

RADIO TEST REPORT

Test Report No. 14724442S-A-R1

Customer	Nintendo Co., Ltd.
Description of EUT	Game console
Model Number of EUT	BEE-001
FCC ID	BKEBEE001
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	December 25, 2024
Remarks	Bluetooth (BR / EDR) parts

Representative Test Engineer



Yosuke Murakami
Engineer

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".

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 24.0

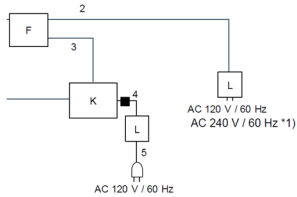
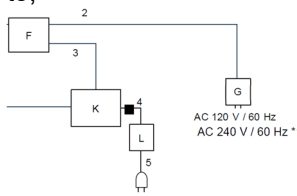
ANNOUNCEMENT

- This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
- The results in this report apply only to the sample tested. (Laboratory was not involved in sampling.)
- This sample tested is in compliance with the limits of the above regulation.
- The test results in this test report are traceable to the national or international standards.
- This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
- This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
- All test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
- The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan, Inc. has been accredited.
- The information provided by the customer for this report is identified in SECTION 1.
- The laboratory is not responsible for information provided by the customer which can impact the validity of the results.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No.: 14724442S-A

This report is a revised version of 14724442S-A. 14724442S-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14724442S-A	December 9, 2024	-
1	14724442S-A-R1	December 25, 2024	Clause 4.2 P.12 Corrected test configuration from;  to;  Clause 4.2 P.13 Corrected note *1) regarding test voltage. APPENDIX 2 Test Instruments P.54, 55 Deleted note *1) regarding calibration date.

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

CONTENTS	PAGE
SECTION 1: Customer Information	5
SECTION 2: Equipment Under Test (EUT).....	5
SECTION 3: Test Specification, Procedures & Results	7
SECTION 4: Operation of EUT during testing	10
SECTION 5: Conducted Emission.....	15
SECTION 6: Radiated Spurious Emission.....	16
SECTION 7: Antenna Terminal Conducted Tests	18
APPENDIX 1: Test data	19
Conducted Emission	19
20 dB Bandwidth, 99 %Occupied Bandwidth and Carrier Frequency Separation	20
Number of Hopping Frequency.....	24
Dwell time	26
Maximum Peak Output Power	29
Radiated Spurious Emission.....	32
Conducted Spurious Emission.....	46
Conducted Emission Band Edge compliance	52
APPENDIX 2: Test Instruments	54
APPENDIX 3: Photographs of test setup.....	56
Conducted Emission	56
Radiated Spurious Emission.....	57
Pre-Check of Worst Case Position	58
Antenna Terminal Conducted Tests	59

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 from 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

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment Under Test (EUT)

2.1 Identification of EUT

Description	Game console
Model Number	BEE-001
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	September 11, 2023 (For Antenna Terminal Conducted Emission) September 19, 2023 (For Radiated Emission and Conducted Emission)
Test Date	September 15, 2023 to May 30, 2024

2.2 Product Description

General Specification

Rating	BEE-001 DC: 5 V to 15 V (*AC Adaptor) Internal battery: 3.78 V *AC Adaptor AC 100 V to 240 V, 50 / 60 Hz AC Adaptor output: 5 V to 20 V
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 (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK) BT LE: GFSK
Antenna Type	LDS Antenna
Antenna Gain ^{a)}	Antenna 0: -2.51 dBi Antenna 1: -1.74 dBi

WLAN (IEEE802.11b/11g/11n-20/11ax-20)

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2472 MHz
Type of Modulation	DSSS, OFDM OFDMA (IEEE802.11ax Only): 26/52/106/242-tone RU
Antenna Type	LDS Antenna
Antenna Gain	Antenna 0: -2.51 dBi Antenna 2: 0.21 dBi

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

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5180 MHz to 5240 MHz 5260 MHz to 5320 MHz 5500 MHz to 5700 MHz 5745 MHz to 5825 MHz
	40 MHz Band	5190 MHz to 5230 MHz 5270 MHz to 5310 MHz 5510 MHz to 5670 MHz 5755 MHz to 5795 MHz
	80 MHz band	5210 MHz 5290 MHz 5530 MHz to 5610 MHz 5775 MHz
Type of Modulation	OFDM	
	OFDMA (IEEE802.11ax only)	20 MHz band: 26/52/106/242-tone RU 40 MHz band: 26/52/106/242/484-tone RU 80 MHz band: 26/52/106/242/484/996-tone RU
Antenna Type	LDS Antenna	
Antenna Gain	Antenna 0	0.70 dBi (WLAN U-NII-1, U-NII-2A, U-NII-2C, U-NII-3 band)
	Antenna 2	4.07 dBi (WLAN U-NII-1, U-NII-2A, U-NII-2C, U-NII-3 band)

LDS: Laser Direct Structuring

* 5600 MHz to 5650 MHz band is not used.

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	15.1 dB, 11.42322 MHz, AV, L1, Tx 3DH5 2402 MHz	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	3.3 dB 250.013 MHz, QP, Hori., Tx 3DH5 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 Module 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	3.0 dB
Radiated Emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.3 dB
	30 MHz to 200 MHz	4.8 dB
	200 MHz to 1 GHz	6.1 dB
	1 GHz to 6 GHz	4.7 dB
	6 GHz to 18 GHz	5.3 dB
	18 GHz to 40 GHz	5.5 dB
Radiated Emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB
	18 GHz to 40 GHz	5.8 dB

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

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.

1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 Japan

Telephone: +81-463-50-6400

A2LA Certificate Number: 1266.03

(FCC test firm registration number: 626366, ISED lab company number: 2973D / CAB identifier: JP0001)

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

3.6 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	Remarks*
Bluetooth (BT)	BR / EDR, Payload: PRBS9
*EUT has the power settings by the software as follows; Power Setting: 5 Software: WlanBtRelayTool Version: 0358079 (Date: 2023.09.19, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

Details of Operating Mode(s)

Test Item	Mode	Hopping	Tested Frequency	Tested Antenna *2)
Conducted Emission	Tx 3DH5 *1)	Off	2402 MHz	Ant 1
Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5 *1)	Off	2402 MHz	Ant 1
	Tx 3DH5 With WLAN Tx 11ax-20 (SDM) 5180 MHz *3)	Off	2402 MHz	Ant 0 * 4)
Radiated Spurious Emission (Above 1 GHz)	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz	Ant 1
	Tx DH5 With WLAN Tx 11ax-20 (SDM) 5180 MHz *3)	Off	2402 MHz 2480 MHz	Ant 0 *4)
Conducted Spurious Emission	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz	Ant 0
Carrier Frequency Separation	Tx DH5 Tx 3DH5	On	2402 MHz 2441 MHz 2480 MHz	Ant 0
20 dB Bandwidth	Tx DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz	Ant 0
Number of Hopping Frequency	Tx DH5 Tx 3DH5	On	-	Ant 0
Dwell time	Tx DH1, DH3, DH5 Tx 3DH1, 3DH3, 3DH5	On	-	Ant 0
Maximum Peak Output Power	Tx DH5 Tx 2DH5 Tx 3DH5	Off	2402 MHz 2441 MHz 2480 MHz	Ant 0, Ant 1
Band Edge Compliance (Conducted)	Tx DH5 Tx 3DH5	On ----- Off	2402 MHz 2480 MHz	Ant 0
99 % Occupied Bandwidth	Tx DH5 Tx 3DH5	On ----- Off	2402 MHz 2441 MHz 2480 MHz	Ant 0

*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.

*2) The test was performed with the antenna that had higher conducted power as a representative (Carrier Frequency Separation test, 20 dB Bandwidth test, Number of Hopping Frequency test, Dwell time test, Band Edge Compliance (Conducted) test and 99 % Occupied Bandwidth test). For Conducted Emission and Radiated Spurious Emission, the test was performed with the worst antenna as a representative by the results of the pre-check.

*3) Simultaneous transmission was tested on the channel that was the worst for single transmission.

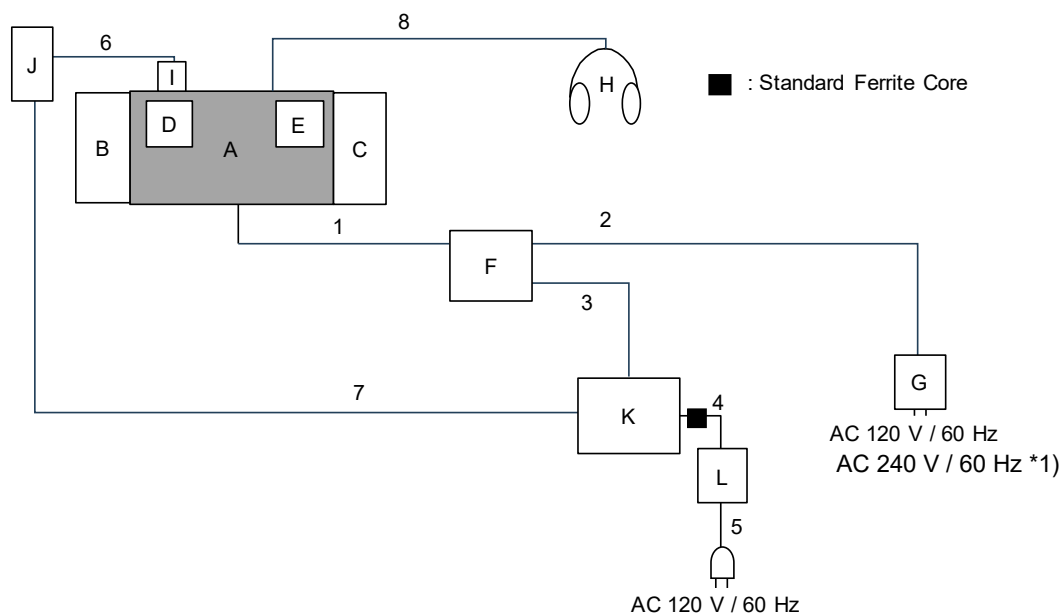
*4) Simultaneous transmission is only available on Ant 0, so testing was performed on Ant 0.

* Ant 0: Antenna 0, Ant 1: Antenna 1, Ant 2: Antenna 2

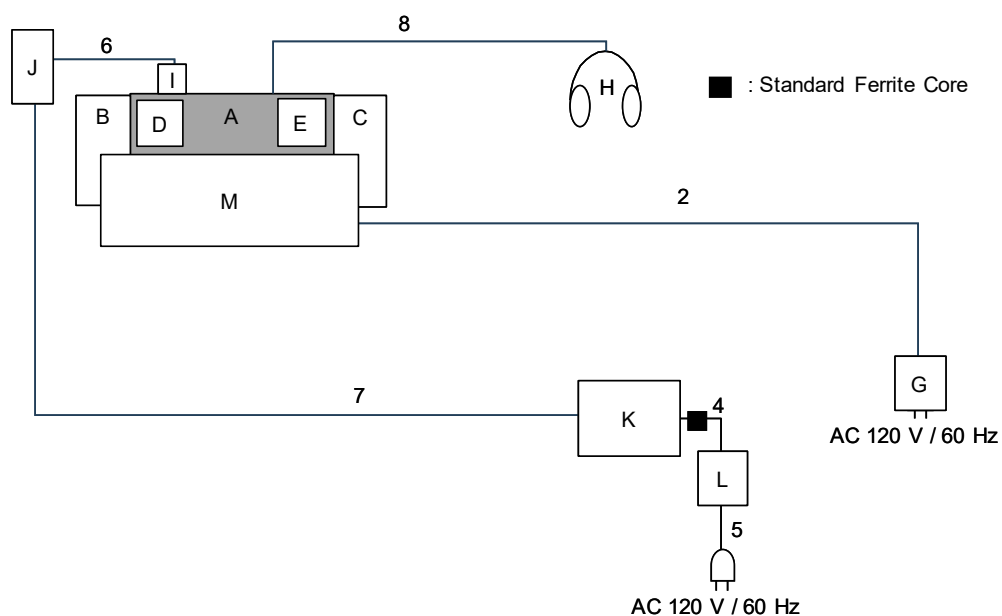
4.2 Configuration and Peripherals

Radiated emission test and Conducted emission test

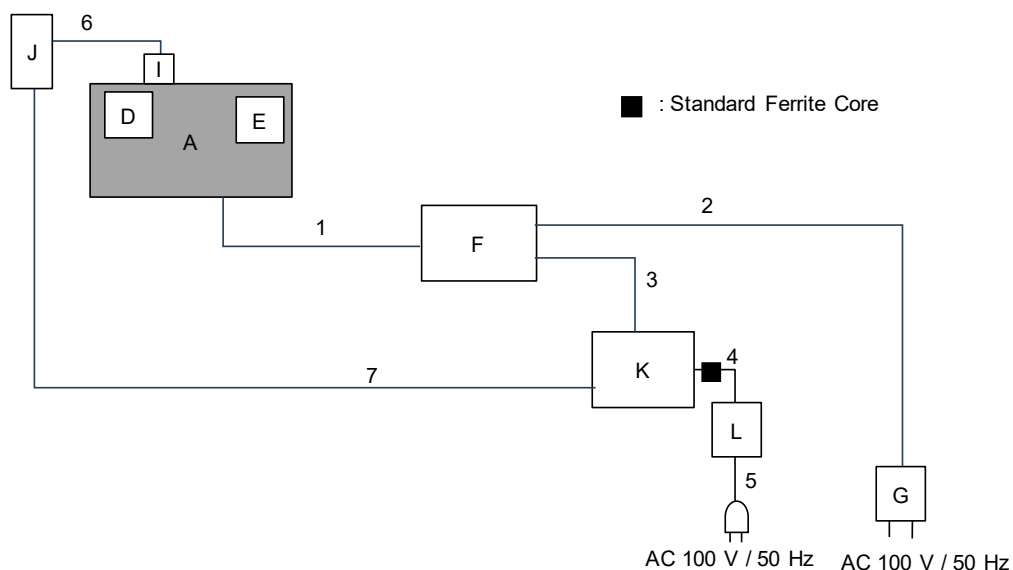
Without Dock



With Dock



Antenna terminal conducted test



- * Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
- * The carrier level and noise levels were confirmed with and without the controller (B and C) and Dock (M), and the test was made at the condition that has the maximum noise. (Only Radiated emission test)
- * The EUT is equipped with two rechargeable USB ports (top and bottom side), a pre-check was performed on the worst port (bottom side) for conducted emissions.
- *1) As a result of comparing AC 120 V and AC 240 V at pre-check, conducted emission test was performed with AC 240 V of the worst voltage as representative.

