

RADIO TEST REPORT

Test Report No. 15116664S-B-R1

Customer	Nintendo Co., Ltd.
Description of EUT	Game controller
Model Number of EUT	BEE-014
FCC ID	BKEBEE014
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	December 19, 2024
Remarks	Bluetooth (BR / EDR) parts

Representative Test EngineerKazuya Noda
Leader**Approved By**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. 15116664S-B

This report is a revised version of 15116664S-B. 15116664S-B is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents																								
- (Original)	15116664S-B	August 8, 2024	-																								
1	15116664S-B-R1	December 19, 2024	Page 15 Corrected note number. Before <table><tr><td>Conducted</td><td>9 kHz to 150 kHz</td><td>200 Hz</td><td>620 Hz</td></tr><tr><td>Spurious</td><td>150 kHz to 30 MHz</td><td>10 kHz</td><td>30 kHz</td></tr><tr><td>Emission *3) *4)</td><td>30 MHz to 25 GHz</td><td>100 kHz</td><td>300 kHz</td></tr></table> After <table><tr><td>Conducted</td><td>9 kHz to 150 kHz</td><td>200 Hz</td><td>620 Hz</td></tr><tr><td>Spurious</td><td>150 kHz to 30 MHz</td><td>10 kHz</td><td>30 kHz</td></tr><tr><td>Emission *2) *3)</td><td>30 MHz to 25 GHz</td><td>100 kHz</td><td>300 kHz</td></tr></table>	Conducted	9 kHz to 150 kHz	200 Hz	620 Hz	Spurious	150 kHz to 30 MHz	10 kHz	30 kHz	Emission *3) *4)	30 MHz to 25 GHz	100 kHz	300 kHz	Conducted	9 kHz to 150 kHz	200 Hz	620 Hz	Spurious	150 kHz to 30 MHz	10 kHz	30 kHz	Emission *2) *3)	30 MHz to 25 GHz	100 kHz	300 kHz
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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
APD	Absorbed Power Density	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	P/M	Power meter
CISPR	Comite International Special des Perturbations Radioelectriques	PCB	Printed Circuit Board
CW	Continuous Wave	PER	Packet Error Rate
DBPSK	Differential BPSK	PHY	Physical Layer
DC	Direct Current	PK	Peak
D-factor	Distance factor	PN	Pseudo random Noise
DFS	Dynamic Frequency Selection	PRBS	Pseudo-Random Bit Sequence
DQPSK	Differential QPSK	PSD	Power Spectral Density
DSSS	Direct Sequence Spread Spectrum	QAM	Quadrature Amplitude Modulation
EDR	Enhanced Data Rate	QP	Quasi-Peak
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	QPSK	Quadri-Phase Shift Keying
EMC	ElectroMagnetic Compatibility	RBW	Resolution Band Width
EMI	ElectroMagnetic Interference	RDS	Radio Data System
EN	European Norm	RE	Radio Equipment
ERP, e.r.p.	Effective Radiated Power	RF	Radio Frequency
EU	European Union	RMS	Root Mean Square
EUT	Equipment Under Test	RSS	Radio Standards Specifications
Fac.	Factor	Rx	Receiving
FCC	Federal Communications Commission	SA, S/A	Spectrum Analyzer
FHSS	Frequency Hopping Spread Spectrum	SAR	Specific Absorption Rate
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
HPF	High-Pass Filter	WPT	Wireless Power Transmit

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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-014
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 19 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)}	1.93 dBi

Bluetooth (BR / EDR)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK)
Antenna Gain _{a)}	1.93 dBi

RFID

Equipment Type	Transceiver
Frequency of Operation	13.56 MHz
Type of Modulation	ASK

SECTION 3: Test Specification, Procedures & Results

3.1 Test Specification

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

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

3.2 Procedures and Results

Item	Test Procedure	Specification	Worst Margin	Results	Remarks
Conducted Emission	FCC: ANSI C63.10-2013 6. Standard test methods ISED: RSS-Gen 8.8	FCC: Section 15.207 ISED: RSS-Gen 8.8	27.1 dB, 0.15000 MHz, QP, L1	Complied	-
Carrier Frequency Separation	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1) ISED: RSS-247 5.1 (b)	See data.	Complied	Conducted
20 dB Bandwidth	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1) ISED: RSS-247 5.1 (a)		Complied	Conducted
Number of Hopping Frequency	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1)(iii) ISED: RSS-247 5.1 (d)		Complied	Conducted
Dwell time	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: -	FCC: Section15.247(a)(1)(iii) ISED: RSS-247 5.1 (d)		Complied	Conducted
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section15.247(b)(1) ISED: RSS-247 5.4 (b)		Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	14.6 dB, 4804.000 Hz, AV, Hori., Mode: Tx, Hopping Off, DH5 2402 MHz	Complied	Conducted/ Radiated (above 30 MHz) *1)

Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

*1) Radiated test was selected over 30 MHz based on section 15.247(d).

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)

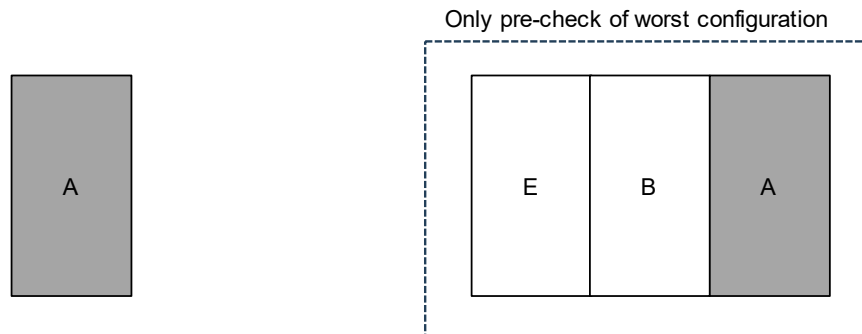
*2DH mode (2Mb/s EDR: pi/4DQPSK) was excluded for other tests than power measurement by using 3DH mode (3 Mb/s EDR: 8DPSK) as a representative.

*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.

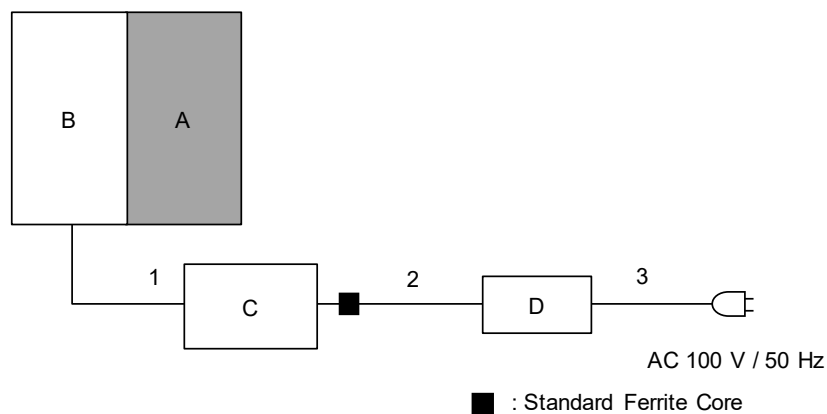
4.2 Configuration and Peripherals

Radiated Emission test

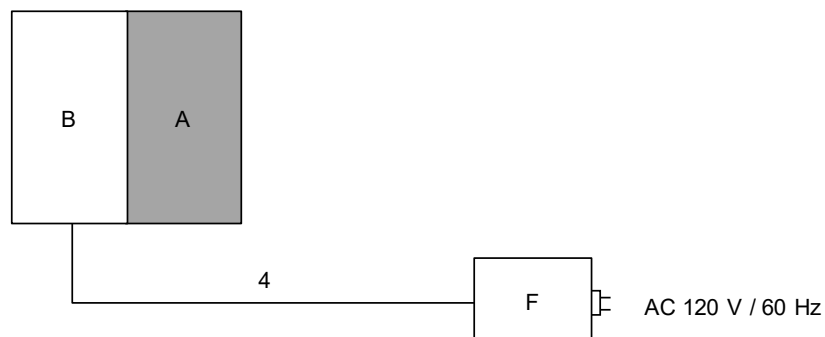


* The carrier level and noise levels were confirmed at each condition of standalone and connected by support equipment, and the test was made at the condition that has the maximum noise.

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-014	HCL01000090015 *1) HCL01000051334 *2)	Nintendo Co., Ltd.	EUT
B	Charging Grip	BEE-010	HDL04000004020 *1) HBL01000051689 *2)	Nintendo Co., Ltd.	-
C	Laptop PC	CF-SZ6RDYVS	8KKSC50259	Panasonic	-
D	AC Adaptor	CF-AA64L2C M1	64L2CM118906341A	Panasonic	-
E	Controller	BEE-012	B-0106	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.

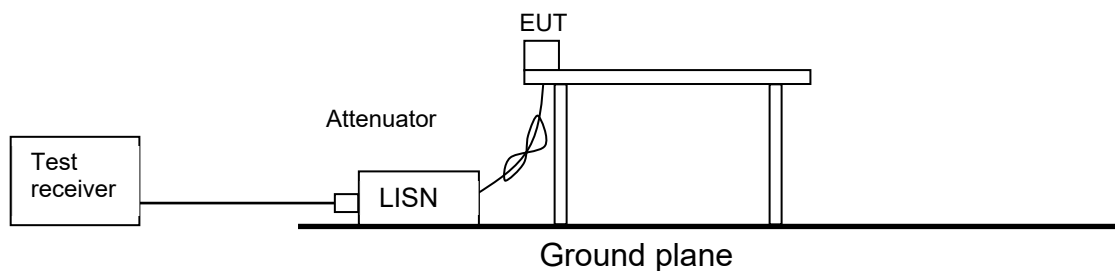
The EUT was connected to a LISN (AMN).

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, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]

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

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).

The test was made with the detector (RBW/VBW) in the following table.

