

RADIO TEST REPORT

Test Report No. 15489623S-A

Customer	Nintendo Co., Ltd.
Description of EUT	Development tool
Model Number of EUT	BEE-056
FCC ID	BKEBEE056
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	December 25, 2024
Remarks	Bluetooth (BR / EDR) parts *Conducted Emission, Maximum Peak Output Power, Spurious Emission Restricted Band Edges tests

Representative Test Engineer*Y. Tanikawara*Yusuke Tanikawara
Engineer**Approved By***K. Noda*Kazuya Noda
Leader

CERTIFICATE 1266.03

- ☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan, Inc.
- ☒ There is no testing item of "Non-accreditation".

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

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REVISION HISTORY

Original Test Report No.: 15489623S-A

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15489623S-A	December 25, 2024	-

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer Information

Company Name	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	Development tool
Model Number	BEE-056
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 10, 2024 (Radiated emission and Conducted emission test) August 6, 2024 (Antenna terminal test)
Test Date	September 10 to December 24, 2024

2.2 Product Description

General Specification

Rating	BEE-056 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
	40 MHz Band	5190 MHz to 5230 MHz 5270 MHz to 5310 MHz
	80 MHz band	5210 MHz 5290 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 band)
	Antenna 2	4.07 dBi (WLAN U-NII-1, U-NII-2A band)

LDS: Laser Direct Structuring

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	15.9 dB 11.49394 MHz, L1, Average	Complied	-
Maximum Peak Output Power	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.12	FCC: Section 15.247(b)(1) ISED: RSS-247 5.4 (b)	See data.	Complied	Conducted
Spurious Emission & Band Edge Compliance	FCC: KDB 558074 D01 15.247 Meas Guidance v05r02 ISED: RSS-Gen 6.13	FCC: Section 15.247(d) ISED: RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10	5.8 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

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.	

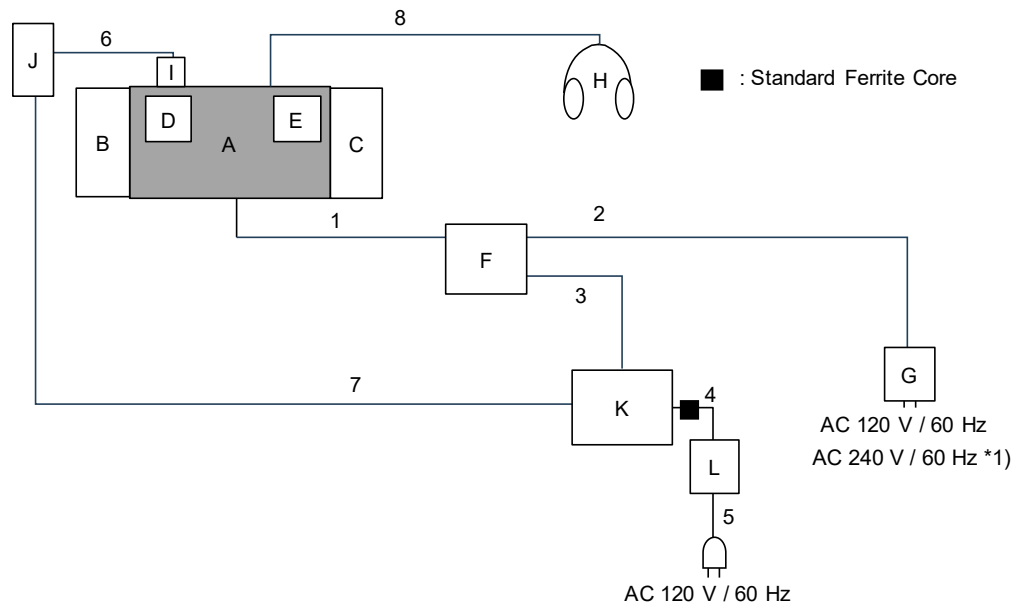
Details of Operating Mode(s)