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	Game console	BEE-001	HAW01000023266 *1) HAW01000021934 *2)	Nintendo Co., Ltd.	EUT
B	Joy-Con (L)	BEE-012	HBL01000022108	Nintendo Co., Ltd.	-
C	Joy-Con (R)	BEE-014	HCL01000022467	Nintendo Co., Ltd.	-
D	Game Card	HAC-008	DFCAA22L000	Nintendo Co., Ltd.	-
E	Micro SD Card	-	S944	Sandisk	-
F	Relay Box	BEE-053	HYL01100004738	Nintendo Co., Ltd.	-
G	AC Adapter	NGN-01	0A0003529 *1) 0A0000165 *2)	Nintendo Co., Ltd.	-
H	Earphones	MDR-EX255AP	-	Sony	-
I	USB TypeA - Type C Adapter	-	-	-	-
J	Wired LAN Adapter	EDC-GUA3-B	16L167005977A	ELECOM	-
K	Laptop PC	CF-SV9RDQVS	0JKSC39510	Panasonic	-
L	AC Adapter	CF-AA65D2A M1	65D2AM1208002424WA	Panasonic	-
M	Dock	BEE-005	HFL0100036471	Nintendo Co., Ltd.	-

*1) Used for Antenna Terminal conducted test

*2) Used for Conducted Emission test and Radiated Emission test

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	USB	1.5	Shielded	Shielded	-
2	USB	1.5	Shielded	Shielded	-
3	USB	1.5	Shielded	Shielded	-
4	DC	0.9	Unshielded	Unshielded	-
5	AC	0.8	Unshielded	Unshielded	-
6	USB	0.1	Shielded	Shielded	-
7	LAN	1.0	Unshielded	Unshielded	Cat.6
8	Earphones	1.25	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and Conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN).

For the tests on EUT with other peripherals (as a whole system)

I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50 ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded room.

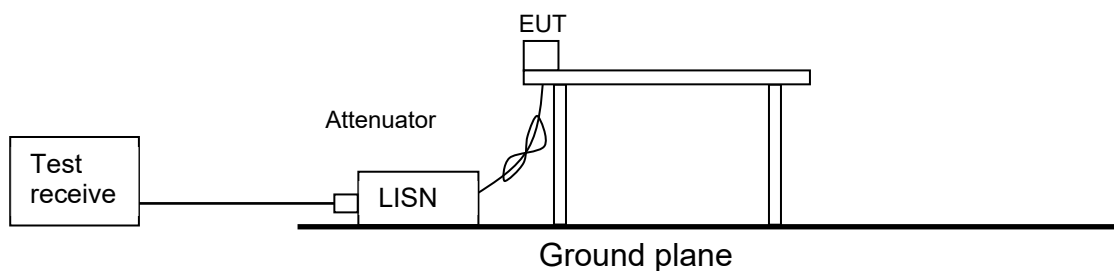
The EUT was connected to a LISN (AMN).

An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, 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

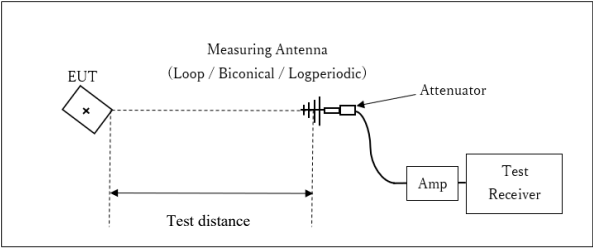
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired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

Figure 2: Test Setup

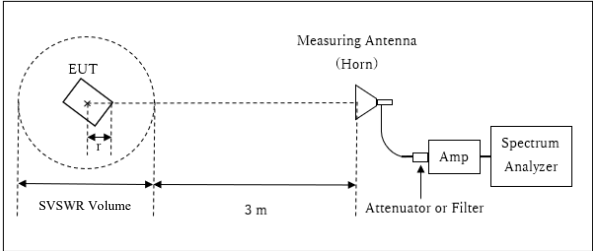
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz

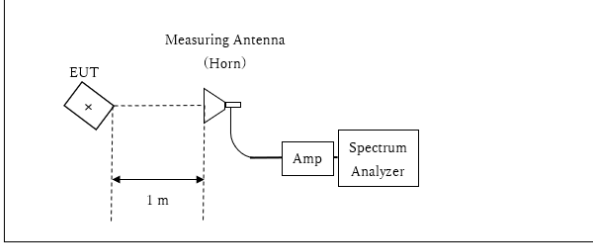


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: $20 \times \log (3.94 \text{ m} / 3.0 \text{ m}) = 2.37 \text{ dB}$
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.94 \text{ m}$

SVSWR Volume : 2.0 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.06 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, and with and without the controller, to see the position of maximum noise, and the test was made at the position that has the maximum noise.

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz - 2.8 GHz)	Spurious (2.8 GHz - 10 GHz)	Spurious (10 GHz - 18 GHz)	Spurious (18 GHz - 26.5 GHz)
Horizontal	Z Without controller	Y With controller	Z Without controller	Z With controller	X With controller	X With controller
Vertical	X Without controller	Z With controller	X Without controller	Y With controller	X With controller	X With controller

*All conditions were performed without dock.

The test results and limit are rounded off to one decimal place, 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, 13 MHz	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

*1) 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.

The test results and limit are rounded off to two decimals place, 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

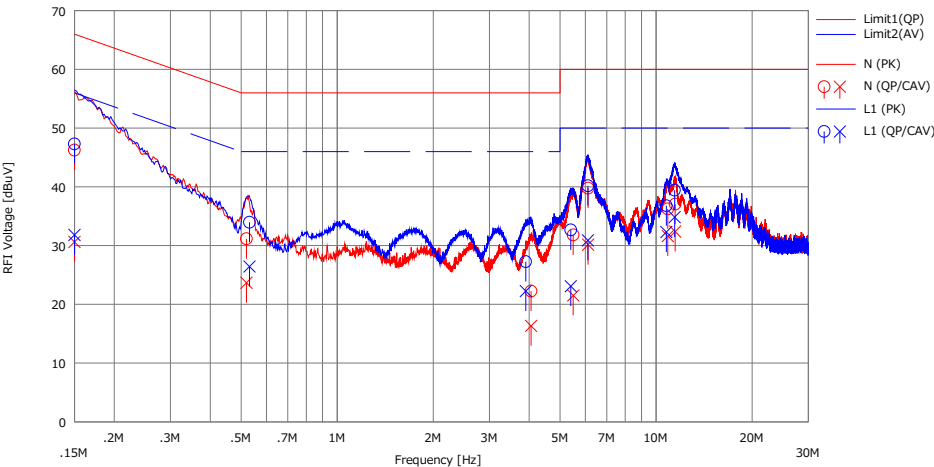
UL Japan, Inc. Shonan EMC Lab. No.2 Shielded Room
Date : 2024/05/18

Mode : Tx, 3DH5, 2402 MHz
Power : AC 240 V / 60 Hz
Temp./Humi. : 24 deg.C / 30 %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	33.70	18.06	12.56	46.25	30.61	66.00	56.00	19.7	25.3	N	
2	0.51916	18.54	11.05	12.62	31.16	23.67	56.00	46.00	24.8	22.3	N	
3	4.05405	9.29	3.35	12.97	22.26	16.32	56.00	46.00	33.7	29.6	N	
4	5.49704	18.69	8.37	13.13	31.82	21.50	60.00	50.00	28.1	28.5	N	
5	6.11710	26.58	16.96	13.19	39.77	30.15	60.00	50.00	20.2	19.8	N	
6	10.87845	22.58	17.96	13.65	36.23	31.61	60.00	50.00	23.7	18.3	N	
7	11.47408	23.36	18.70	13.70	37.06	32.40	60.00	50.00	22.9	17.6	N	
8	0.15000	34.73	19.24	12.57	47.30	31.81	66.00	56.00	18.7	24.1	L1	
9	0.53097	21.36	13.83	12.61	33.97	26.44	56.00	46.00	22.0	19.5	L1	
10	3.90128	14.34	9.32	12.93	27.27	22.25	56.00	46.00	28.7	23.7	L1	
11	5.40031	19.60	10.01	13.07	32.67	23.08	60.00	50.00	27.3	26.9	L1	
12	6.11595	27.06	17.76	13.12	40.18	30.88	60.00	50.00	19.8	19.1	L1	
13	10.76558	23.31	18.83	13.47	36.78	32.30	60.00	50.00	23.2	17.7	L1	
14	11.42764	25.92	21.33	13.52	39.44	34.85	60.00	50.00	20.5	15.1	L1	

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

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

Test place	Shonan EMC Lab. No.1 Measurement Room
Date	September 22, 2023
Temperature / Humidity	26 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx, Hopping Off, Tx, Hopping On