When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

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

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

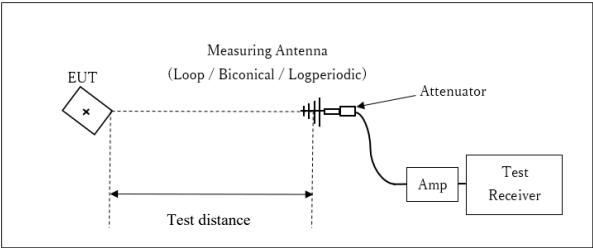
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9 (ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer *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

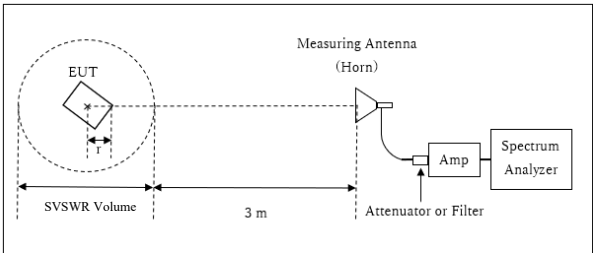
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz



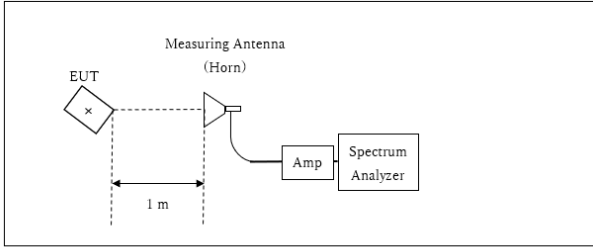
r : Radius of an outer periphery of EUT

× : Center of turn table

Distance Factor: $20 \times \log (3.98 \text{ m} / 3.0 \text{ m}) = 2.46 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.98 \text{ m}$

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

10 GHz to 26.5 GHz



× : Center of turn table

Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$
*Test Distance: 1 m

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

	Below 1 GHz	1 GHz to 2.8 GHz	2.8 GHz to 10 GHz	Above 10 GHz
Horizontal	Axis-X	Axis-X	Axis-X	Axis-X
Vertical	Axis-X	Axis-Y	Axis-Z	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	13 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 Ohms. 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

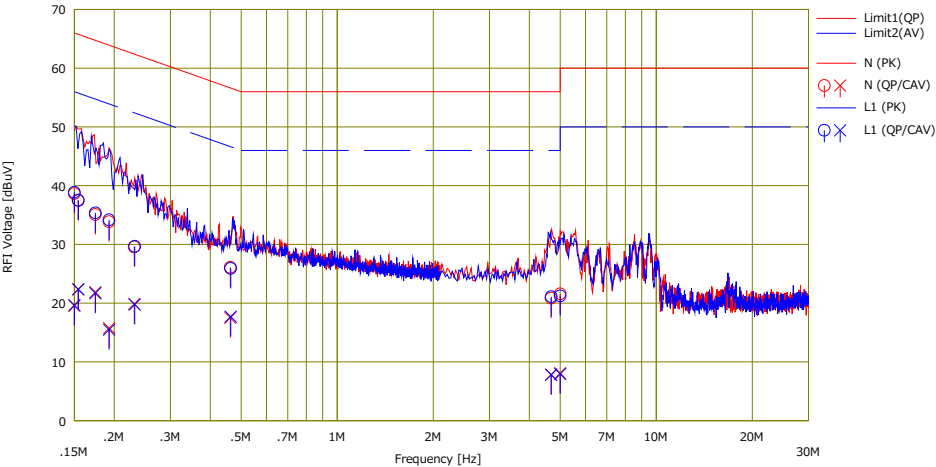
DATA OF CONDUCTED EMISSION TEST

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

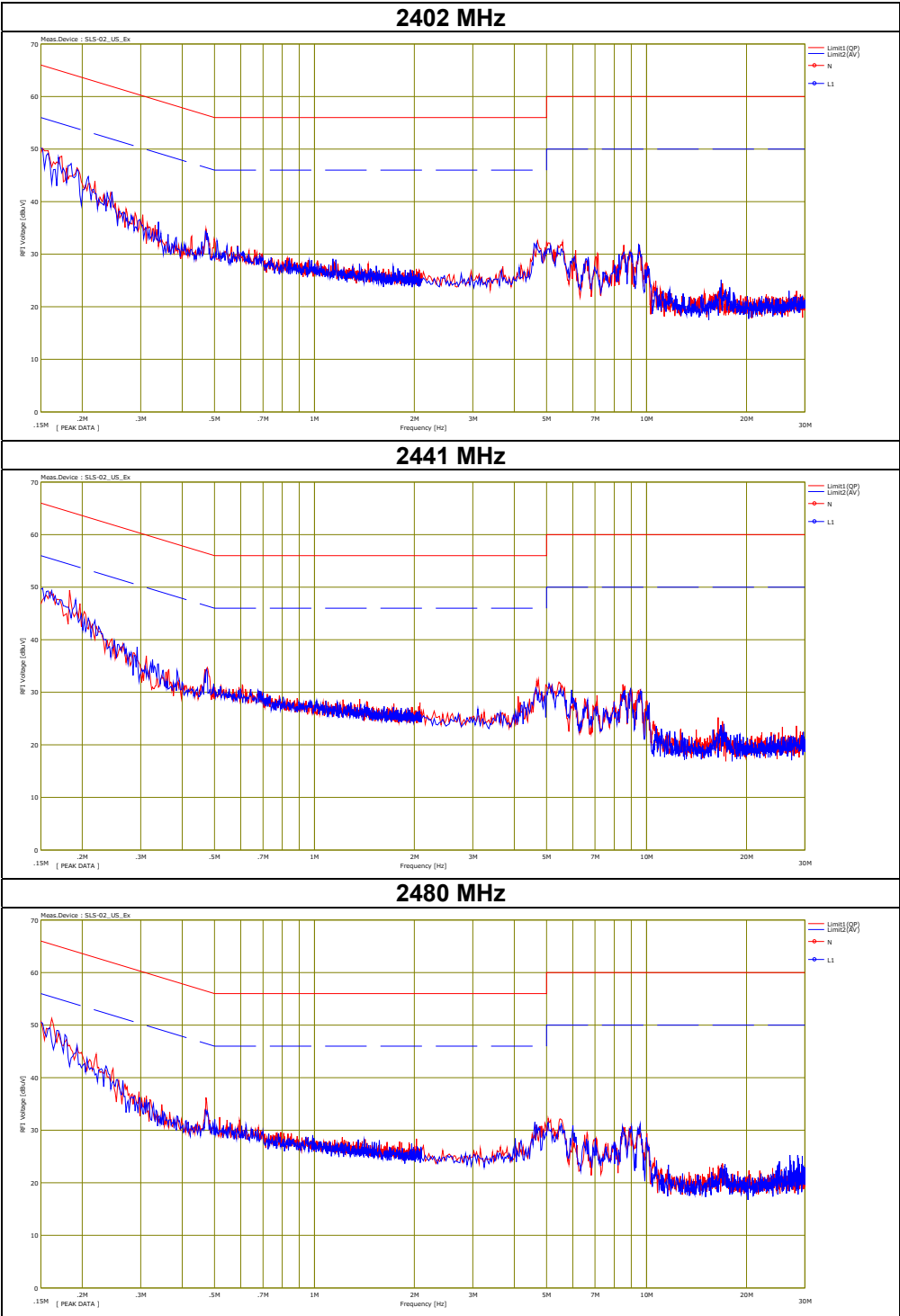


No.	Freq. [MHz]	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		<QP>	<CAV>		<QP>	<CAV>	<QP>	<AV>	<QP>	<AV>		
		[dBuV]	[dBuV]		[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	26.10	7.00	12.55	38.65	19.55	66.00	56.00	27.3	36.4	N	
2	0.15407	25.00	9.80	12.56	37.56	22.36	65.78	55.78	28.2	33.4	N	
3	0.17455	22.50	9.30	12.58	35.08	21.88	64.74	54.74	29.6	32.8	N	
4	0.19279	21.30	3.20	12.56	33.86	15.76	63.92	53.92	30.0	38.1	N	
5	0.23113	17.00	7.30	12.57	29.57	19.87	62.41	52.41	32.8	32.5	N	
6	0.46238	13.50	4.90	12.61	26.11	17.51	56.65	46.65	30.5	29.1	N	
7	4.68169	7.80	-5.20	13.05	20.85	7.85	56.00	46.00	35.1	38.1	N	
8	4.99983	8.50	-5.00	13.09	21.59	8.09	56.00	46.00	34.4	37.9	N	
9	0.15000	26.30	7.10	12.57	38.87	19.67	66.00	56.00	27.1	36.3	L1	
10	0.15456	24.90	9.80	12.57	37.47	22.37	65.75	55.75	28.2	33.3	L1	
11	0.17467	22.80	9.10	12.57	35.37	21.67	64.74	54.74	29.3	33.0	L1	
12	0.19275	21.60	2.90	12.58	34.18	15.48	63.92	53.92	29.7	38.4	L1	
13	0.23198	17.10	7.20	12.57	29.67	19.77	62.38	52.38	32.7	32.6	L1	
14	0.46370	13.30	5.10	12.61	25.91	17.71	56.63	46.63	30.7	28.9	L1	
15	4.68490	8.10	-5.20	13.00	21.10	7.80	56.00	46.00	34.9	38.2	L1	
16	4.99989	8.20	-5.10	13.04	21.24	7.94	56.00	46.00	34.7	38.0	L1	

