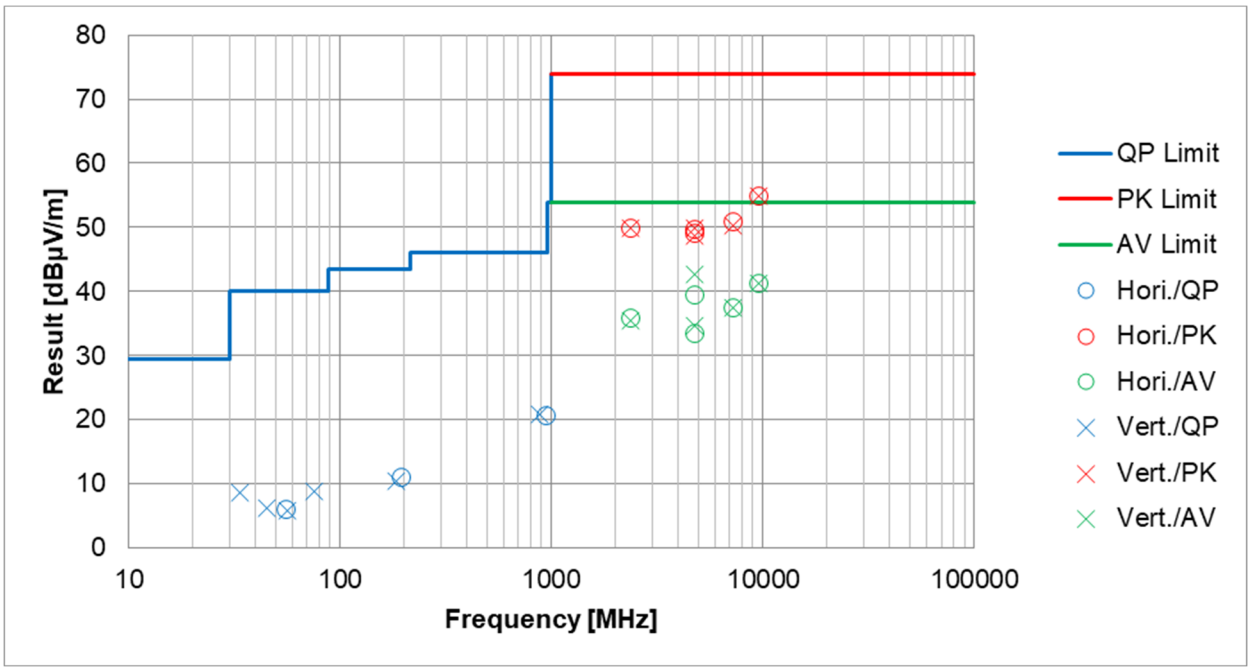
Horizontal
Restricted-band band-edge Plot

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

Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	WAC2	WAC2	WAC2
Date	June 24, 2024	June 19, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 59 % RH	21 deg. C / 59 % RH	24 deg. C / 61 % RH
Engineer	Kouki Yamada	Hiromasa Sato	Yusuke Tanikawara
	(Below 1 GHz)	(1 GHz to 10 GHz)	(10 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz		



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