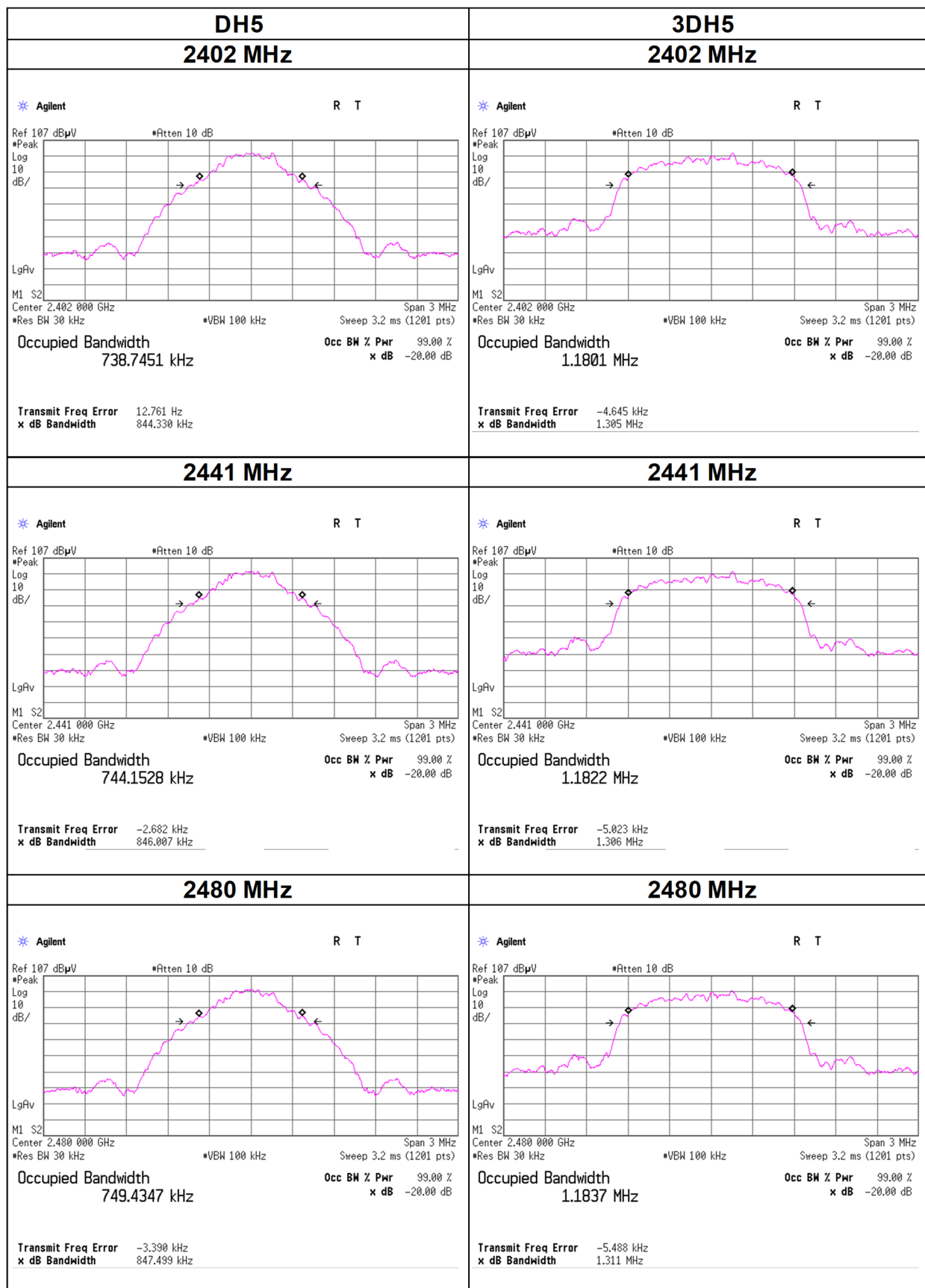
Antenna : Ant 0

Mode	Freq. [MHz]	20 dB Bandwidth [MHz]	99 % Occupied Bandwidth [kHz]	Carrier Frequency Separation [MHz]	Limit for Carrier Frequency separation [MHz]
DH5	2402.0	0.844	738.7	1.000	>= 0.563
DH5	2441.0	0.846	744.2	1.000	>= 0.564
DH5	2480.0	0.847	749.4	1.000	>= 0.565
DH5	Hopping On	-	78649.2	-	-
3DH5	2402.0	1.305	1180.1	1.000	>= 0.870
3DH5	2441.0	1.306	1182.2	1.000	>= 0.871
3DH5	2480.0	1.311	1183.7	1.000	>= 0.874
3DH5	Hopping On	-	78735.0	-	-

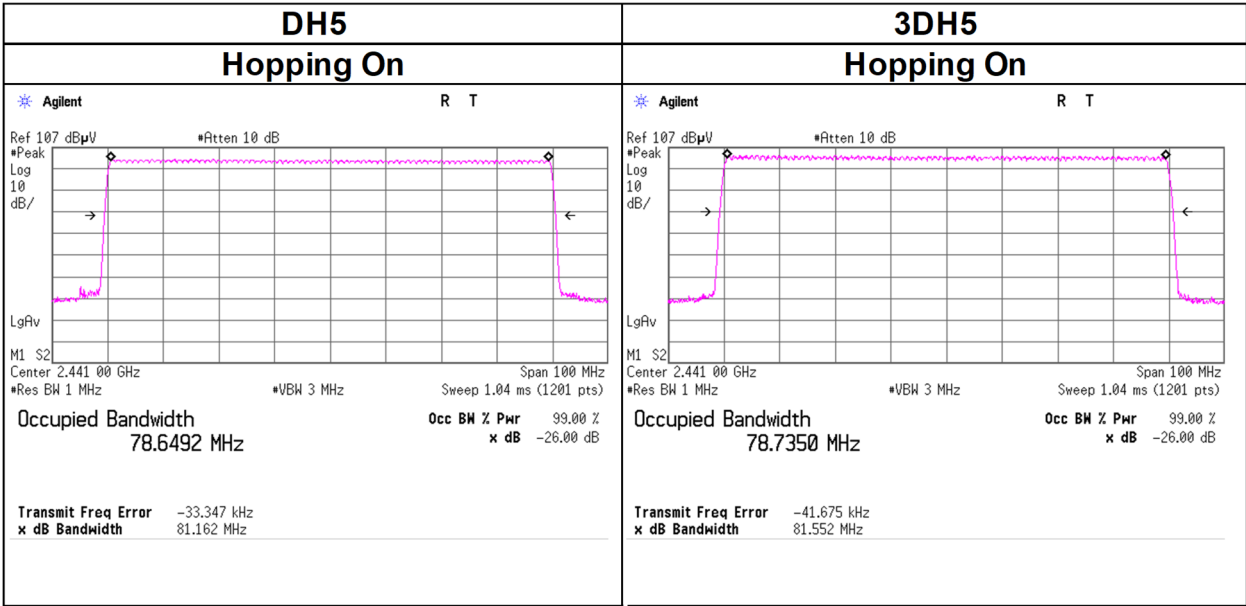
Limit: Two-thirds of 20 dB Bandwidth or 25 kHz (whichever is greater).

No limit applies to 20 dB Bandwidth.

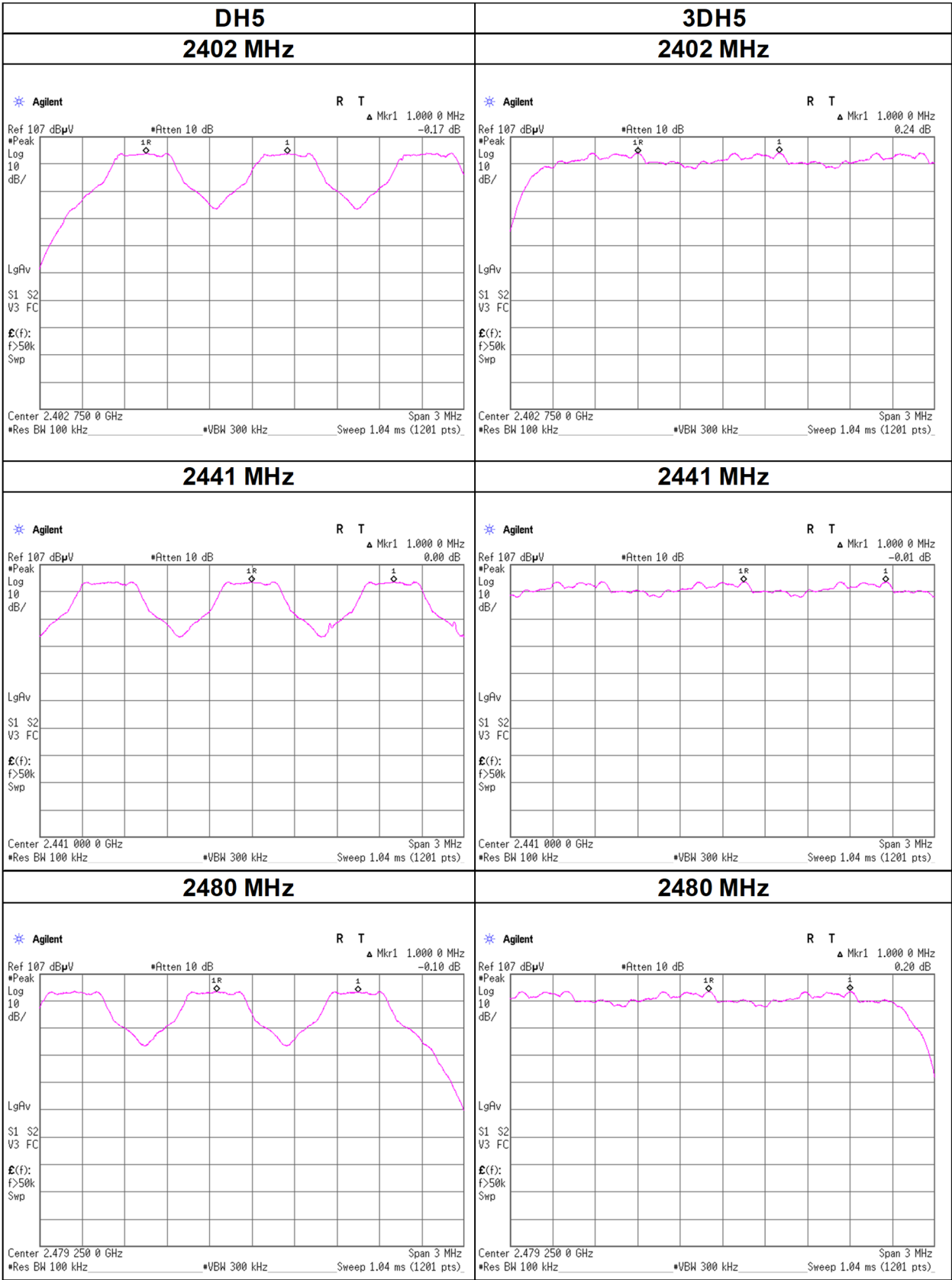
20 dB Bandwidth and 99 % Occupied Bandwidth



20 dB Bandwidth and 99 % Occupied Bandwidth



Carrier Frequency Separation



Number of Hopping Frequency

Test place Shonan EMC Lab. No.1 Measurement Room
Date September 22, 2023
Temperature / Humidity 25 deg. C / 51 % RH
Engineer Yosuke Murakami
Mode Tx, Hopping On

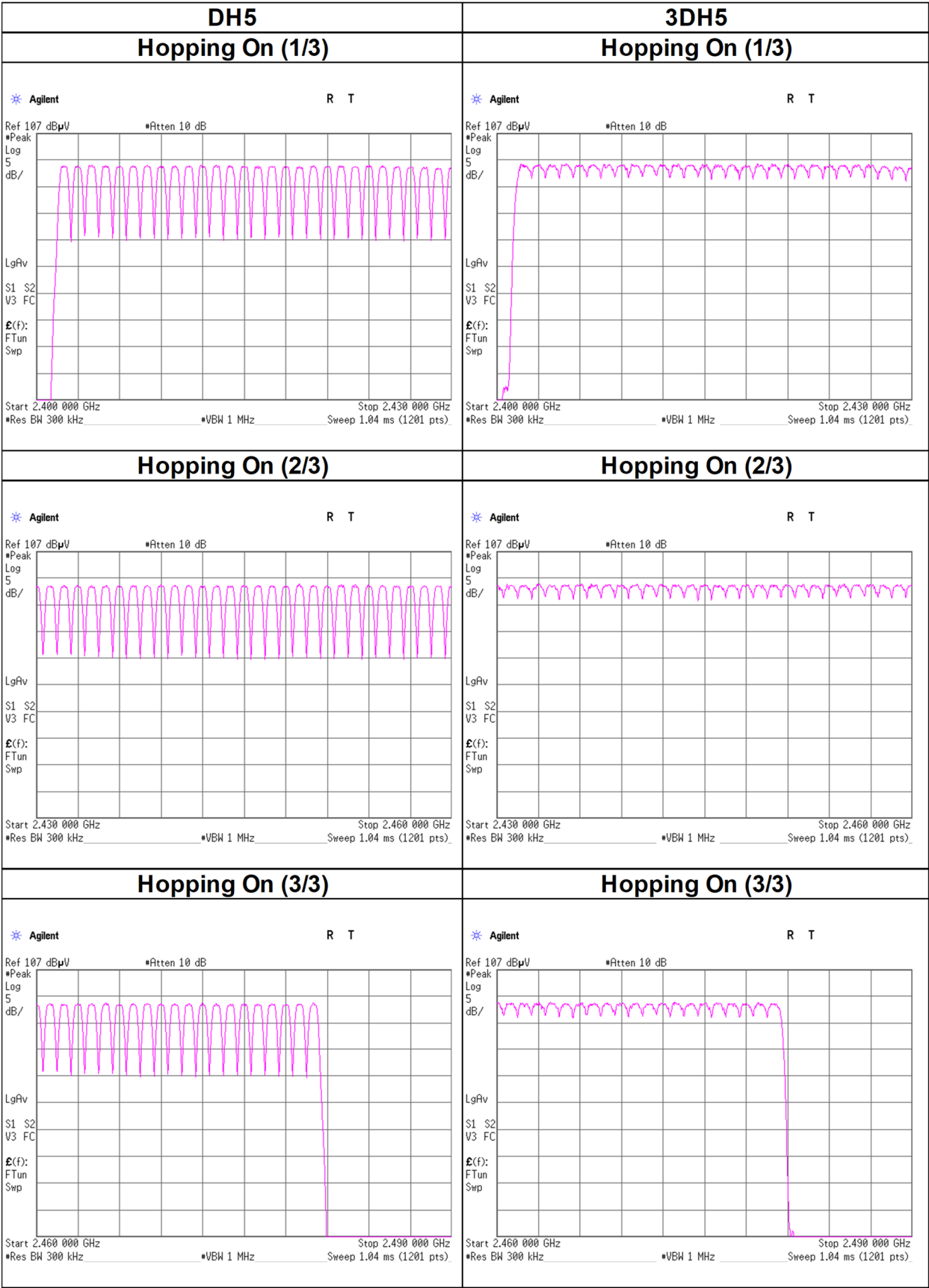
Antenna : Ant 0

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.