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

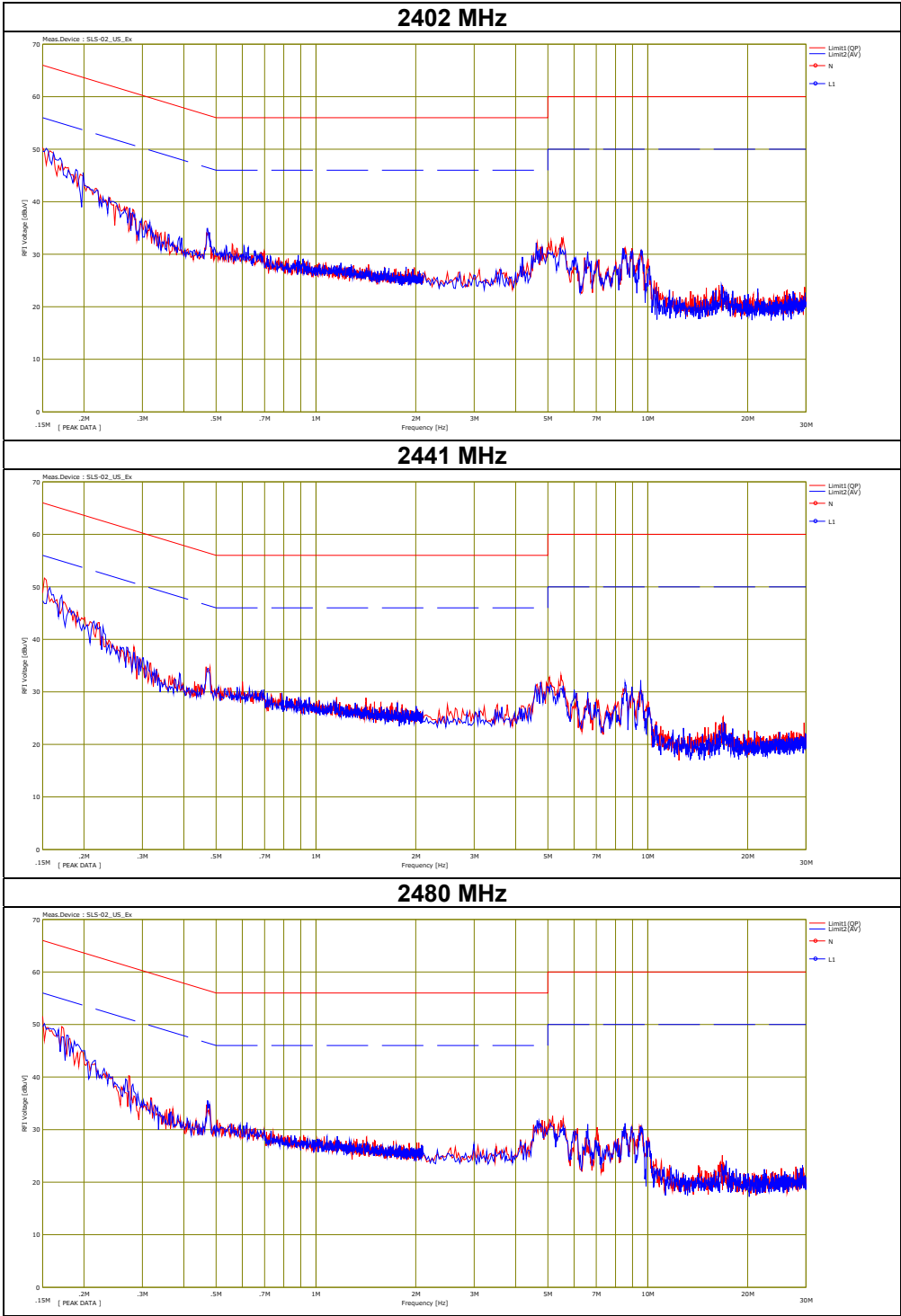
Conducted Emission

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



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



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

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, 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	0.964	872.4	1.000	>= 0.643
DH5	2441.0	0.964	870.8	1.000	>= 0.643
DH5	2480.0	0.964	870.9	1.000	>= 0.643
DH5	Hopping On	-	78650.9	-	-
3DH5	2402.0	1.270	1153.8	1.000	>= 0.847
3DH5	2441.0	1.275	1155.9	1.000	>= 0.850
3DH5	2480.0	1.274	1157.1	1.000	>= 0.849
3DH5	Hopping On	-	78705.3	-	-

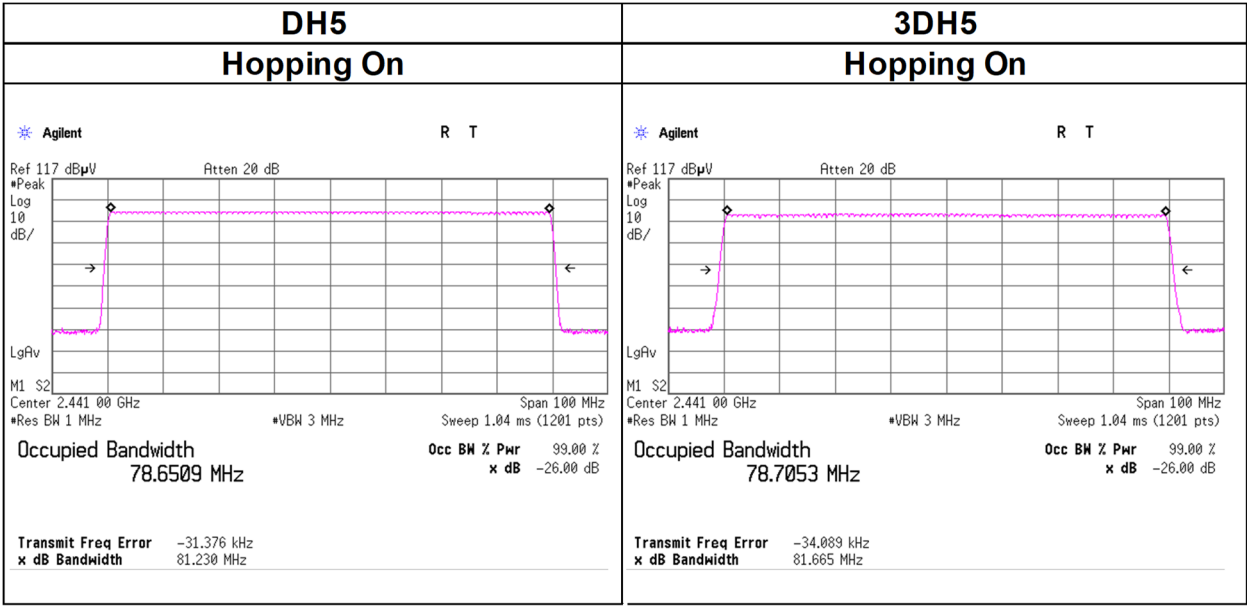
Limit: Two-thirds of 20 dB Bandwidth or 25 kHz (whichever is greater).

No limit applies to 20 dB Bandwidth.

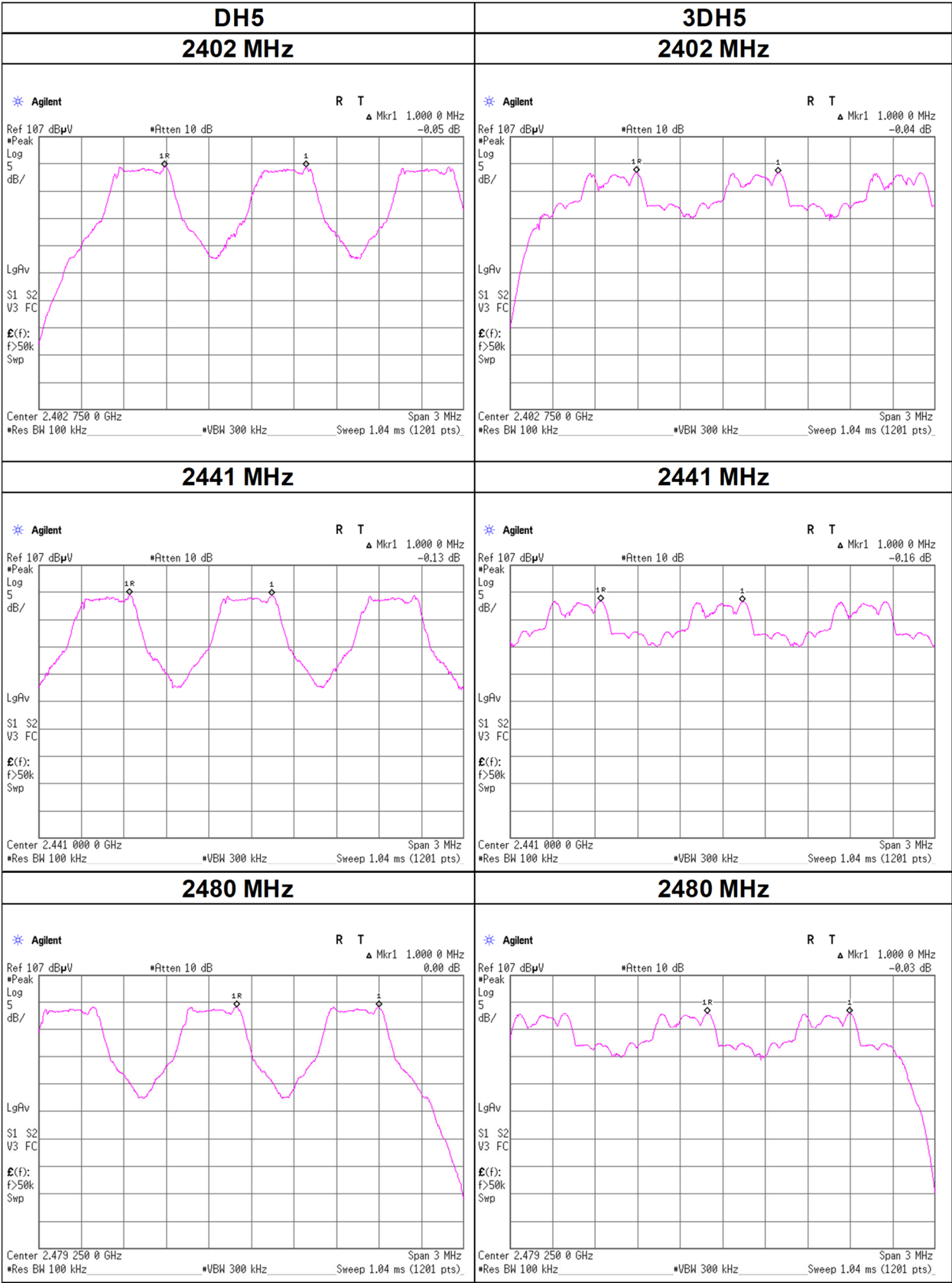
20 dB Bandwidth and 99 % Occupied Bandwidth