Test Item	Mode	Hopping	Tested Frequency	Tested Antenna
Conducted Emission	Tx 3DH5	Off	2402 MHz	Ant 1
Radiated Spurious Emission (Below 1 GHz)	Tx 3DH5	Off	2402 MHz	Ant 1
Radiated Spurious Emission (Above 1 GHz)	Tx DH5	Off Off	2402 MHz *1) 2480 MHz *2)	Ant 1
Maximum Peak Output Power	Tx 3DH5	Off	2402 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) *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. * Operating mode, tested antenna and tested frequency are selected for worst result for Test Report No. 14724442S-A-R1. *1) The test was performed on only bandedge. *2) The test was performed on only spurious emission.				

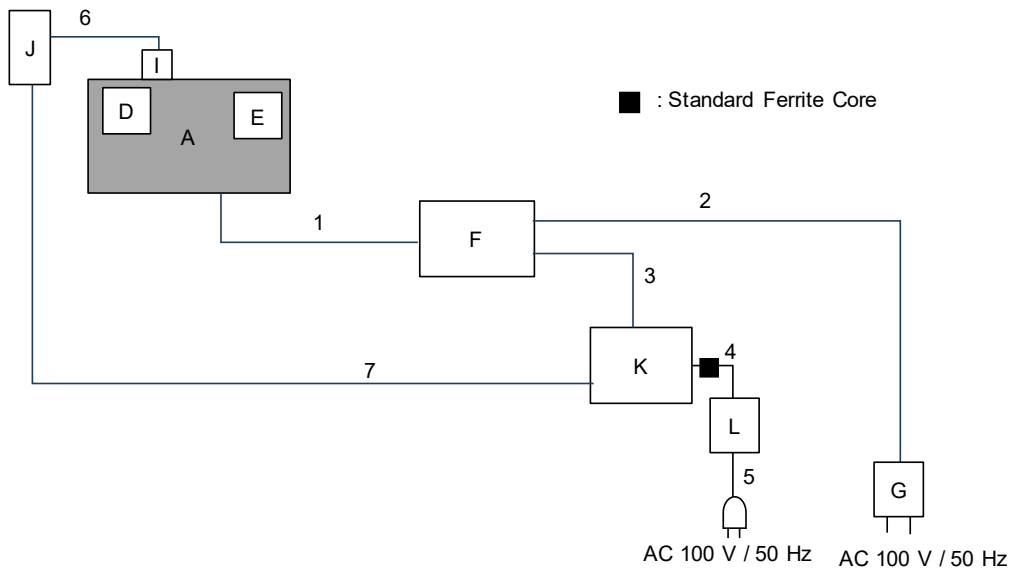
* Ant 0: Antenna 0, Ant 1: Antenna 1, Ant 2: Antenna 2

4.2 Configuration and Peripherals

Radiated emission test and Conducted emission test



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 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	Development tool	BEE-056	HAL00110047513 *1) HAL00110048510 *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	-

*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	Custom Cable	1.3	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 hung 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.

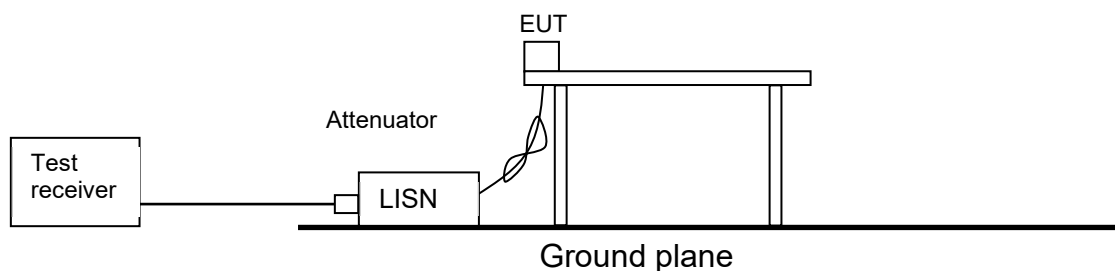
The EUT was connected to a LISN (AMN).