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 September 22, 2023
Temperature / Humidity 25 deg. C / 51 % RH
Engineer Yosuke Murakami
Mode Tx, Hopping On

Antenna : Ant 0

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	0.389	126	400
DH3	27.0 times / 5 s x 31.6 s = 171 times	1.654	283	400
DH5	21.2 times / 5 s x 31.6 s = 134 times	2.903	389	400
3DH1	50.6 times / 5 s x 31.6 s = 320 times	0.397	127	400
3DH3	28.4 times / 5 s x 31.6 s = 180 times	1.657	298	400
3DH5	21.6 times / 5 s x 31.6 s = 137 times	2.903	398	400

Sample Calculation

Result = Number of transmission x Length of transmission

*Average data of 5 tests.

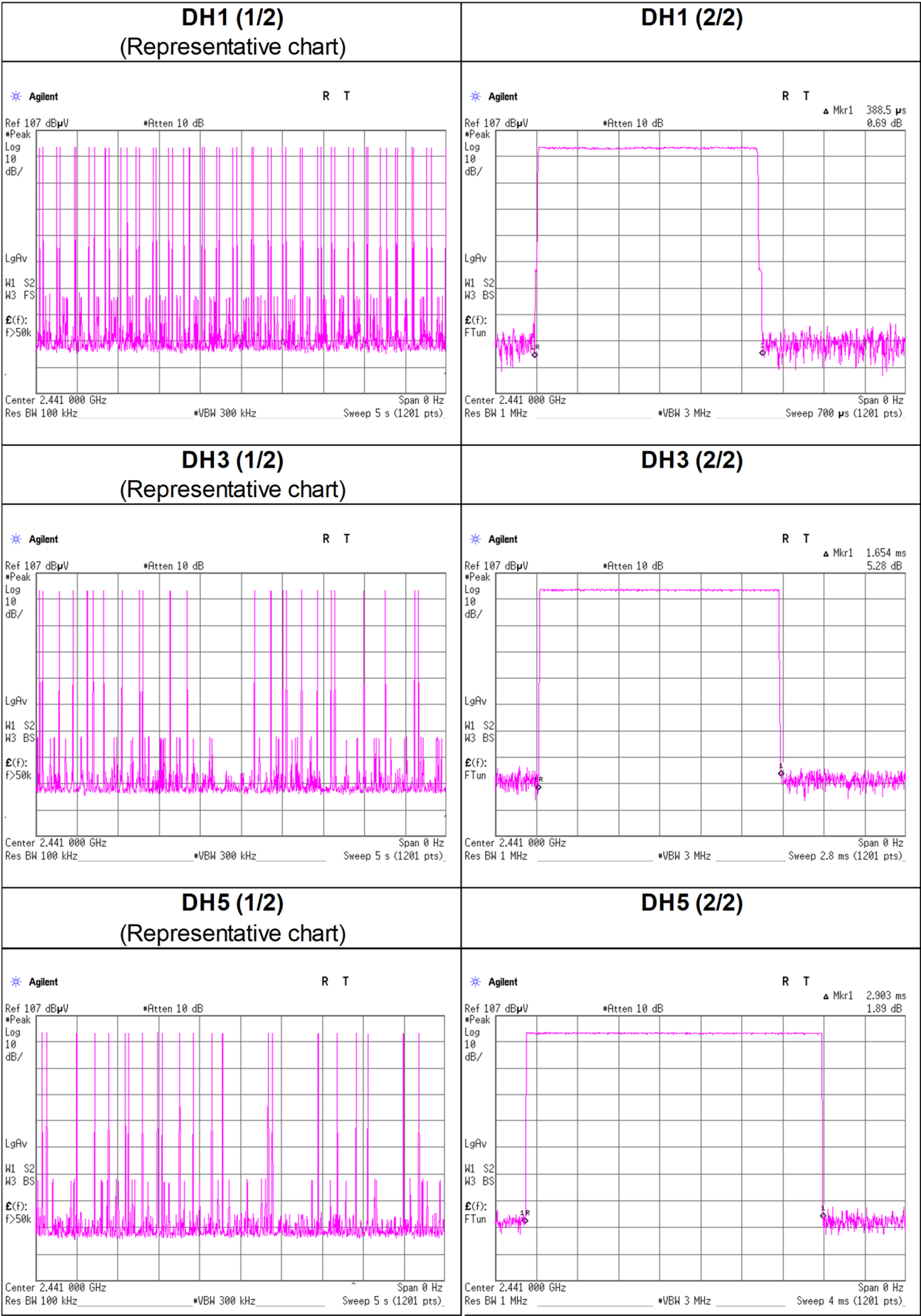
Mode	Sampling [times]					Average [times]
	1	2	3	4	5	
DH1	51	52	51	51	51	51.2
DH3	24	32	27	26	26	27
DH5	20	22	21	22	21	21.2
3DH1	48	52	50	51	52	50.6
3DH3	26	28	33	28	27	28.4
3DH5	22	23	21	22	20	21.6

Sample Calculation

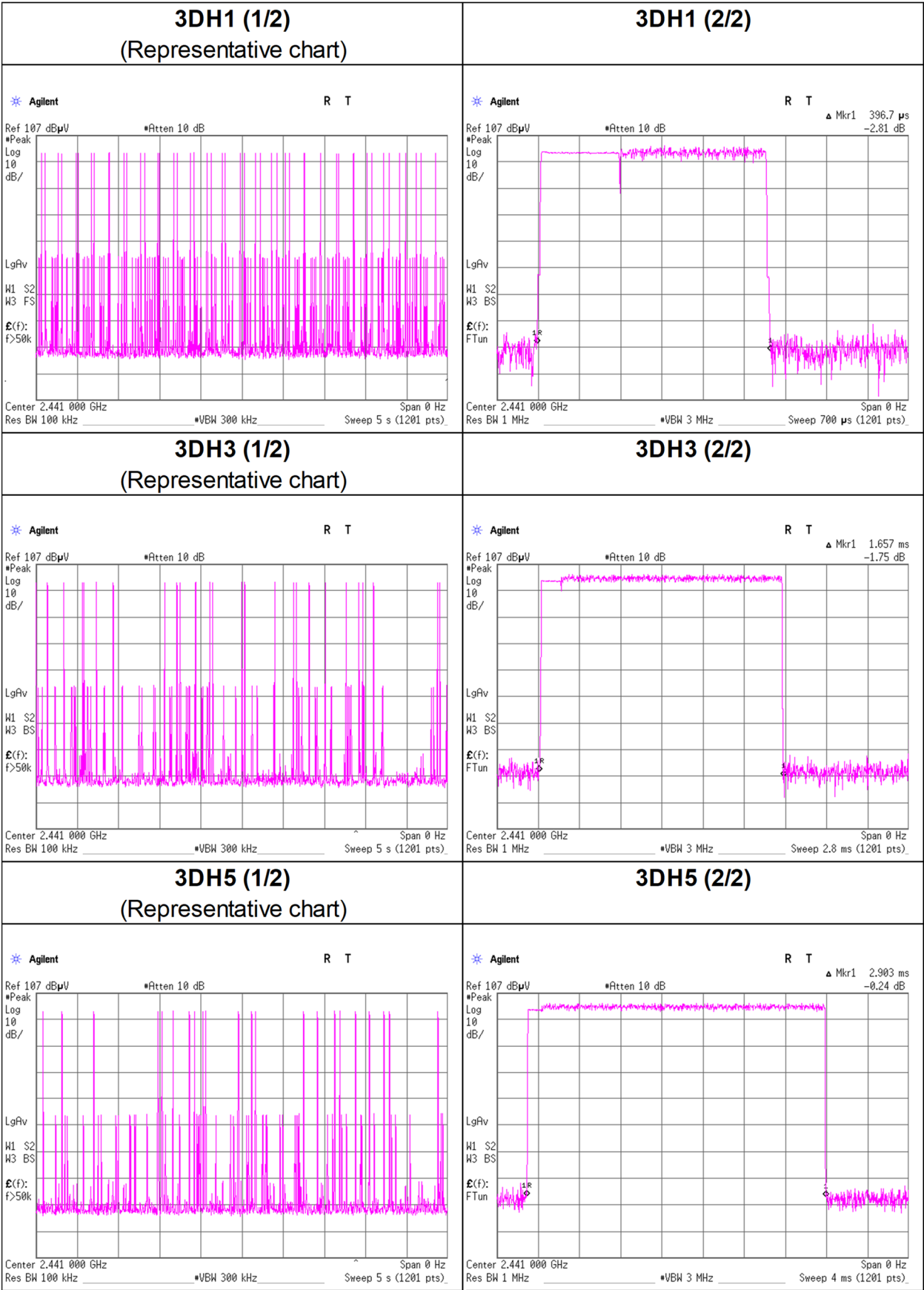
Average = Summation (Sampling 1 to 5) / 5

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 September 15, 2023
Temperature / Humidity 25 deg. C / 42 % RH
Engineer Yosuke Murakami
Mode Tx, Hopping Off

Antenna : Ant 0

Maximum peak output power

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	-5.58	1.64	9.98	6.04	4.02	20.97	125	14.93	-2.51	3.53	2.25	36.02	4000	32.49
DH5	2441	-5.81	1.65	9.98	5.82	3.82	20.97	125	15.15	-2.51	3.31	2.14	36.02	4000	32.71
DH5	2480	-6.00	1.65	9.98	5.63	3.66	20.97	125	15.34	-2.51	3.12	2.05	36.02	4000	32.90
2DH5	2402	-3.25	1.64	9.98	8.37	6.87	20.97	125	12.60	-2.51	5.86	3.85	36.02	4000	30.16
2DH5	2441	-3.52	1.65	9.98	8.11	6.47	20.97	125	12.86	-2.51	5.60	3.63	36.02	4000	30.42
2DH5	2480	-3.72	1.65	9.98	7.91	6.18	20.97	125	13.06	-2.51	5.40	3.47	36.02	4000	30.62
3DH5	2402	-2.83	1.64	9.98	8.79	7.57	20.97	125	12.18	-2.51	6.28	4.25	36.02	4000	29.74
3DH5	2441	-3.09	1.65	9.98	8.54	7.14	20.97	125	12.43	-2.51	6.03	4.01	36.02	4000	29.99
3DH5	2480	-3.33	1.65	9.98	8.30	6.76	20.97	125	12.67	-2.51	5.79	3.79	36.02	4000	30.23

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

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

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.

Maximum Peak Output Power

Test place Shonan EMC Lab.
No.1 Measurement Room
Date September 15, 2023
Temperature / Humidity 25 deg. C / 42 % RH
Engineer Yosuke Murakami
Mode Tx, Hopping Off

Antenna : Ant 1

Maximum peak output power

Maximum Peak Output Power					Conducted Power					e.i.r.p. for RSS-247					
Mode	Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
					[dBm]	[mW]	[dBm]	[mW]			[dBm]	[mW]	[dBm]	[mW]	
DH5	2402	-6.10	1.64	9.98	5.52	3.56	20.97	125	15.45	-1.74	3.78	2.39	36.02	4000	32.24
DH5	2441	-6.14	1.65	9.98	5.49	3.54	20.97	125	15.48	-1.74	3.75	2.37	36.02	4000	32.27
DH5	2480	-6.33	1.65	9.98	5.30	3.39	20.97	125	15.67	-1.74	3.56	2.27	36.02	4000	32.46
2DH5	2402	-3.73	1.64	9.98	7.89	6.15	20.97	125	13.08	-1.74	6.15	4.12	36.02	4000	29.87
2DH5	2441	-3.77	1.65	9.98	7.86	6.11	20.97	125	13.11	-1.74	6.12	4.09	36.02	4000	29.90
2DH5	2480	-3.96	1.65	9.98	7.67	5.85	20.97	125	13.30	-1.74	5.93	3.92	36.02	4000	30.09
3DH5	2402	-3.27	1.64	9.98	8.35	6.84	20.97	125	12.62	-1.74	6.61	4.58	36.02	4000	29.41
3DH5	2441	-3.30	1.65	9.98	8.33	6.81	20.97	125	12.64	-1.74	6.59	4.56	36.02	4000	29.43
3DH5	2480	-3.53	1.65	9.98	8.10	6.46	20.97	125	12.87	-1.74	6.36	4.33	36.02	4000	29.66

Sample Calculation:

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

e.i.r.p. Result = Conducted Power Result + Antenna Gain

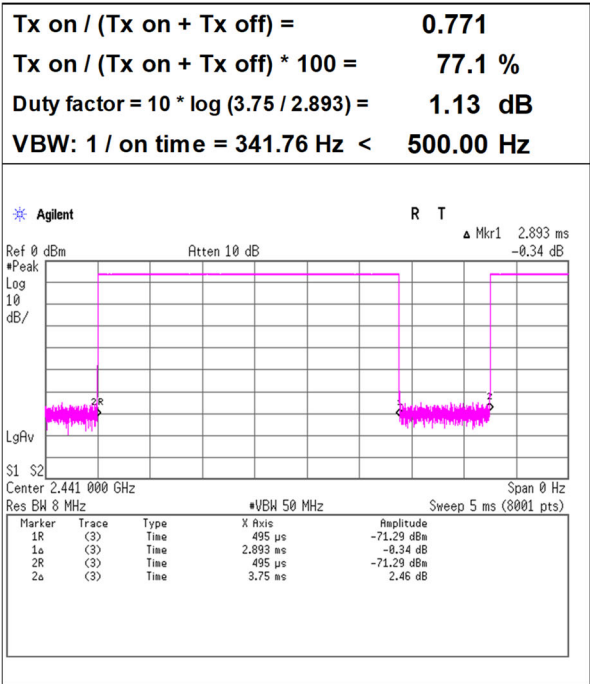
*The equipment and cables were not used for factor 0 dB of the data sheets.