DH5 2402 MHz	3DH5 2402 MHz
Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.402 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 872.3655 kHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -9.480 kHz x dB Bandwidth 964.044 kHz	Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.402 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 1.1538 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -10.171 kHz x dB Bandwidth 1.270 MHz
2441 MHz	2441 MHz
Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.441 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 870.7764 kHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -9.985 kHz x dB Bandwidth 963.907 kHz	Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.441 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 1.1559 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -10.563 kHz x dB Bandwidth 1.275 MHz
2480 MHz	2480 MHz
Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.480 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 870.8916 kHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -10.425 kHz x dB Bandwidth 964.046 kHz	Agilent R T Ref 117 dBμV Atten 20 dB Peak Log 10 dB/ LgAv M1 S2 Center 2.480 000 GHz Span 3 MHz Res BW 30 kHz VBW 100 kHz Sweep 3.2 ms (1201 pts) Occupied Bandwidth 1.1571 MHz Occ BW % Pwr 99.00 % x dB -20.00 dB Transmit Freq Error -10.793 kHz x dB Bandwidth 1.274 MHz

20 dB Bandwidth and 99 % Occupied Bandwidth



Carrier Frequency Separation



Number of Hopping Frequency

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 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



Dwell time

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 On

Mode	Number of transmission in a 31.6 (79 Hopping x0.4)				Length of transmission [ms]	Result [ms]	Limit [ms]
DH1	50.0 times	/	5 s	x 31.6 s = 316 times	0.399	126	400
DH3	24.0 times	/	5 s	x 31.6 s = 152 times	1.658	252	400
DH5	19.2 times	/	5 s	x 31.6 s = 122 times	2.907	355	400
3DH1	50.6 times	/	5 s	x 31.6 s = 320 times	0.404	129	400
3DH3	25.2 times	/	5 s	x 31.6 s = 160 times	1.669	267	400
3DH5	19.6 times	/	5 s	x 31.6 s = 124 times	2.910	361	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

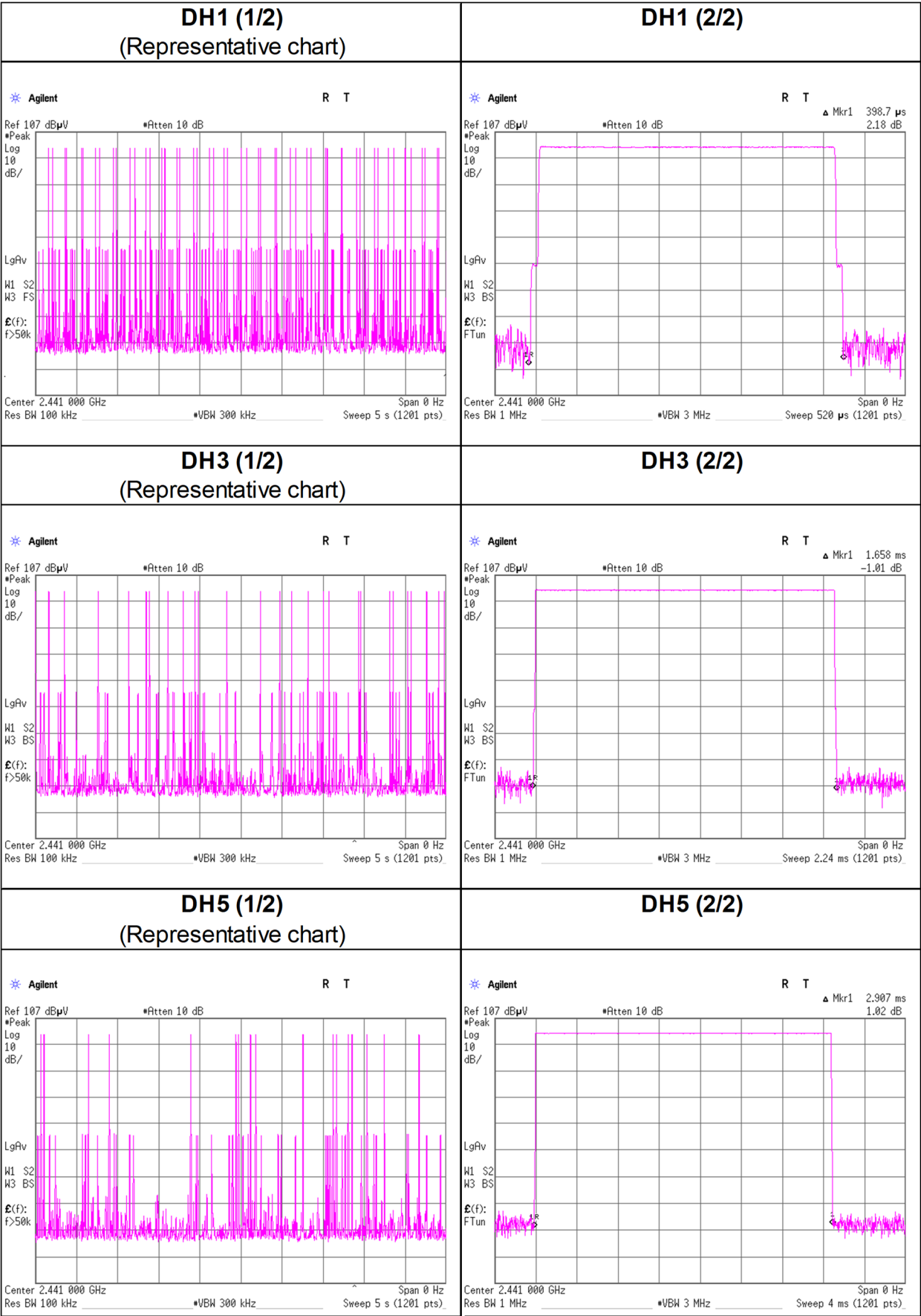
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	50	49	50	51	50	50
DH3	26	22	21	23	28	24
DH5	17	21	22	21	15	19.2
3DH1	51	51	50	52	49	50.6
3DH3	26	25	22	24	29	25.2
3DH5	24	20	15	17	22	19.6

Sample Calculation

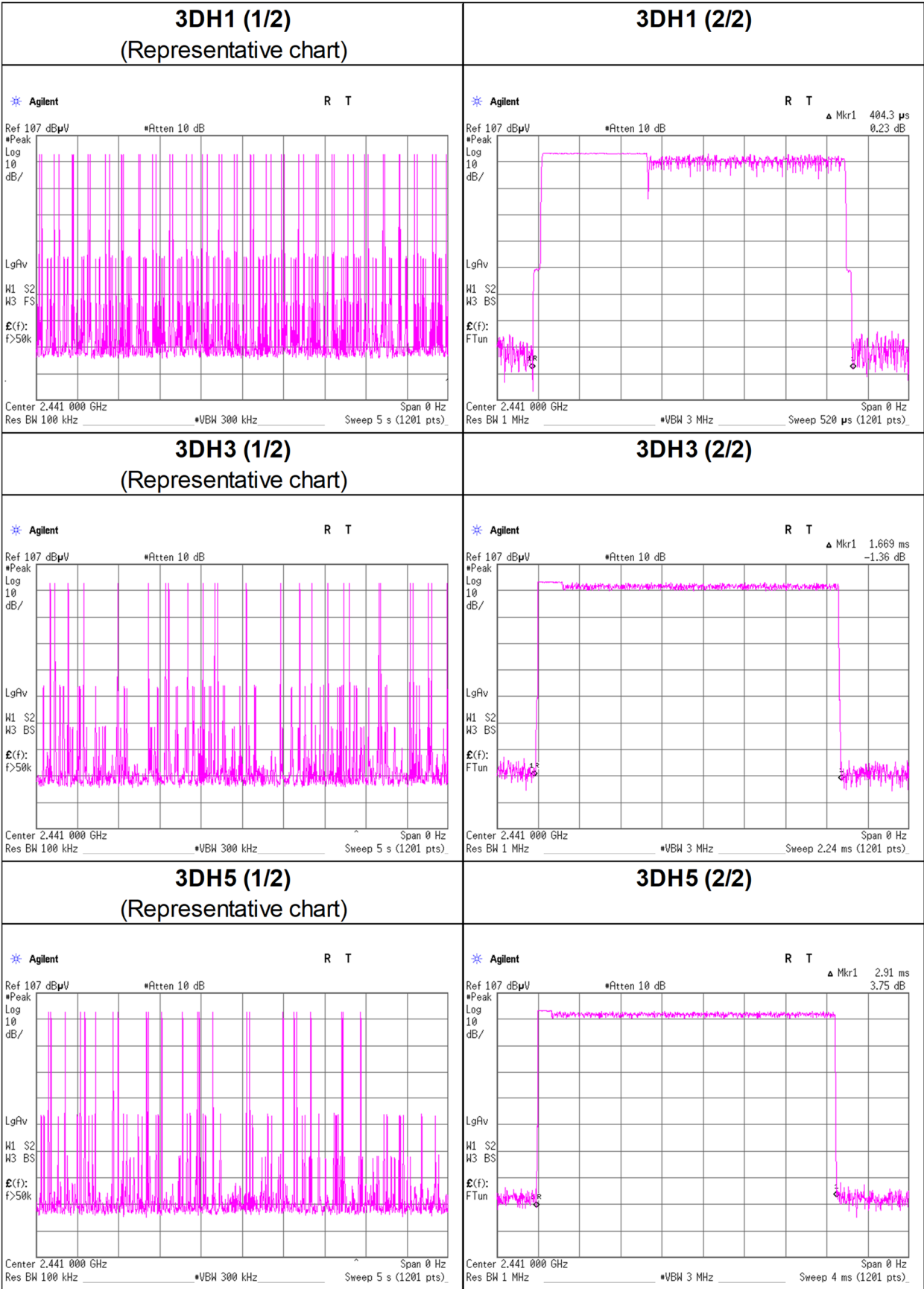
Average = Summation (Sampling 1 to 5) / 5