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

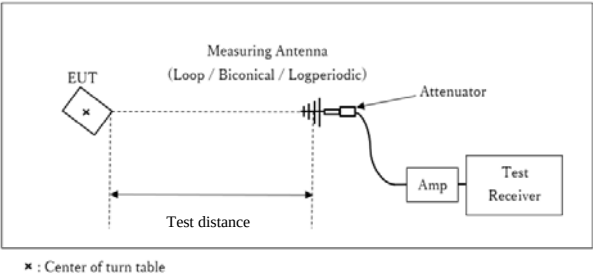
In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired 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 of Test Report No.: 14724442S-A-R1 Detector: Peak)	RBW: 100 kHz VBW: 300 kHz

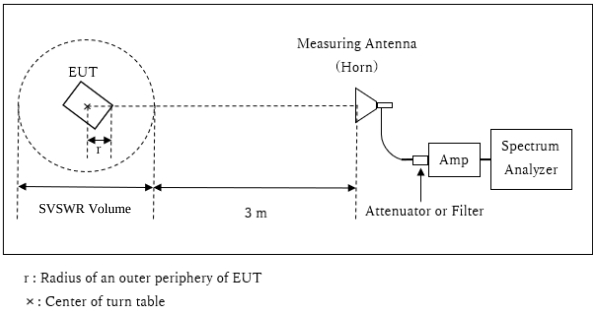
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

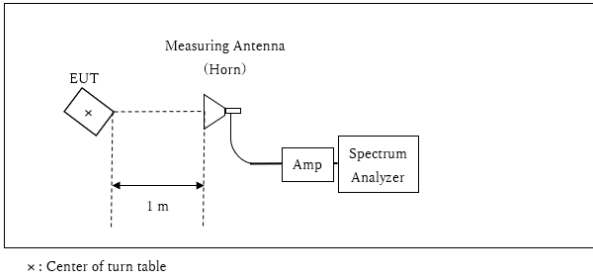
1 GHz to 10 GHz



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.)
 $r = 0.06 \text{ m}$

10 GHz to 26.5 GHz



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

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
Maximum Peak Output Power	-	-	-	Auto	Peak	-	Power Meter (Sensor: 160 MHz BW)

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.2 Shielded Room
Date: 2024/09/13