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.

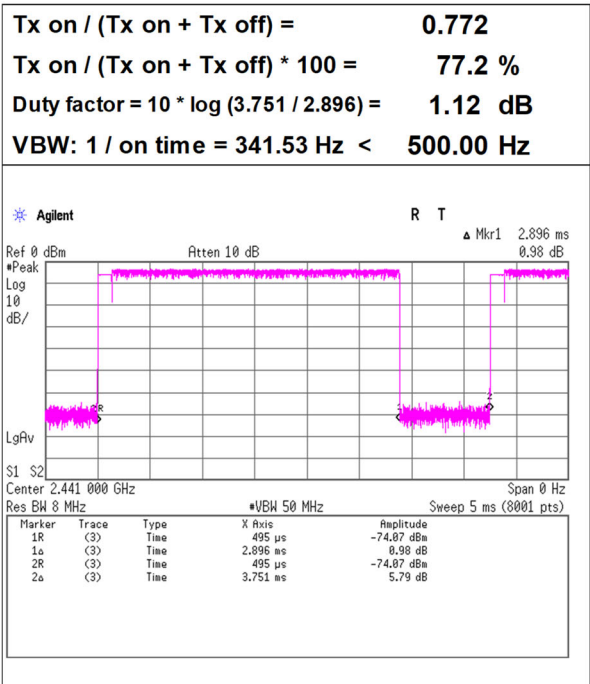
Burst rate confirmation

Test place Shonan EMC Lab.
 No.5 Shielded Room
Date September 16, 2023
Temperature / Humidity 24 deg. C / 40 % RH
Engineer Yosuke Murakami
Mode Tx, Hopping Off, Ant 0

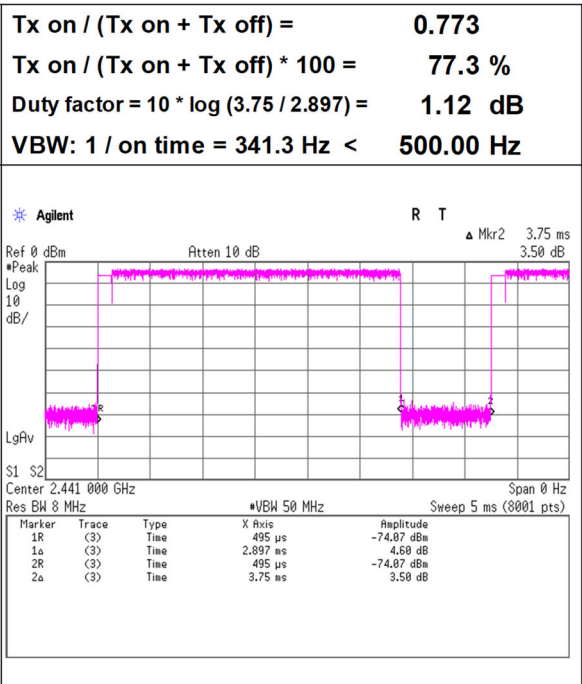
DH5



2DH5



3DH5



Radiated Spurious Emission

Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	WAC2	WAC2	WAC2	WAC2
Date	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz, Ant 1			

(* 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	45.96	27.62	-24.00	-	2.37	51.95	73.9	21.9	154	256	-
Hori.	4804.000	PK	43.99	31.57	-31.48	-	2.37	46.45	73.9	27.4	209	165	-
Hori.	7206.000	PK	44.36	36.04	-30.83	-	2.37	51.94	73.9	21.9	150	0	Floor Noise
Hori.	8407.000	PK	44.21	36.86	-30.39	-	2.37	53.05	73.9	20.8	100	182	-
Hori.	9608.000	PK	45.21	37.74	-30.16	-	2.37	55.16	73.9	18.7	150	0	Floor Noise
Hori.	2390.000	AV	32.09	27.62	-24.00	-	2.37	38.08	53.9	15.8	154	256	VBW : 500 Hz
Hori.	4804.000	AV	30.64	31.57	-31.48	-	2.37	33.10	53.9	20.8	209	165	VBW : 500 Hz
Hori.	7206.000	AV	30.26	36.04	-30.83	-	2.37	37.84	53.9	16.0	150	0	VBW : 500 Hz, Floor Noise
Hori.	8407.000	AV	30.97	36.86	-30.39	-	2.37	39.81	53.9	14.0	100	182	VBW : 500 Hz
Hori.	9608.000	AV	31.41	37.74	-30.16	-	2.37	41.36	53.9	12.5	150	0	VBW : 500 Hz, Floor Noise
Vert.	2390.000	PK	45.66	27.62	-24.00	-	2.37	51.65	73.9	22.2	100	254	-
Vert.	4804.000	PK	44.02	31.57	-31.48	-	2.37	46.48	73.9	27.4	154	106	-
Vert.	7206.000	PK	44.25	36.04	-30.83	-	2.37	51.83	73.9	22.0	150	0	Floor Noise
Vert.	8407.000	PK	44.28	36.86	-30.39	-	2.37	53.12	73.9	20.7	247	80	-
Vert.	9608.000	PK	45.03	37.74	-30.16	-	2.37	54.98	73.9	18.9	150	0	Floor Noise
Vert.	2390.000	AV	31.73	27.62	-24.00	-	2.37	37.72	53.9	16.1	100	254	VBW : 500 Hz
Vert.	4804.000	AV	30.58	31.57	-31.48	-	2.37	33.04	53.9	20.8	154	106	VBW : 500 Hz
Vert.	7206.000	AV	30.23	36.04	-30.83	-	2.37	37.81	53.9	16.0	150	0	VBW : 500 Hz, Floor Noise
Vert.	8407.000	AV	31.01	36.86	-30.39	-	2.37	39.85	53.9	14.0	247	80	VBW : 500 Hz
Vert.	9608.000	AV	31.30	37.74	-30.16	-	2.37	41.25	53.9	12.6	150	0	VBW : 500 Hz, Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 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	88.93	27.63	-24.00	-	2.37	94.93	-	-	- Carrier
Hori.	2400.000	PK	37.06	27.63	-24.00	-	2.37	43.06	74.9	31.8	-
Vert.	2402.000	PK	89.85	27.63	-24.00	-	2.37	95.85	-	-	- Carrier
Vert.	2400.000	PK	37.26	27.63	-24.00	-	2.37	43.26	75.8	32.5	-

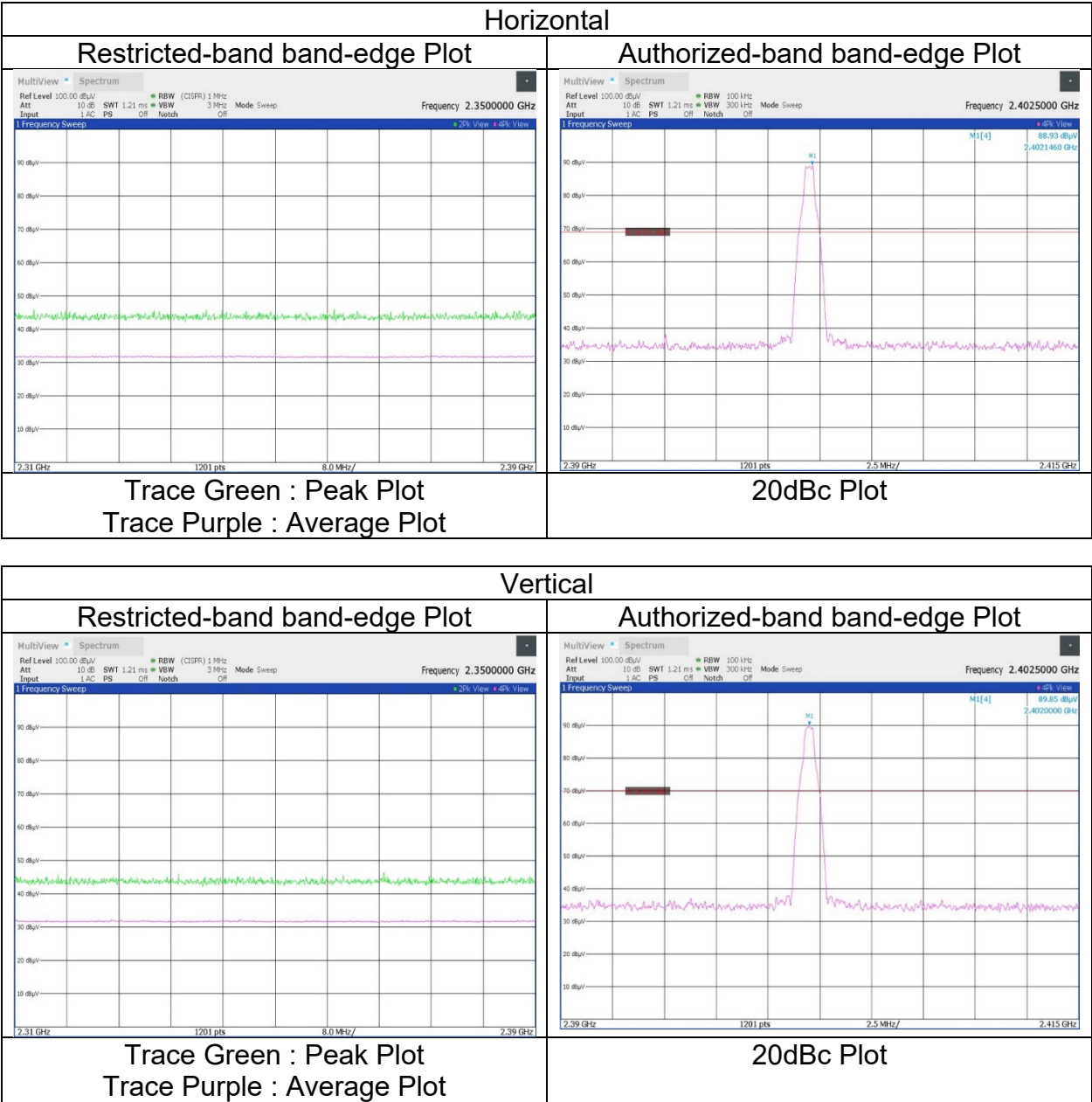
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 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	September 28, 2023
Temperature / Humidity	25 deg.C, 54 %RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz, Ant 1



* 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	WAC2	WAC2
Date	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2441 MHz, Ant 1			

(* 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	44.04	31.88	-31.42	-	2.37	46.87	73.9	27.0	222	201	-
Hori.	7323.000	PK	44.21	36.31	-30.79	-	2.37	52.10	73.9	21.8	150	0	Floor Noise
Hori.	8543.500	PK	44.62	37.02	-30.33	-	2.37	53.68	73.9	20.2	114	194	-
Hori.	9764.000	PK	45.00	37.71	-30.02	-	2.37	55.06	73.9	18.8	150	0	Floor Noise
Hori.	4882.000	AV	30.83	31.88	-31.42	-	2.37	33.66	53.9	20.2	222	201	VBW : 500 Hz
Hori.	7323.000	AV	30.30	36.31	-30.79	-	2.37	38.19	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Hori.	8543.500	AV	31.55	37.02	-30.33	-	2.37	40.61	53.9	13.2	114	194	VBW : 500 Hz
Hori.	9764.000	AV	31.29	37.71	-30.02	-	2.37	41.35	53.9	12.5	150	0	VBW : 500 Hz, Floor Noise
Vert.	4882.000	PK	44.11	31.88	-31.42	-	2.37	46.94	73.9	26.9	153	101	-
Vert.	7323.000	PK	44.00	36.31	-30.79	-	2.37	51.89	73.9	22.0	150	0	Floor Noise
Vert.	8543.500	PK	44.42	37.02	-30.33	-	2.37	53.48	73.9	20.4	257	73	-
Vert.	9764.000	PK	44.74	37.71	-30.02	-	2.37	54.80	73.9	19.1	150	0	Floor Noise
Vert.	4882.000	AV	30.79	31.88	-31.42	-	2.37	33.62	53.9	20.2	153	101	VBW : 500 Hz
Vert.	7323.000	AV	30.29	36.31	-30.79	-	2.37	38.18	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	8543.500	AV	31.61	37.02	-30.33	-	2.37	40.67	53.9	13.2	257	73	VBW : 500 Hz
Vert.	9764.000	AV	31.13	37.71	-30.02	-	2.37	41.19	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 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	WAC2	WAC2
Date	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz, Ant 1			