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 $N \times 0.4$ 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



Dwell time



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

Mode	Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Conducted Power					e.i.r.p. for RSS-247					
					Result		Limit		Margin [dB]	Antenna Gain [dBi]	Result		Limit		Margin [dB]
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402	-5.21	1.62	9.94	6.35	4.32	20.97	125	14.62	1.93	8.28	6.73	36.02	4000	27.74
DH5	2441	-5.44	1.63	9.94	6.13	4.10	20.97	125	14.84	1.93	8.06	6.40	36.02	4000	27.96
DH5	2480	-5.57	1.63	9.94	6.00	3.98	20.97	125	14.97	1.93	7.93	6.21	36.02	4000	28.09
2DH5	2402	-6.36	1.62	9.94	5.20	3.31	20.97	125	15.77	1.93	7.13	5.16	36.02	4000	28.89
2DH5	2441	-6.52	1.63	9.94	5.05	3.20	20.97	125	15.92	1.93	6.98	4.99	36.02	4000	29.04
2DH5	2480	-6.72	1.63	9.94	4.85	3.05	20.97	125	16.12	1.93	6.78	4.76	36.02	4000	29.24
3DH5	2402	-6.23	1.62	9.94	5.33	3.41	20.97	125	15.64	1.93	7.26	5.32	36.02	4000	28.76
3DH5	2441	-6.39	1.63	9.94	5.18	3.30	20.97	125	15.79	1.93	7.11	5.14	36.02	4000	28.91
3DH5	2480	-6.57	1.63	9.94	5.00	3.16	20.97	125	15.97	1.93	6.93	4.93	36.02	4000	29.09

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.

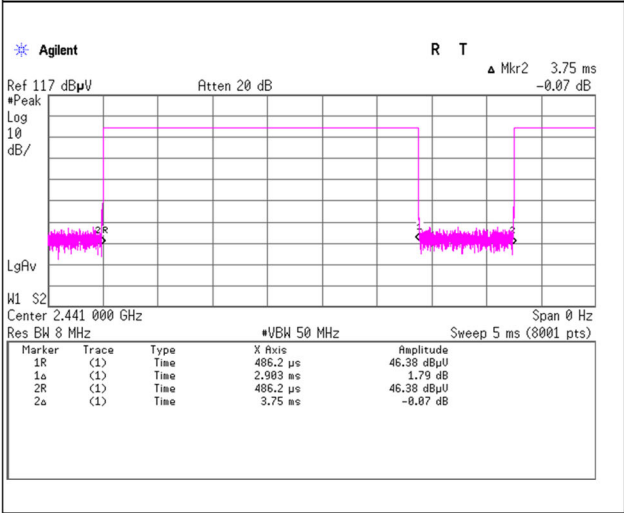
As this device had AFH mode and frequency separation could not meet the requirement of over 20 dB BW without 2/3 relaxation, 125 mW power limit was applied to it.

Burst Rate Confirmation

Test place Shonan EMC Lab. No.1 Measurement Room
Date June 19, 2024
Temperature / Humidity 25 deg. C / 50 % RH
Engineer Kazuya Noda
Mode Tx, Hopping Off

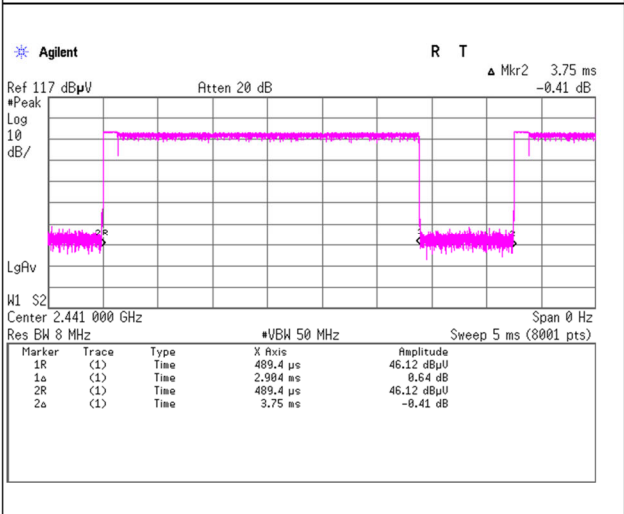
DH5

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



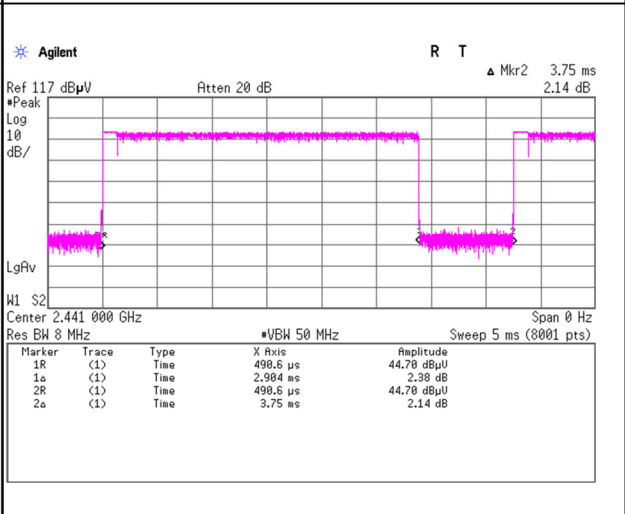
2DH5

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 = 344.35 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 = 344.31 Hz < 500.00 Hz



Radiated Spurious Emission

Test place Shonan EMC Lab.
Semi Anechoic Chamber WAC2 WAC2 WAC2
Date June 24, 2024 June 20, 2024 June 21, 2024
Temperature / Humidity 24 deg. C / 59 % RH 24 deg. C / 53 % RH 24 deg. C / 61 % RH
Engineer Kouki Yamada Yusuke Tanikawara 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.	31.028	QP	22.20	13.41	6.25	32.69	0.00	9.17	40.0	30.8	100	86	-
Hori.	53.992	QP	22.60	9.80	6.45	33.09	0.00	5.77	40.0	34.2	100	84	-
Hori.	68.093	QP	22.90	9.33	6.46	33.17	0.00	5.52	40.0	34.4	100	85	-
Hori.	923.282	QP	19.90	22.10	8.93	30.24	0.00	20.69	46.0	25.3	100	74	-
Hori.	2390.000	PK	47.53	27.75	-28.27	-	2.46	49.47	73.9	24.4	145	148	-
Hori.	4804.000	PK	50.14	31.56	-36.04	-	2.46	48.12	73.9	25.7	106	90	-
Hori.	7206.000	PK	46.75	36.21	-34.48	-	2.46	50.94	73.9	22.9	150	0	Floor Noise
Hori.	9608.000	PK	45.75	38.14	-31.55	-	2.46	54.80	73.9	19.1	150	0	Floor Noise
Hori.	2390.000	AV	33.59	27.75	-28.27	-	2.46	35.53	53.9	18.3	145	148	VBW : 500 Hz
Hori.	4804.000	AV	41.28	31.56	-36.04	-	2.46	39.26	53.9	14.6	106	90	VBW : 500 Hz
Hori.	7206.000	AV	33.13	36.21	-34.48	-	2.46	37.32	53.9	16.5	150	0	VBW : 500 Hz, Floor Noise
Hori.	9608.000	AV	32.30	38.14	-31.55	-	2.46	41.35	53.9	12.5	150	0	VBW : 500 Hz, Floor Noise
Vert.	35.148	QP	22.80	12.46	6.31	32.81	0.00	8.77	40.0	31.2	100	318	-
Vert.	55.362	QP	22.80	9.73	6.45	33.10	0.00	5.88	40.0	34.1	100	143	-
Vert.	75.317	QP	25.90	9.12	6.64	33.19	0.00	8.47	40.0	31.5	100	142	-
Vert.	83.823	QP	23.00	8.95	6.88	33.20	0.00	5.63	40.0	34.3	100	341	-
Vert.	897.580	QP	19.90	22.09	8.89	30.40	0.00	20.48	46.0	25.5	100	318	-
Vert.	2390.000	PK	47.52	27.75	-28.27	-	2.46	49.46	73.9	24.4	302	271	-
Vert.	4804.000	PK	50.56	31.56	-36.04	-	2.46	48.54	73.9	25.3	111	3	-
Vert.	7206.000	PK	46.57	36.21	-34.48	-	2.46	50.76	73.9	23.1	150	0	Floor Noise
Vert.	9608.000	PK	45.90	38.14	-31.55	-	2.46	54.95	73.9	18.9	150	0	Floor Noise
Vert.	2390.000	AV	33.44	27.75	-28.27	-	2.46	35.38	53.9	18.5	302	271	VBW : 500 Hz
Vert.	4804.000	AV	40.87	31.56	-36.04	-	2.46	38.85	53.9	15.0	111	3	VBW : 500 Hz
Vert.	7206.000	AV	33.11	36.21	-34.48	-	2.46	37.30	53.9	16.6	150	0	VBW : 500 Hz, Floor Noise
Vert.	9608.000	AV	32.39	38.14	-31.55	-	2.46	41.44	53.9	12.4	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	100.39	27.77	-28.26	-	2.46	102.36	-	-	Carrier
Hori.	2400.000	PK	42.89	27.77	-28.26	-	2.46	44.86	82.3	37.4	-
Vert.	2402.000	PK	99.49	27.77	-28.26	-	2.46	101.46	-	-	Carrier
Vert.	2400.000	PK	42.45	27.77	-28.26	-	2.46	44.42	81.4	36.9	-