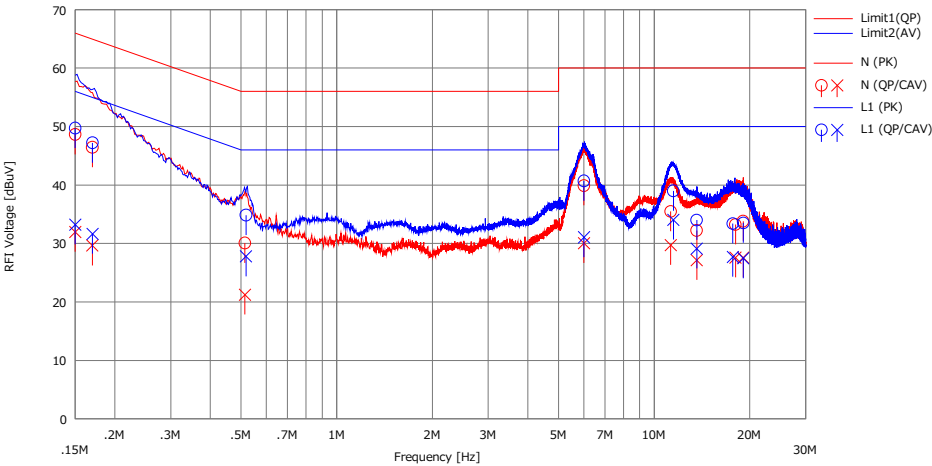
Mode : Tx, 3DH5 2402 MHz

Power : AC 240 V / 60 Hz
Temp./Humi. : 23 deg.C / 52 %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	36.09	19.40	12.55	48.64	31.95	66.00	56.00	17.3	24.0	N	
2	0.17003	33.86	17.07	12.58	46.44	29.65	64.96	54.96	18.5	25.3	N	
3	0.51382	17.45	8.62	12.62	30.07	21.24	56.00	46.00	25.9	24.7	N	
4	6.01221	26.72	16.86	13.18	39.90	30.04	60.00	50.00	20.1	19.9	N	
5	11.27554	21.79	16.02	13.69	35.48	29.71	60.00	50.00	24.5	20.2	N	
6	13.62346	18.36	13.27	13.87	32.23	27.14	60.00	50.00	27.7	22.8	N	
7	18.03954	19.06	13.42	14.16	33.22	27.58	60.00	50.00	26.7	22.4	N	
8	19.07415	19.60	13.36	14.22	33.82	27.58	60.00	50.00	26.1	22.4	N	
9	0.15000	37.15	20.65	12.57	49.72	33.22	66.00	56.00	16.2	22.7	L1	
10	0.17011	34.66	19.07	12.57	47.23	31.64	64.96	54.96	17.7	23.3	L1	
11	0.51822	22.24	15.18	12.61	34.85	27.79	56.00	46.00	21.1	18.2	L1	
12	6.00522	27.57	17.93	13.12	40.69	31.05	60.00	50.00	19.3	18.9	L1	
13	11.49394	25.48	20.52	13.52	39.00	34.04	60.00	50.00	21.0	15.9	L1	
14	13.62206	20.32	15.45	13.66	33.98	29.11	60.00	50.00	26.0	20.8	L1	
15	17.69149	19.52	13.82	13.88	33.40	27.70	60.00	50.00	26.6	22.3	L1	
16	19.07538	19.54	13.50	13.95	33.49	27.45	60.00	50.00	26.5	22.5	L1	

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

Maximum Peak Output Power

Test placeShonan EMC Lab. No.1 Measurement Room

DateSeptember 20, 2024

Temperature / Humidity24 deg. C / 52 % RH

EngineerMakoto Hosaka

ModeTx, Hopping Off

Antenna: Ant 0

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]	
3DH5	2402	-3.07	1.63	9.98	8.54	7.14	20.97	125	12.43	-2.51	6.03	4.01	36.02	4000	29.99

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.

Radiated Spurious Emission

Test place Shonan EMC Lab.
Semi Anechoic Chamber WAC2
Date September 10, 2024
Temperature / Humidity 23 deg. C / 58 % RH
Engineer Yosuke Murakami
 (1 GHz to 2.8 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	48.09	27.75	-28.27	-	2.37	49.94	73.9	23.9	119	230	-
Hori.	2390.000	AV	33.46	27.75	-28.27	-	2.37	35.31	53.9	18.5	119	230	VBW: 500 Hz
Vert.	2390.000	PK	48.29	27.75	-28.27	-	2.37	50.14	73.9	23.7	157	297	-
Vert.	2390.000	AV	33.66	27.75	-28.27	-	2.37	35.51	53.9	18.3	157	297	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 : $20\log(3.94\text{ m} / 3.0\text{ m}) = 2.37\text{ dB}$

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.

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	93.36	27.77	-28.26	-	2.37	95.24	-	-	Carrier
Hori.	2400.000	PK	39.56	27.77	-28.26	-	2.37	41.44	75.2	33.7	-
Vert.	2402.000	PK	93.35	27.77	-28.26	-	2.37	95.23	-	-	Carrier
Vert.	2400.000	PK	39.64	27.77	-28.26	-	2.37	41.52	75.2	33.6	-