(* 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	45.80	27.64	-23.93	-	2.37	51.88	73.9	22.0	151	250	-
Hori.	4960.000	PK	44.76	32.11	-31.36	-	2.37	47.88	73.9	26.0	206	179	-
Hori.	7440.000	PK	44.02	36.46	-30.75	-	2.37	52.10	73.9	21.8	150	0	Floor Noise
Hori.	8680.000	PK	45.31	37.10	-30.31	-	2.37	54.47	73.9	19.4	100	195	-
Hori.	9920.000	PK	44.93	37.72	-29.90	-	2.37	55.12	73.9	18.7	150	0	Floor Noise
Hori.	2483.500	AV	31.69	27.64	-23.93	-	2.37	37.77	53.9	16.1	151	250	VBW : 500 Hz
Hori.	4960.000	AV	32.45	32.11	-31.36	-	2.37	35.57	53.9	18.3	206	179	VBW : 500 Hz
Hori.	7440.000	AV	30.42	36.46	-30.75	-	2.37	38.50	53.9	15.4	150	0	VBW : 500 Hz, Floor Noise
Hori.	8680.000	AV	32.49	37.10	-30.31	-	2.37	41.65	53.9	12.2	100	195	VBW : 500 Hz
Hori.	9920.000	AV	31.53	37.72	-29.90	-	2.37	41.72	53.9	12.1	150	0	VBW : 500 Hz, Floor Noise
Vert.	2483.500	PK	45.62	27.64	-23.93	-	2.37	51.70	73.9	22.2	153	277	-
Vert.	4960.000	PK	44.99	32.11	-31.36	-	2.37	48.11	73.9	25.7	156	109	-
Vert.	7440.000	PK	43.94	36.46	-30.75	-	2.37	52.02	73.9	21.8	150	0	Floor Noise
Vert.	8680.000	PK	45.32	37.10	-30.31	-	2.37	54.48	73.9	19.4	244	83	-
Vert.	9920.000	PK	44.98	37.72	-29.90	-	2.37	55.17	73.9	18.7	150	0	Floor Noise
Vert.	2483.500	AV	31.67	27.64	-23.93	-	2.37	37.75	53.9	16.1	153	277	VBW : 500 Hz
Vert.	4960.000	AV	32.79	32.11	-31.36	-	2.37	35.91	53.9	17.9	156	109	VBW : 500 Hz
Vert.	7440.000	AV	30.40	36.46	-30.75	-	2.37	38.48	53.9	15.4	150	0	VBW : 500 Hz, Floor Noise
Vert.	8680.000	AV	33.39	37.10	-30.31	-	2.37	42.55	53.9	11.3	244	83	VBW : 500 Hz
Vert.	9920.000	AV	31.41	37.72	-29.90	-	2.37	41.60	53.9	12.3	150	0	VBW : 500 Hz, Floor Noise

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

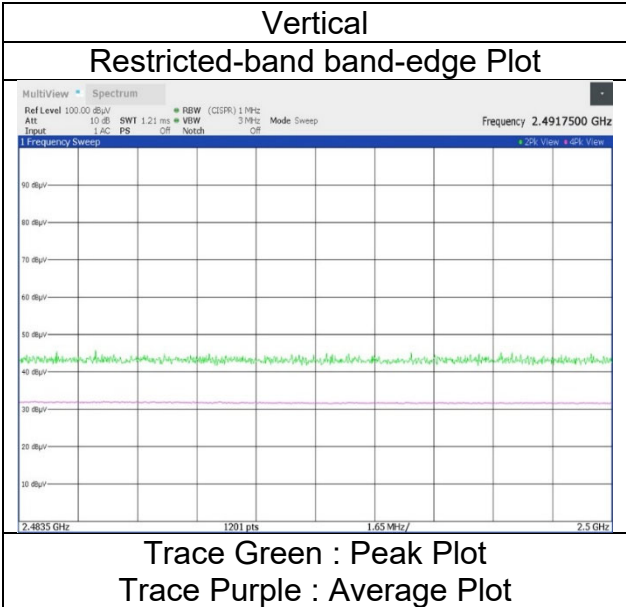
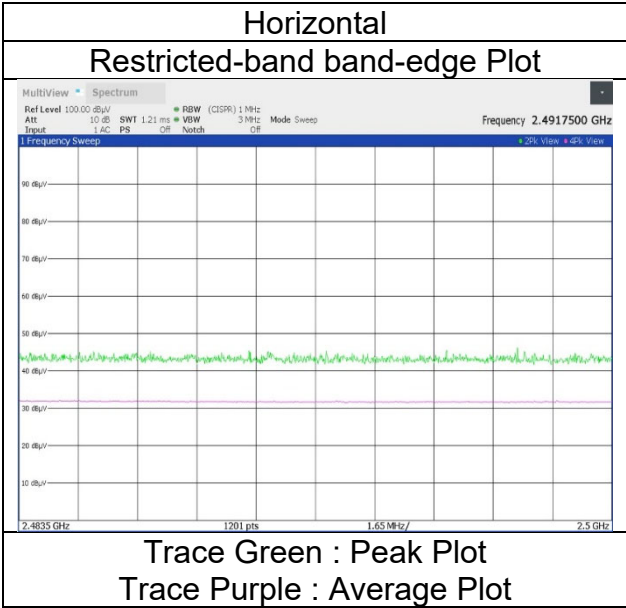
Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 dB

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	September 28, 2023
Temperature / Humidity	25 deg.C, 54 %RH
Engineer	Shiro Kobayashi (1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz, Ant 1



* 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	WAC2	WAC2	WAC2
Date	September 28, 2023	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	27 deg.C, 46 %RH	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Kouki Yamada	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz, Ant 1				

(* 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.	87.758	QP	46.70	7.80	7.07	33.08	0.00	28.49	40.0	11.5	400	111	-
Hori.	250.013	QP	56.40	11.78	7.32	32.83	0.00	42.67	46.0	3.3	133	40	-
Hori.	2390.000	PK	45.72	27.62	-24.00	-	2.37	51.71	73.9	22.1	105	255	-
Hori.	4804.000	PK	44.19	31.57	-31.48	-	2.37	46.65	73.9	27.2	204	211	-
Hori.	7206.000	PK	44.21	36.04	-30.83	-	2.37	51.79	73.9	22.1	150	0	Floor Noise
Hori.	8407.000	PK	44.69	36.86	-30.39	-	2.37	53.53	73.9	20.3	100	176	-
Hori.	9608.000	PK	44.85	37.74	-30.16	-	2.37	54.80	73.9	19.1	150	0	Floor Noise
Hori.	2390.000	AV	31.75	27.62	-24.00	-	2.37	37.74	53.9	16.1	105	255	VBW : 500 Hz
Hori.	4804.000	AV	30.54	31.57	-31.48	-	2.37	33.00	53.9	20.9	204	211	VBW : 500 Hz
Hori.	7206.000	AV	30.34	36.04	-30.83	-	2.37	37.92	53.9	15.9	150	0	VBW : 500 Hz, Floor Noise
Hori.	8407.000	AV	31.09	36.86	-30.39	-	2.37	39.93	53.9	13.9	100	176	VBW : 500 Hz
Hori.	9608.000	AV	31.20	37.74	-30.16	-	2.37	41.15	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	33.803	QP	41.10	17.23	6.26	32.63	0.00	31.96	40.0	8.0	100	143	-
Vert.	70.017	QP	48.60	6.65	6.35	33.05	0.00	28.55	40.0	11.4	100	230	-
Vert.	78.160	QP	48.50	6.38	6.98	33.07	0.00	28.79	40.0	11.2	100	246	-
Vert.	97.088	QP	50.00	9.63	6.89	33.08	0.00	33.44	43.5	10.0	100	130	-
Vert.	118.034	QP	45.80	12.88	6.64	33.07	0.00	32.25	43.5	11.2	100	90	-
Vert.	125.010	QP	47.60	13.58	6.70	33.06	0.00	34.82	43.5	8.6	100	262	-
Vert.	176.345	QP	40.20	16.17	7.05	33.00	0.00	30.42	43.5	13.0	100	20	-
Vert.	721.136	QP	35.80	20.13	8.43	31.46	0.00	32.90	46.0	13.1	108	350	-
Vert.	2390.000	PK	45.77	27.62	-24.00	-	2.37	51.76	73.9	22.1	192	92	-
Vert.	4804.000	PK	44.33	31.57	-31.48	-	2.37	46.79	73.9	27.1	160	116	-
Vert.	7206.000	PK	43.74	36.04	-30.83	-	2.37	51.32	73.9	22.5	150	0	Floor Noise
Vert.	8407.000	PK	44.61	36.86	-30.39	-	2.37	53.45	73.9	20.4	253	72	-
Vert.	9608.000	PK	44.94	37.74	-30.16	-	2.37	54.89	73.9	19.0	150	0	Floor Noise
Vert.	2390.000	AV	31.77	27.62	-24.00	-	2.37	37.76	53.9	16.1	192	92	VBW : 500 Hz
Vert.	4804.000	AV	30.63	31.57	-31.48	-	2.37	33.09	53.9	20.8	160	116	VBW : 500 Hz
Vert.	7206.000	AV	30.39	36.04	-30.83	-	2.37	37.97	53.9	15.9	150	0	VBW : 500 Hz, Floor Noise
Vert.	8407.000	AV	31.06	36.86	-30.39	-	2.37	39.90	53.9	14.0	253	72	VBW : 500 Hz
Vert.	9608.000	AV	31.23	37.74	-30.16	-	2.37	41.18	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise

1 GHz to 18 GHz : Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - 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 (3.94 m / 3.0 m) = 2.37 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	89.25	27.63	-24.00	-	2.37	95.25	-	-	Carrier
Hori.	2400.000	PK	36.81	27.63	-24.00	-	2.37	42.81	75.2	32.3	-
Vert.	2402.000	PK	88.35	27.63	-24.00	-	2.37	94.35	-	-	Carrier
Vert.	2400.000	PK	36.19	27.63	-24.00	-	2.37	42.19	74.3	32.1	-