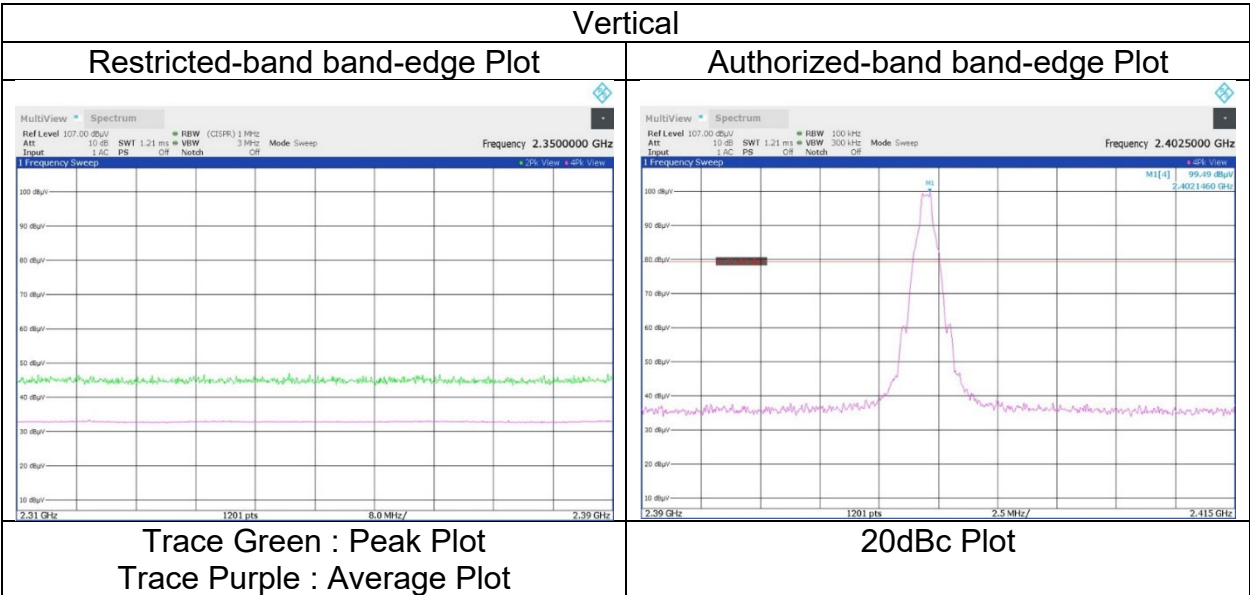
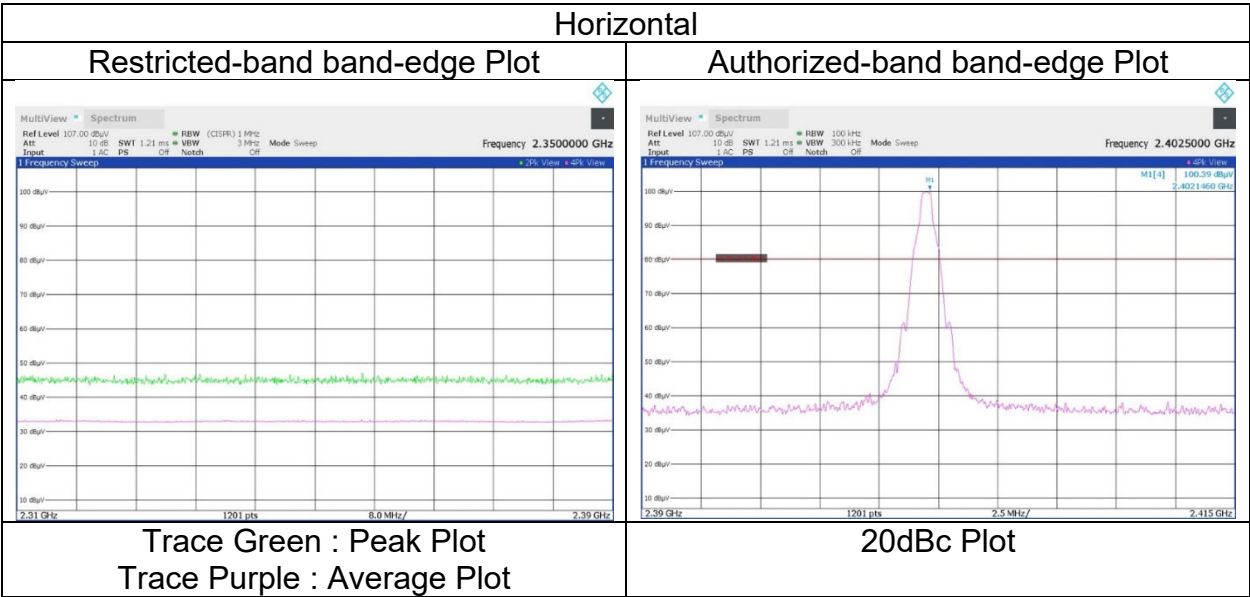
1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor

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 20, 2024
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Yusuke Tanikawara
	(1 GHz to 10 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	WAC2	WAC2
Date	June 20, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 53 % RH	24 deg. C / 61 % RH
Engineer	Yusuke Tanikawara (1 GHz to 10 GHz)	Yusuke Tanikawara (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.	4882.000	PK	48.12	31.96	-36.00	-	2.46	46.54	73.9	27.3	100	41	-
Hori.	7323.000	PK	46.92	36.67	-34.24	-	2.46	51.81	73.9	22.0	150	0	Floor Noise
Hori.	9764.000	PK	46.11	38.10	-31.32	-	2.46	55.35	73.9	18.5	150	0	Floor Noise
Hori.	4882.000	AV	36.66	31.96	-36.00	-	2.46	35.08	53.9	18.8	100	41	VBW : 500 Hz
Hori.	7323.000	AV	33.15	36.67	-34.24	-	2.46	38.04	53.9	15.8	150	0	VBW : 500 Hz, Floor Noise
Hori.	9764.000	AV	32.25	38.10	-31.32	-	2.46	41.49	53.9	12.4	150	0	VBW : 500 Hz, Floor Noise
Vert.	4882.000	PK	49.01	31.96	-36.00	-	2.46	47.43	73.9	26.4	110	10	-
Vert.	7323.000	PK	46.96	36.67	-34.24	-	2.46	51.85	73.9	22.0	150	0	Floor Noise
Vert.	9764.000	PK	46.05	38.10	-31.32	-	2.46	55.29	73.9	18.6	150	0	Floor Noise
Vert.	4882.000	AV	37.23	31.96	-36.00	-	2.46	35.65	53.9	18.2	110	10	VBW : 500 Hz
Vert.	7323.000	AV	33.29	36.67	-34.24	-	2.46	38.18	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	9764.000	AV	32.37	38.10	-31.32	-	2.46	41.61	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: $20\log (3.98 \text{ m} / 3.0 \text{ m}) = 2.46 \text{ dB}$

10 GHz- 40 GHz: $20\log(1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$

*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 20, 2024 June 21, 2024
Temperature / Humidity 24 deg. C / 53 % RH 24 deg. C / 61 % RH
Engineer Yusuke Tanikawara 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	53.46	27.80	-28.21	-	2.46	55.51	73.9	18.3	299	144	-	-
Hori.	4960.000	PK	48.50	32.23	-35.97	-	2.46	47.22	73.9	26.6	104	97	-	-
Hori.	7440.000	PK	47.46	36.81	-33.99	-	2.46	52.74	73.9	21.1	150	0	Floor Noise	-
Hori.	9920.000	PK	45.61	38.04	-31.10	-	2.46	55.01	73.9	18.8	150	0	Floor Noise	-
Hori.	2483.500	AV	34.67	27.80	-28.21	-	2.46	36.72	53.9	17.1	299	144	VBW : 500 Hz	-
Hori.	4960.000	AV	36.27	32.23	-35.97	-	2.46	34.99	53.9	18.9	104	97	VBW : 500 Hz	-
Hori.	7440.000	AV	33.37	36.81	-33.99	-	2.46	38.65	53.9	15.2	150	0	VBW : 500 Hz, Floor Noise	-
Hori.	9920.000	AV	31.94	38.04	-31.10	-	2.46	41.34	53.9	12.5	150	0	VBW : 500 Hz, Floor Noise	-
Vert.	2483.500	PK	53.61	27.80	-28.21	-	2.46	55.66	73.9	18.2	247	250	-	-
Vert.	4960.000	PK	48.87	32.23	-35.97	-	2.46	47.59	73.9	26.3	151	19	-	-
Vert.	7440.000	PK	47.63	36.81	-33.99	-	2.46	52.91	73.9	20.9	150	0	Floor Noise	-
Vert.	9920.000	PK	45.46	38.04	-31.10	-	2.46	54.86	73.9	19.0	150	0	Floor Noise	-
Vert.	2483.500	AV	34.63	27.80	-28.21	-	2.46	36.68	53.9	17.2	247	250	VBW : 500 Hz	-
Vert.	4960.000	AV	36.72	32.23	-35.97	-	2.46	35.44	53.9	18.4	151	19	VBW : 500 Hz	-
Vert.	7440.000	AV	33.49	36.81	-33.99	-	2.46	38.77	53.9	15.1	150	0	VBW : 500 Hz, Floor Noise	-
Vert.	9920.000	AV	31.92	38.04	-31.10	-	2.46	41.32	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