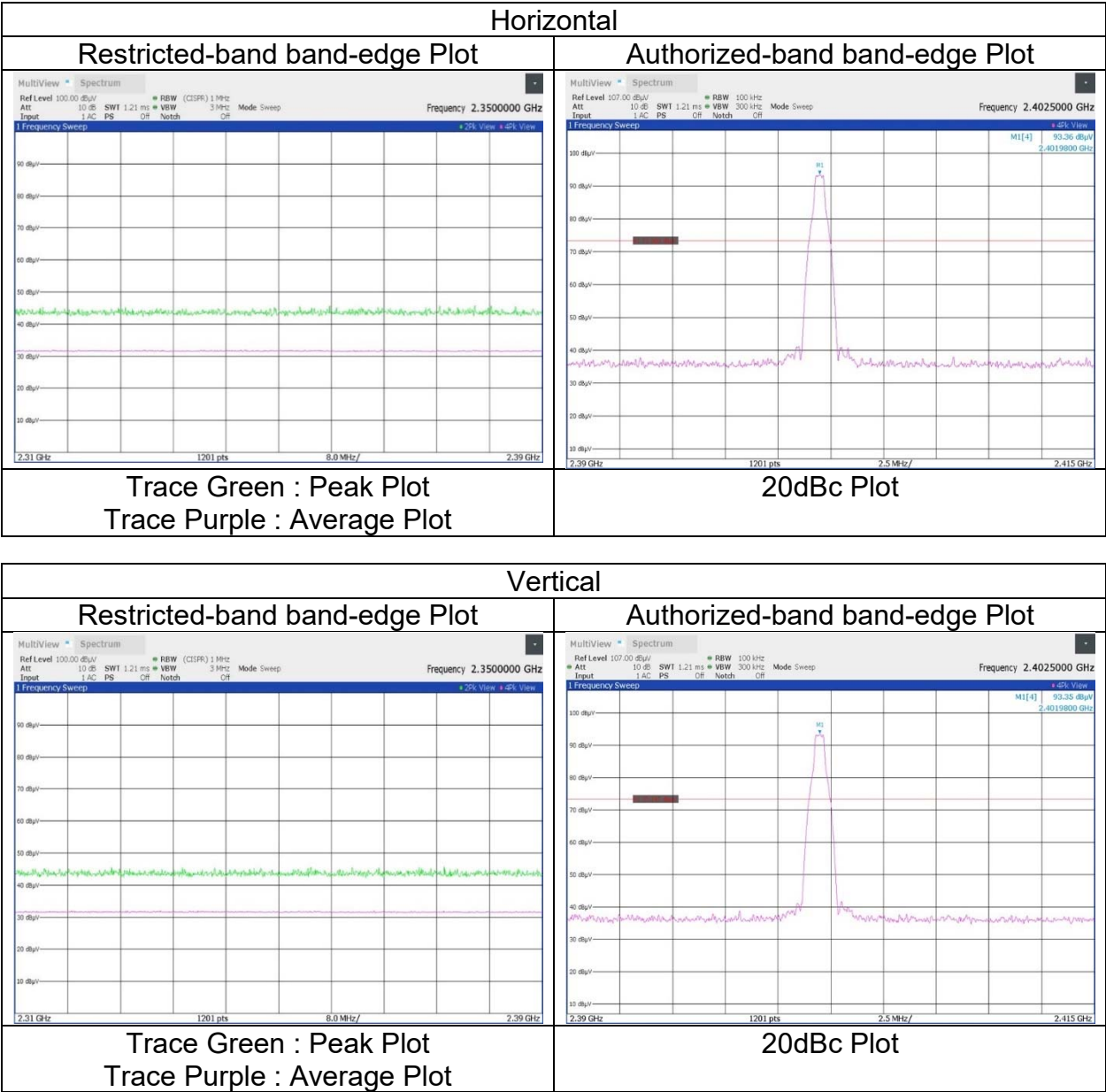
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amplifier) + Distance factor