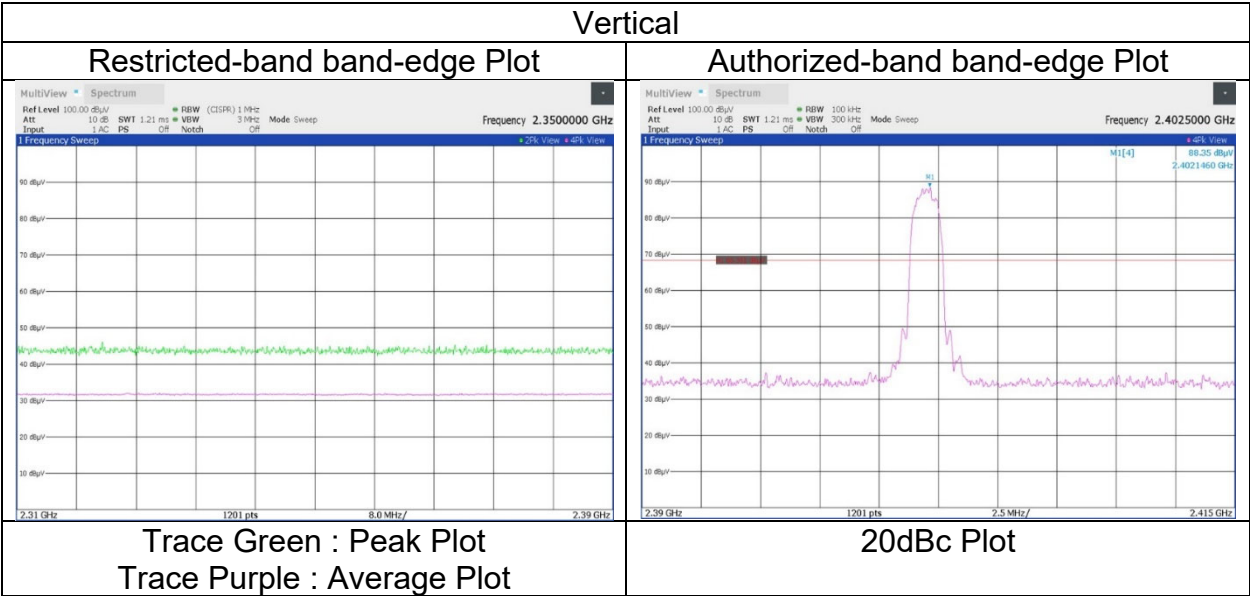
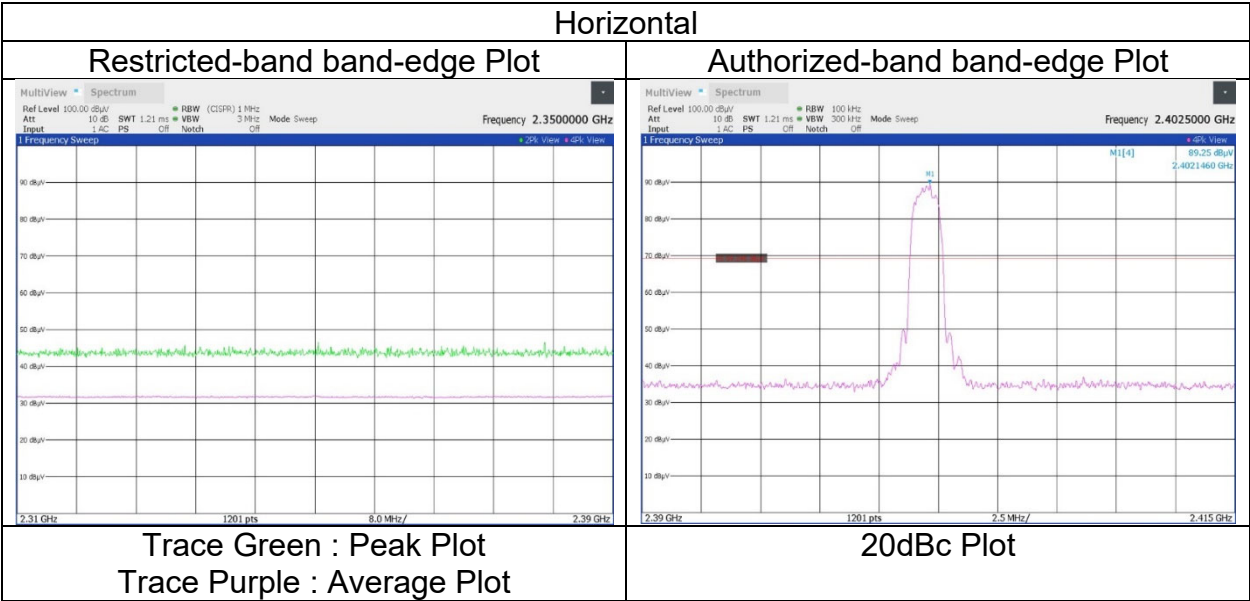
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 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	September 28, 2023
Temperature / Humidity	25 deg.C, 54 %RH
Engineer	Shiro Kobayashi
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz, Ant 1



* 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	WAC2	WAC2
Date	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2441 MHz, Ant 1			

(* 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	44.31	31.88	-31.42	-	2.37	47.14	73.9	26.7	210	199	-
Hori.	7323.000	PK	44.07	36.31	-30.79	-	2.37	51.96	73.9	21.9	150	0	Floor Noise
Hori.	8543.500	PK	44.76	37.02	-30.33	-	2.37	53.82	73.9	20.0	100	196	-
Hori.	9764.000	PK	44.63	37.71	-30.02	-	2.37	54.69	73.9	19.2	150	0	Floor Noise
Hori.	4882.000	AV	30.89	31.88	-31.42	-	2.37	33.72	53.9	20.1	210	199	VBW : 500 Hz
Hori.	7323.000	AV	30.26	36.31	-30.79	-	2.37	38.15	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Hori.	8543.500	AV	31.57	37.02	-30.33	-	2.37	40.63	53.9	13.2	100	196	VBW : 500 Hz
Hori.	9764.000	AV	31.13	37.71	-30.02	-	2.37	41.19	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	4882.000	PK	44.50	31.88	-31.42	-	2.37	47.33	73.9	26.5	153	103	-
Vert.	7323.000	PK	44.17	36.31	-30.79	-	2.37	52.06	73.9	21.8	150	0	Floor Noise
Vert.	8543.500	PK	44.80	37.02	-30.33	-	2.37	53.86	73.9	20.0	239	80	-
Vert.	9764.000	PK	44.85	37.71	-30.02	-	2.37	54.91	73.9	18.9	150	0	Floor Noise
Vert.	4882.000	AV	30.81	31.88	-31.42	-	2.37	33.64	53.9	20.2	153	103	VBW : 500 Hz
Vert.	7323.000	AV	30.27	36.31	-30.79	-	2.37	38.16	53.9	15.7	150	0	VBW : 500 Hz, Floor Noise
Vert.	8543.500	AV	31.73	37.02	-30.33	-	2.37	40.79	53.9	13.1	239	80	VBW : 500 Hz
Vert.	9764.000	AV	31.08	37.71	-30.02	-	2.37	41.14	53.9	12.7	150	0	VBW : 500 Hz, Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 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	WAC2	WAC2
Date	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2480 MHz, Ant 1			

(* 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	46.22	27.64	-23.93	-	2.37	52.30	73.9	21.6	152	248	-
Hori.	4960.000	PK	44.85	32.11	-31.36	-	2.37	47.97	73.9	25.9	184	203	-
Hori.	7440.000	PK	43.84	36.46	-30.75	-	2.37	51.92	73.9	21.9	150	0	Floor Noise
Hori.	8680.000	PK	45.21	37.10	-30.31	-	2.37	54.37	73.9	19.5	100	194	-
Hori.	9920.000	PK	44.76	37.72	-29.90	-	2.37	54.95	73.9	18.9	150	0	Floor Noise
Hori.	2483.500	AV	31.91	27.64	-23.93	-	2.37	37.99	53.9	15.9	152	248	VBW : 500 Hz
Hori.	4960.000	AV	31.99	32.11	-31.36	-	2.37	35.11	53.9	18.7	184	203	VBW : 500 Hz
Hori.	7440.000	AV	30.34	36.46	-30.75	-	2.37	38.42	53.9	15.4	150	0	VBW : 500 Hz, Floor Noise
Hori.	8680.000	AV	32.33	37.10	-30.31	-	2.37	41.49	53.9	12.4	100	194	VBW : 500 Hz
Hori.	9920.000	AV	31.42	37.72	-29.90	-	2.37	41.61	53.9	12.2	150	0	VBW : 500 Hz, Floor Noise
Vert.	2483.500	PK	45.82	27.64	-23.93	-	2.37	51.90	73.9	22.0	148	89	-
Vert.	4960.000	PK	44.89	32.11	-31.36	-	2.37	48.01	73.9	25.8	161	103	-
Vert.	7440.000	PK	44.01	36.46	-30.75	-	2.37	52.09	73.9	21.8	150	0	Floor Noise
Vert.	8680.000	PK	45.29	37.10	-30.31	-	2.37	54.45	73.9	19.4	249	83	-
Vert.	9920.000	PK	44.88	37.72	-29.90	-	2.37	55.07	73.9	18.8	150	0	Floor Noise
Vert.	2483.500	AV	31.72	27.64	-23.93	-	2.37	37.80	53.9	16.1	148	89	VBW : 500 Hz
Vert.	4960.000	AV	32.13	32.11	-31.36	-	2.37	35.25	53.9	18.6	161	103	VBW : 500 Hz
Vert.	7440.000	AV	30.41	36.46	-30.75	-	2.37	38.49	53.9	15.4	150	0	VBW : 500 Hz, Floor Noise
Vert.	8680.000	AV	32.93	37.10	-30.31	-	2.37	42.09	53.9	11.8	249	83	VBW : 500 Hz
Vert.	9920.000	AV	31.34	37.72	-29.90	-	2.37	41.53	53.9	12.3	150	0	VBW : 500 Hz, Floor Noise

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

Distance factor : 1 GHz - 10 GHz : 20log (3.94 m / 3.0 m) = 2.37 dB

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

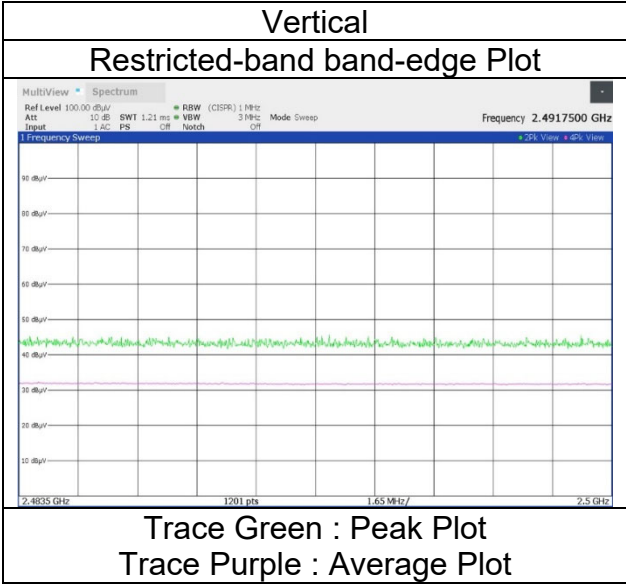
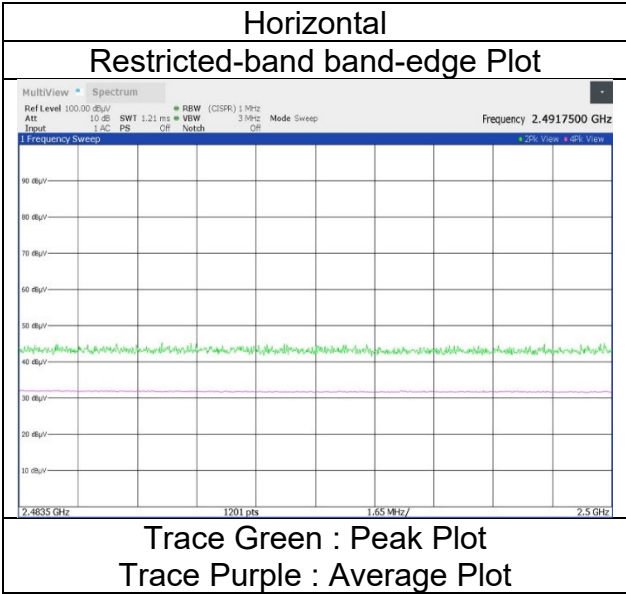
*These results have sufficient margin without taking account Duty cycle correction factor.

**Radiated Spurious Emission
(Reference Plot for band-edge)**

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Shonan EMC Lab.
WAC2
September 28, 2023
25 deg.C, 54 %RH
Shiro Kobayashi
(1 GHz -2.8 GHz)
Tx, Hopping Off, 3DH5 2480 MHz, Ant 1



* 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 May 30, 2024
Temperature / Humidity 24 deg.C, 56 %RH
Engineer Yusuke Tanikawara
(1 GHz -2.8 GHz)
Mode Tx, Hopping Off, DH5 2402 MHz With WLAN Tx 11ax-20(SDM) 5180 MHz, Ant 0

(* 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	47.65	27.75	-27.50	-	2.37	50.27	73.9	23.6	100	131	-
Hori.	2390.000	AV	33.72	27.75	-27.50	-	2.37	36.34	53.9	17.5	100	131	VBW: 500 Hz
Vert.	2390.000	PK	47.61	27.75	-27.50	-	2.37	50.23	73.9	23.6	138	59	-
Vert.	2390.000	AV	33.65	27.75	-27.50	-	2.37	36.27	53.9	17.6	138	59	VBW: 500 Hz

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz: 20log (3.94 m / 3.0 m) = 2.37 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.