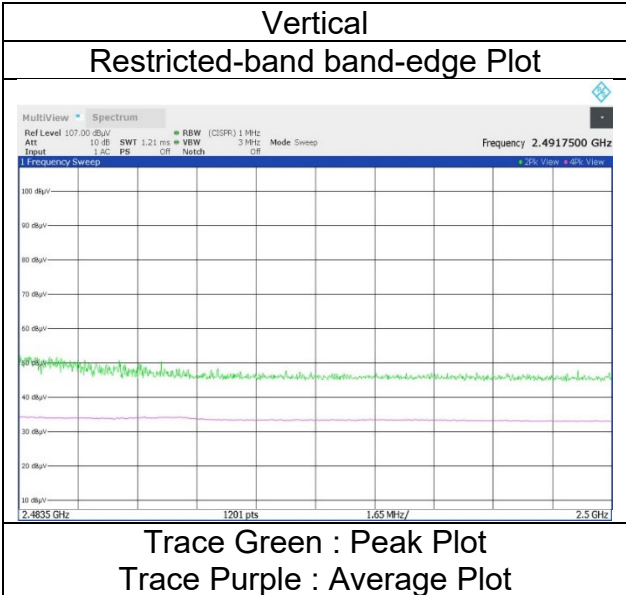
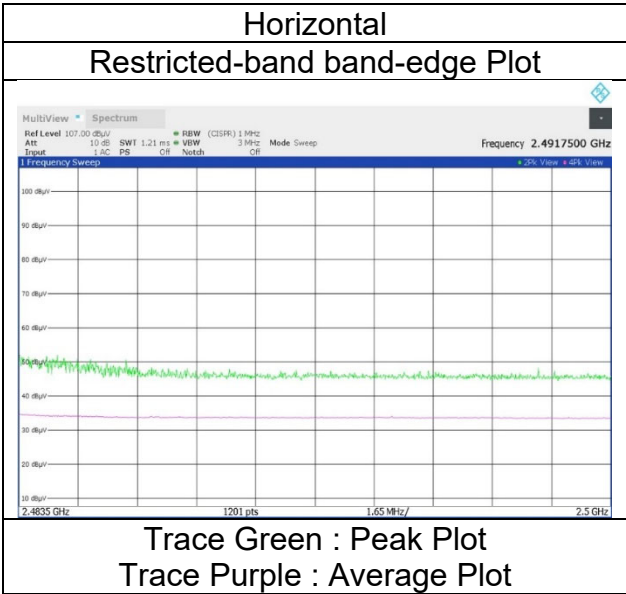
*These results have sufficient margin without taking account Duty cycle correction factor.

Radiated Spurious Emission
(Reference Plot for bandto edge)

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Shonan EMC Lab.
WAC2
June 20, 2024
24 deg. C / 53 % RH
Yusuke Tanikawara
(1 GHz to 10 GHz)
Tx, Hopping Off, DH5 2480 MHz



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

Radiated Spurious Emission

Test place Shonan EMC Lab.
Semi Anechoic Chamber WAC2
Date June 20, 2024
Temperature / Humidity 24 deg. C / 53 % RH
Engineer Yusuke Tanikawara
Mode (1 GHz to 10 GHz)
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	47.58	27.75	-28.27	-	2.46	49.52	73.9	24.3	146	153	-
Hori.	4804.000	PK	49.19	31.56	-36.04	-	2.46	47.17	73.9	26.7	100	94	-
Hori.	7206.000	PK	46.95	36.21	-34.48	-	2.46	51.14	73.9	22.7	150	0	Floor Noise
Hori.	9608.000	PK	45.92	38.14	-31.55	-	2.46	54.97	73.9	18.9	150	0	Floor Noise
Hori.	2390.000	AV	33.56	27.75	-28.27	-	2.46	35.50	53.9	18.4	146	153	VBW : 500 Hz
Hori.	4804.000	AV	36.06	31.56	-36.04	-	2.46	34.04	53.9	19.8	100	94	VBW : 500 Hz
Hori.	7206.000	AV	33.30	36.21	-34.48	-	2.46	37.49	53.9	16.4	150	0	VBW : 500 Hz, Floor Noise
Hori.	9608.000	AV	32.16	38.14	-31.55	-	2.46	41.21	53.9	12.6	150	0	VBW : 500 Hz, Floor Noise
Vert.	2390.000	PK	47.26	27.75	-28.27	-	2.46	49.20	73.9	24.7	300	263	-
Vert.	4804.000	PK	49.41	31.56	-36.04	-	2.46	47.39	73.9	26.5	111	352	-
Vert.	7206.000	PK	46.72	36.21	-34.48	-	2.46	50.91	73.9	22.9	150	0	Floor Noise
Vert.	9608.000	PK	45.94	38.14	-31.55	-	2.46	54.99	73.9	18.9	150	0	Floor Noise
Vert.	2390.000	AV	33.74	27.75	-28.27	-	2.46	35.68	53.9	18.2	300	263	VBW : 500 Hz
Vert.	4804.000	AV	37.02	31.56	-36.04	-	2.46	35.00	53.9	18.9	111	352	VBW : 500 Hz
Vert.	7206.000	AV	33.21	36.21	-34.48	-	2.46	37.40	53.9	16.5	150	0	VBW : 500 Hz, Floor Noise
Vert.	9608.000	AV	32.24	38.14	-31.55	-	2.46	41.29	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
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.

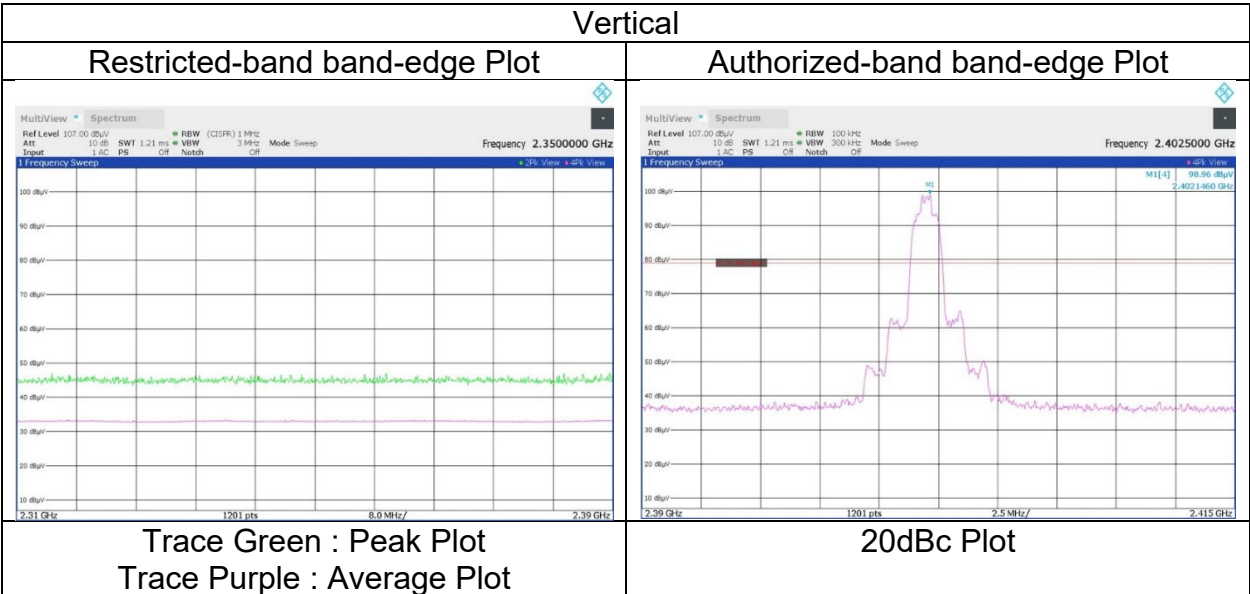
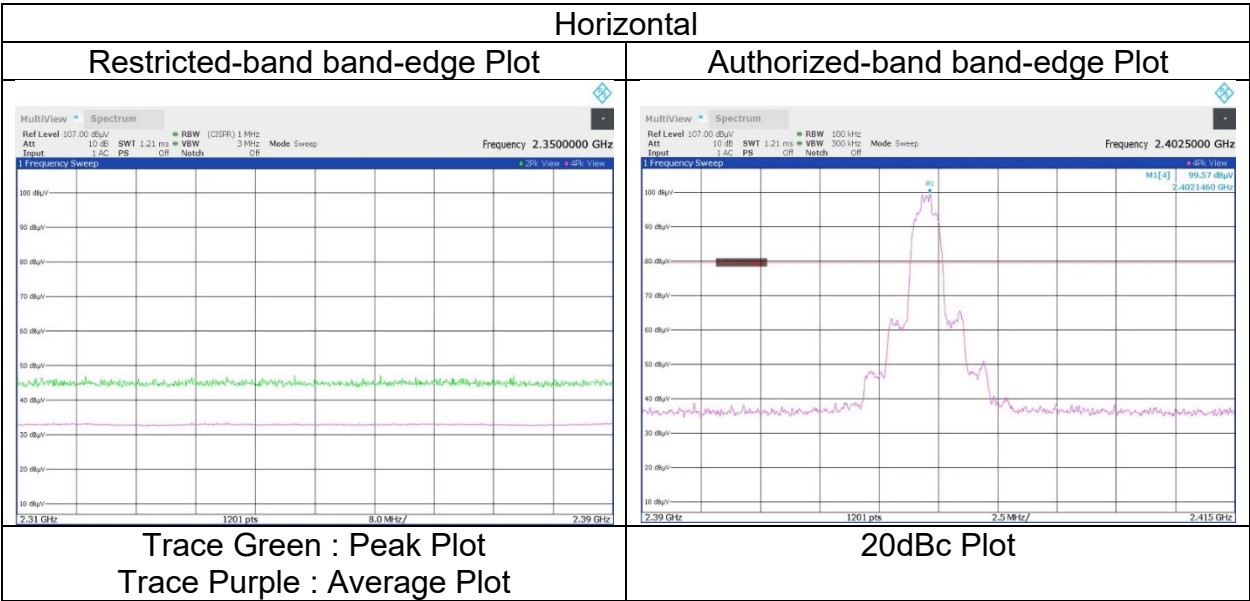
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

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	99.57	27.77	-28.26	-	2.46	101.54	-	-	Carrier
Hori.	2399.509	PK	50.18	27.77	-28.26	-	2.46	52.15	81.5	29.3	-
Hori.	2400.000	PK	48.26	27.77	-28.26	-	2.46	50.23	81.5	31.2	-
Vert.	2402.000	PK	98.96	27.77	-28.26	-	2.46	100.93	-	-	Carrier
Vert.	2399.628	PK	49.02	27.77	-28.26	-	2.46	50.99	80.9	29.9	-
Vert.	2400.000	PK	47.52	27.77	-28.26	-	2.46	49.49	80.9	31.4	-

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 20, 2024
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Yusuke Tanikawara
	(1 GHz to 10 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz



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

Radiated Spurious Emission

Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	WAC2	WAC2
Date	June 20, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 53 % RH	24 deg. C / 61 % RH
Engineer	Yusuke Tanikawara	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.	4882.000	PK	48.18	31.96	-36.00	-	2.46	46.60	73.9	27.3	110	45	-
Hori.	7323.000	PK	47.02	36.67	-34.24	-	2.46	51.91	73.9	21.9	150	0	Floor Noise
Hori.	9764.000	PK	46.21	38.10	-31.32	-	2.46	55.45	73.9	18.4	150	0	Floor Noise
Hori.	4882.000	AV	34.24	31.96	-36.00	-	2.46	32.66	53.9	21.2	110	45	VBW : 500 Hz
Hori.	7323.000	AV	33.30	36.67	-34.24	-	2.46	38.19	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Hori.	9764.000	AV	32.33	38.10	-31.32	-	2.46	41.57	53.9	12.3	150	0	VBW : 500 Hz, Floor Noise
Vert.	4882.000	PK	48.23	31.96	-36.00	-	2.46	46.65	73.9	27.2	208	2	-
Vert.	7323.000	PK	47.09	36.67	-34.24	-	2.46	51.98	73.9	21.9	150	0	Floor Noise
Vert.	9764.000	PK	46.09	38.10	-31.32	-	2.46	55.33	73.9	18.5	150	0	Floor Noise
Vert.	4882.000	AV	36.32	31.96	-36.00	-	2.46	34.74	53.9	19.1	208	2	VBW : 500 Hz
Vert.	7323.000	AV	33.23	36.67	-34.24	-	2.46	38.12	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	9764.000	AV	32.18	38.10	-31.32	-	2.46	41.42	53.9	12.4	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 20, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 53 % RH	24 deg. C / 61 % RH
Engineer	Yusuke Tanikawara	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	53.85	27.80	-28.21	-	2.46	55.90	73.9	18.0	114	157	-
Hori.	4960.000	PK	48.45	32.23	-35.97	-	2.46	47.17	73.9	26.7	271	62	-
Hori.	7440.000	PK	47.41	36.81	-33.99	-	2.46	52.69	73.9	21.2	150	0	Floor Noise
Hori.	9920.000	PK	45.42	38.04	-31.10	-	2.46	54.82	73.9	19.0	150	0	Floor Noise
Hori.	2483.500	AV	35.66	27.80	-28.21	-	2.46	37.71	53.9	16.1	114	157	VBW : 500 Hz
Hori.	4960.000	AV	34.85	32.23	-35.97	-	2.46	33.57	53.9	20.3	271	62	VBW : 500 Hz
Hori.	7440.000	AV	33.34	36.81	-33.99	-	2.46	38.62	53.9	15.2	150	0	VBW : 500 Hz, Floor Noise
Hori.	9920.000	AV	31.71	38.04	-31.10	-	2.46	41.11	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	2483.500	PK	53.89	27.80	-28.21	-	2.46	55.94	73.9	17.9	249	266	-
Vert.	4960.000	PK	48.52	32.23	-35.97	-	2.46	47.24	73.9	26.6	175	353	-
Vert.	7440.000	PK	47.35	36.81	-33.99	-	2.46	52.63	73.9	21.2	150	0	Floor Noise
Vert.	9920.000	PK	45.63	38.04	-31.10	-	2.46	55.03	73.9	18.8	150	0	Floor Noise
Vert.	2483.500	AV	35.50	27.80	-28.21	-	2.46	37.55	53.9	16.3	249	266	VBW : 500 Hz
Vert.	4960.000	AV	35.87	32.23	-35.97	-	2.46	34.59	53.9	19.3	175	353	VBW : 500 Hz
Vert.	7440.000	AV	33.38	36.81	-33.99	-	2.46	38.66	53.9	15.2	150	0	VBW : 500 Hz, Floor Noise
Vert.	9920.000	AV	31.85	38.04	-31.10	-	2.46	41.25	53.9	12.6	150	0	VBW : 500 Hz, Floor Noise

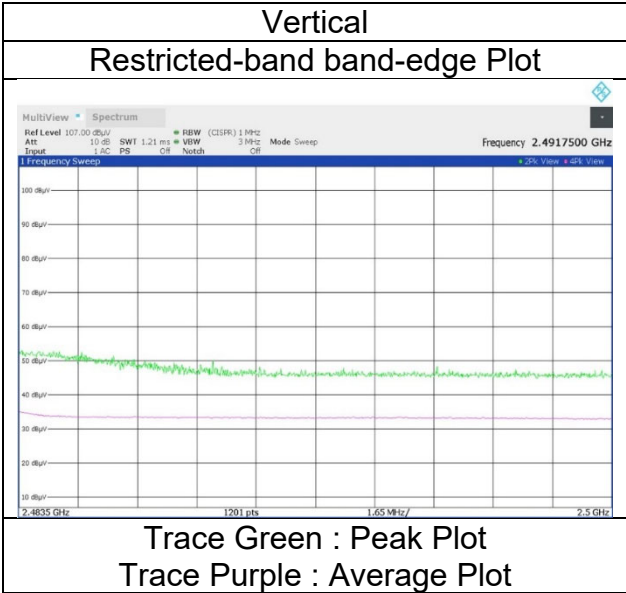
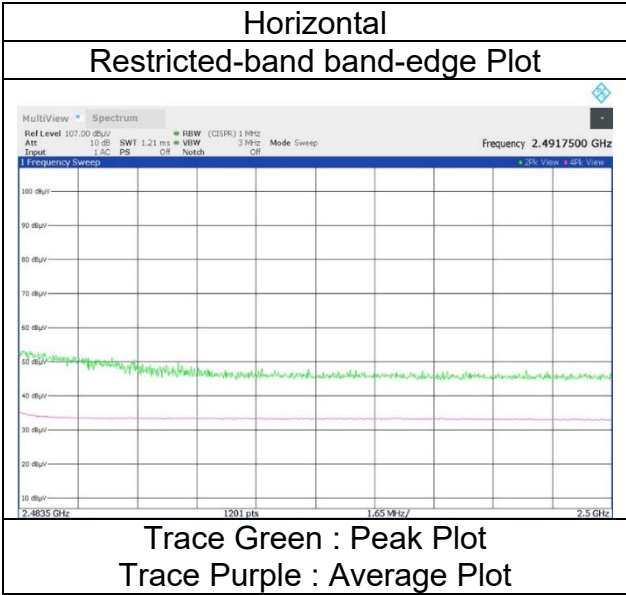
1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz : 20log (3.98 m / 3.0 m) = 2.46 dB

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)

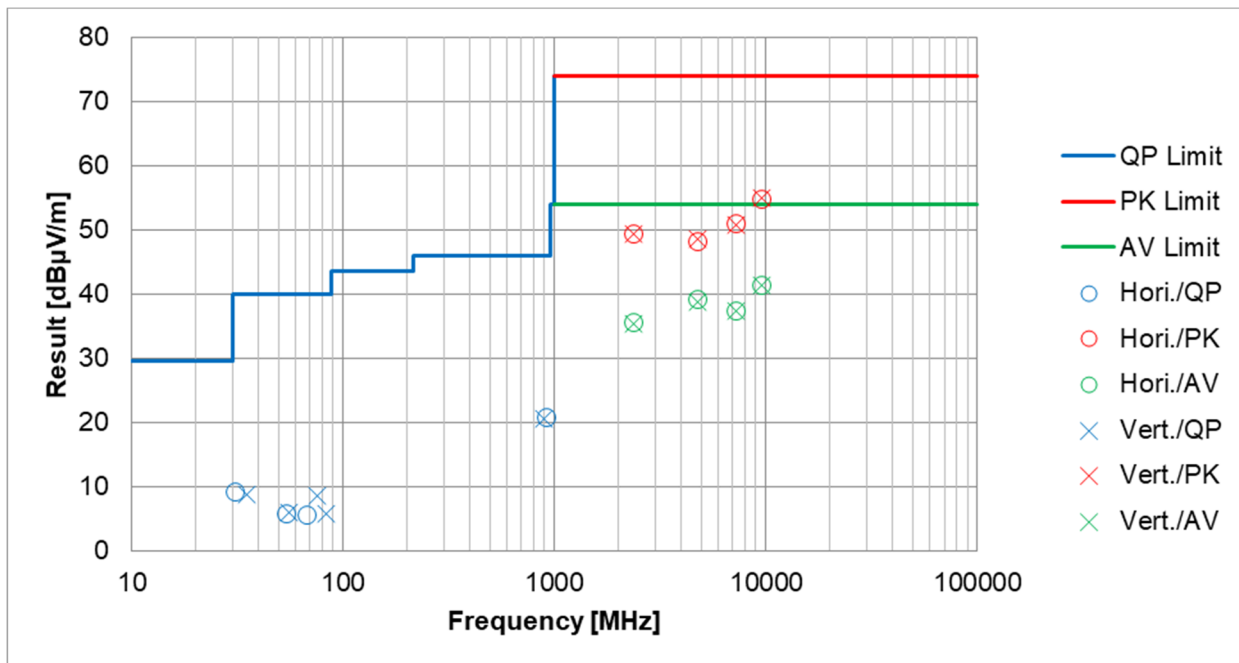
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	June 20, 2024
Temperature / Humidity	24 deg. C / 53 % RH
Engineer	Yusuke Tanikawara
	(1 GHz to 10 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz



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

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

Test place	Shonan EMC Lab.	WAC2	WAC2
Semi Anechoic Chamber	WAC2	WAC2	WAC2
Date	June 24, 2024	June 20, 2024	June 21, 2024
Temperature / Humidity	24 deg. C / 59 % RH	24 deg. C / 53 % RH	24 deg. C / 61 % RH
Engineer	Kouki Yamada	Yusuke Tanikawara	Yusuke Tanikawara
Mode	(Below 1 GHz) Tx, Hopping Off, DH5 2402 MHz	(1 GHz to 10 GHz)	(10 GHz to 26.5 GHz)



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