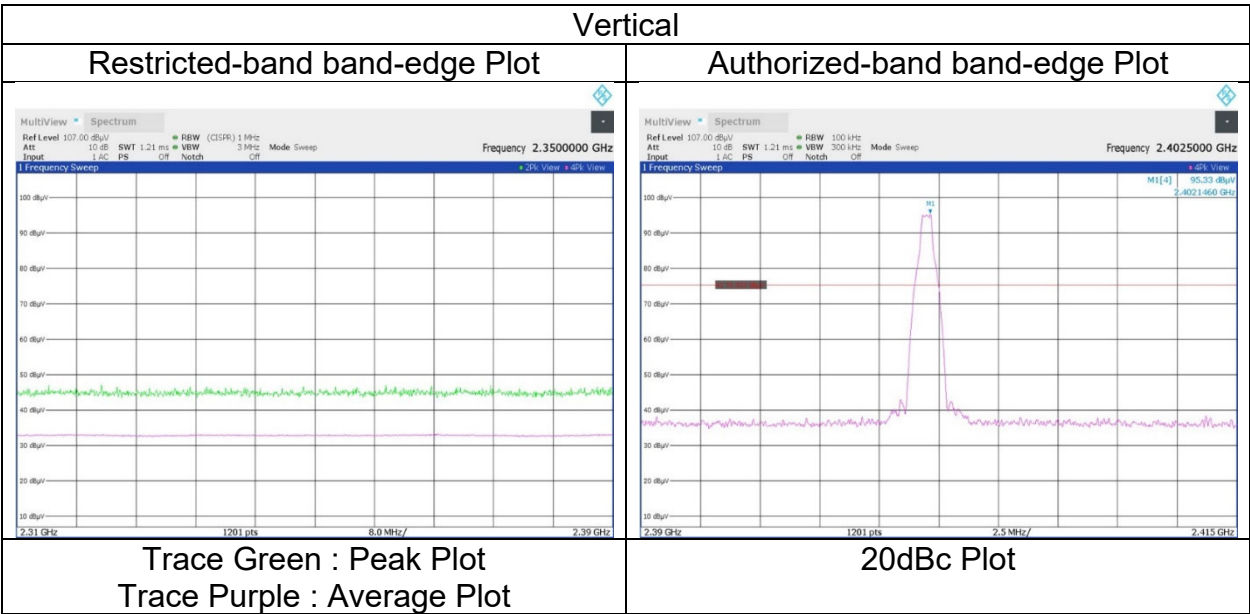
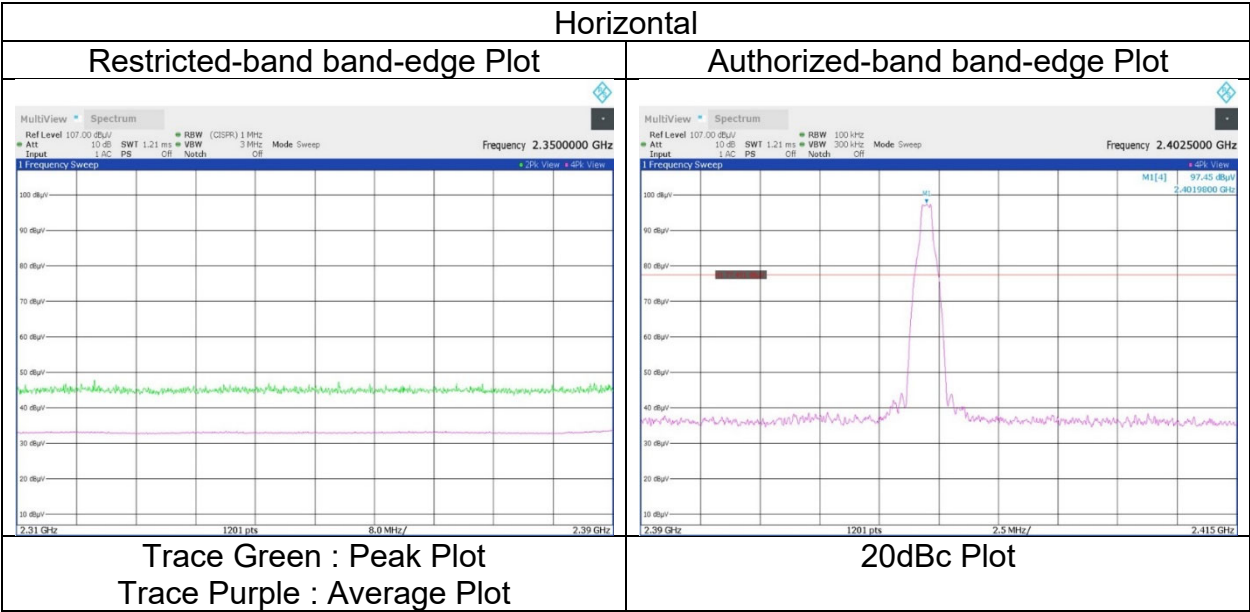
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

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	97.45	27.77	-27.49	-	2.37	100.10	-	-	Carrier
Hori.	2400.000	PK	39.65	27.77	-27.49	-	2.37	42.30	80.1	37.8	-
Vert.	2402.000	PK	95.33	27.77	-27.49	-	2.37	97.98	-	-	Carrier
Vert.	2400.000	PK	39.43	27.77	-27.49	-	2.37	42.08	77.9	35.8	-

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz) - Gain(Amplifier)) + Distance factor
Distance factor : 1 GHz - 10 GHz: 20log (3.94 m / 3.0 m) = 2.37 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	May 30, 2024
Temperature / Humidity	24 deg.C, 56 %RH
Engineer	Yusuke Tanikawara
	(1 GHz -2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz With WLAN Tx 11ax-20(SDM) 5180 MHz, Ant 0



* 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 WAC2
Date May 30, 2024 April 16, 2024 April 17, 2024
Temperature / Humidity 24 deg.C, 56 %RH 23 deg.C, 47 %RH 24 deg.C, 50 %RH
Engineer Yusuke Tanikawara Yosuke Murakami Makoto Hosaka
(1 GHz -10 GHz) (10 GHz -18 GHz) (18 GHz -26.5 GHz)
Mode Tx, Hopping Off, DH5 2480 MHz With WLAN Tx 11ax-20(SDM) 5180 MHz Ant 0

(* 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.	4960.000	PK	47.89	32.23	-24.87	-	2.37	57.62	73.9	16.2	233	153	-
Hori.	7440.000	PK	46.98	36.81	-32.71	-	2.37	53.45	73.9	20.4	150	0	Floor Noise
Hori.	8680.000	PK	46.97	37.75	-31.20	-	2.37	55.89	73.9	18.0	150	0	Floor Noise
Hori.	9920.000	PK	46.11	38.04	-29.52	-	2.37	57.00	73.9	16.9	150	0	Floor Noise
Hori.	4960.000	AV	34.85	32.23	-24.87	-	2.37	44.58	53.9	9.3	233	153	VBW: 500 Hz
Hori.	7440.000	AV	33.65	36.81	-32.71	-	2.37	40.12	53.9	13.7	150	0	VBW: 500 Hz, Floor Noise
Hori.	8680.000	AV	32.86	37.75	-31.20	-	2.37	41.78	53.9	12.1	150	0	VBW: 500 Hz, Floor Noise
Hori.	9920.000	AV	32.26	38.04	-29.52	-	2.37	43.15	53.9	10.7	150	0	VBW: 500 Hz, Floor Noise
Vert.	4960.000	PK	47.99	32.23	-24.87	-	2.37	57.72	73.9	16.1	343	95	-
Vert.	7440.000	PK	46.97	36.81	-32.71	-	2.37	53.44	73.9	20.4	150	0	Floor Noise
Vert.	8680.000	PK	46.85	37.75	-31.20	-	2.37	55.77	73.9	18.1	150	0	Floor Noise
Vert.	9920.000	PK	45.75	38.04	-29.52	-	2.37	56.64	73.9	17.2	150	0	Floor Noise
Vert.	4960.000	AV	35.02	32.23	-24.87	-	2.37	44.75	53.9	9.1	343	95	VBW: 500 Hz
Vert.	7440.000	AV	33.60	36.81	-32.71	-	2.37	40.07	53.9	13.8	150	0	VBW: 500 Hz, Floor Noise
Vert.	8680.000	AV	32.94	37.75	-31.20	-	2.37	41.86	53.9	12.0	150	0	VBW: 500 Hz, Floor Noise
Vert.	9920.000	AV	32.10	38.04	-29.52	-	2.37	42.99	53.9	10.9	150	0	VBW: 500 Hz, Floor Noise

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

Distance factor : 1 GHz - 10 GHz : $20\log(3.94\text{ m} / 3.0\text{ m}) = 2.37\text{ dB}$

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
Date April 22, 2024
Temperature / Humidity 22 deg.C, 55 %RH
Engineer Kouki Yamada
(Below 1 GHz)
Mode Tx, Hopping Off, 3DH5 2402 MHz With WLAN Tx 11ax-20(SDM) 5180 MHz, Ant 0

(* 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.	83.679	QP	43.50	8.95	6.82	33.07	0.00	26.20	40.0	13.8	400	118	-
Hori.	480.022	QP	41.90	17.19	7.92	32.30	0.00	34.71	46.0	11.2	179	63	-
Vert.	35.751	QP	45.10	12.34	6.26	32.69	0.00	31.01	40.0	8.9	100	218	-
Vert.	56.795	QP	44.40	9.68	6.39	32.97	0.00	27.50	40.0	12.5	100	222	-
Vert.	67.095	QP	46.40	9.36	6.40	33.04	0.00	29.12	40.0	10.8	100	106	-
Vert.	70.194	QP	46.80	9.26	6.44	33.05	0.00	29.45	40.0	10.5	100	85	-
Vert.	86.738	QP	40.20	9.03	6.87	33.08	0.00	23.02	40.0	16.9	100	255	-
Vert.	102.349	QP	47.60	9.60	6.90	33.08	0.00	31.02	43.5	12.4	100	79	-
Vert.	480.024	QP	41.70	17.19	7.92	32.30	0.00	34.51	46.0	11.4	100	172	-

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

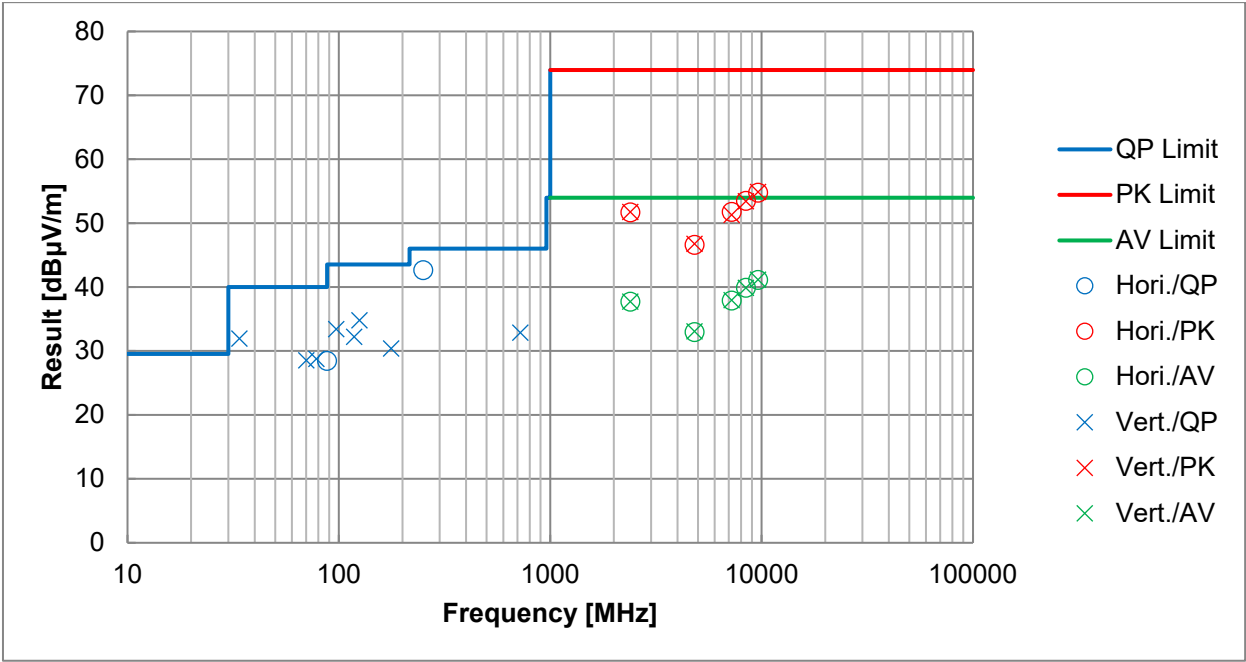
Distance factor : 1 GHz - 10 GHz : $20\log(3.94\text{ m} / 3.0\text{ m}) = 2.37\text{ dB}$

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

Test place	Shonan EMC Lab.				
Semi Anechoic Chamber	WAC2	WAC2	WAC2	WAC2	WAC2
Date	September 28, 2023	September 28, 2023	September 26, 2023	September 25, 2023	September 23, 2023
Temperature / Humidity	27 deg.C, 46 %RH	25 deg.C, 54 %RH	24 deg.C, 54 %RH	25 deg.C, 53 %RH	24 deg.C, 55 %RH
Engineer	Kouki Yamada	Shiro Kobayashi	Yusuke Tanikawara	Makoto Hosaka	Makoto Hosaka
	(30 MHz -1 GHz)	(1 GHz -2.8 GHz)	(2.8 GHz -10 GHz)	(10 GHz -18 GHz)	(18 GHz -26.5 GHz)
Mode	Tx, Hopping Off, 3DH5 2402 MHz, Ant 1				



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