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

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

Radiated Spurious Emission

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	September 10, 2024
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Murakami
	(1 GHz to 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
Date December 24, 2024
Temperature / Humidity 24 deg. C / 22 % RH
Engineer Miku Ikudome
 (1 GHz to 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.	4960.000	PK	49.16	32.23	-36.40	-	2.37	47.36	73.9	26.5	109	144	-
Hori.	7440.000	PK	46.77	36.81	-34.46	-	2.37	51.49	73.9	22.4	150	0	Floor Noise
Hori.	8680.000	PK	46.12	37.75	-33.02	-	2.37	53.22	73.9	20.6	102	237	-
Hori.	9920.000	PK	44.62	38.04	-31.57	-	2.37	53.46	73.9	20.4	150	0	Floor Noise
Hori.	4960.000	AV	38.50	32.23	-36.40	-	2.37	36.70	53.9	17.2	109	144	VBW:500 Hz
Hori.	7440.000	AV	32.52	36.81	-34.46	-	2.37	37.24	53.9	16.6	150	0	VBW:500 Hz, Floor Noise
Hori.	8680.000	AV	32.66	37.75	-33.02	-	2.37	39.76	53.9	14.1	102	237	VBW:500 Hz
Hori.	9920.000	AV	30.31	38.04	-31.57	-	2.37	39.15	53.9	14.7	150	0	VBW:500 Hz, Floor Noise
Vert.	4960.000	PK	49.65	32.23	-36.40	-	2.37	47.85	73.9	26.0	160	251	-
Vert.	7440.000	PK	46.93	36.81	-34.46	-	2.37	51.65	73.9	22.2	150	0	Floor Noise
Vert.	8680.000	PK	46.89	37.75	-33.02	-	2.37	53.99	73.9	19.9	235	192	-
Vert.	9920.000	PK	44.51	38.04	-31.57	-	2.37	53.35	73.9	20.5	150	0	Floor Noise
Vert.	4960.000	AV	40.19	32.23	-36.40	-	2.37	38.39	53.9	15.5	160	251	VBW:500 Hz
Vert.	7440.000	AV	32.85	36.81	-34.46	-	2.37	37.57	53.9	16.3	150	0	VBW:500 Hz, Floor Noise
Vert.	8680.000	AV	33.37	37.75	-33.02	-	2.37	40.47	53.9	13.4	235	192	VBW:500 Hz
Vert.	9920.000	AV	30.52	38.04	-31.57	-	2.37	39.36	53.9	14.5	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
Date September 11, 2024
Temperature / Humidity 23 deg. C / 58 % RH
Engineer Miku Ikudome
 (Below 1 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.	70.184	QP	45.87	9.24	6.49	33.18	0.00	28.42	40.0	11.5	270	263	-
Hori.	250.013	QP	53.85	11.86	7.39	32.92	0.00	40.18	46.0	5.8	136	84	-
Vert.	31.504	QP	45.10	13.28	6.25	32.70	0.00	31.93	40.0	8.0	100	25	-
Vert.	66.599	QP	40.40	9.31	6.44	33.17	0.00	22.98	40.0	17.0	100	242	-
Vert.	70.811	QP	41.00	9.22	6.52	33.18	0.00	23.56	40.0	16.4	100	273	-
Vert.	80.363	QP	41.50	8.95	6.80	33.20	0.00	24.05	40.0	15.9	100	109	-
Vert.	103.144	QP	47.30	9.59	6.95	33.21	0.00	30.63	43.5	12.8	100	92	-
Vert.	119.709	QP	35.60	10.68	6.80	33.19	0.00	19.89	43.5	23.6	100	101	-
Vert.	125.007	QP	40.60	10.98	6.81	33.18	0.00	25.21	43.5	18.2	100	100	-
Vert.	175.032	QP	34.70	12.90	7.37	33.11	0.00	21.86	43.5	21.6	100	170	-
Vert.	356.488	QP	38.10	15.15	7.71	32.66	0.00	28.30	46.0	17.7	100	182	-
Vert.	720.018	QP	28.30	20.23	8.57	31.44	0.00	25.66	46.0	20.3	100	43	-
Vert.	750.025	QP	34.00	20.21	8.64	31.31	0.00	31.54	46.0	14.4	100	342	-
Vert.	960.000	QP	30.30	22.08	8.99	29.99	0.00	31.38	46.0	14.6	152	126	-

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

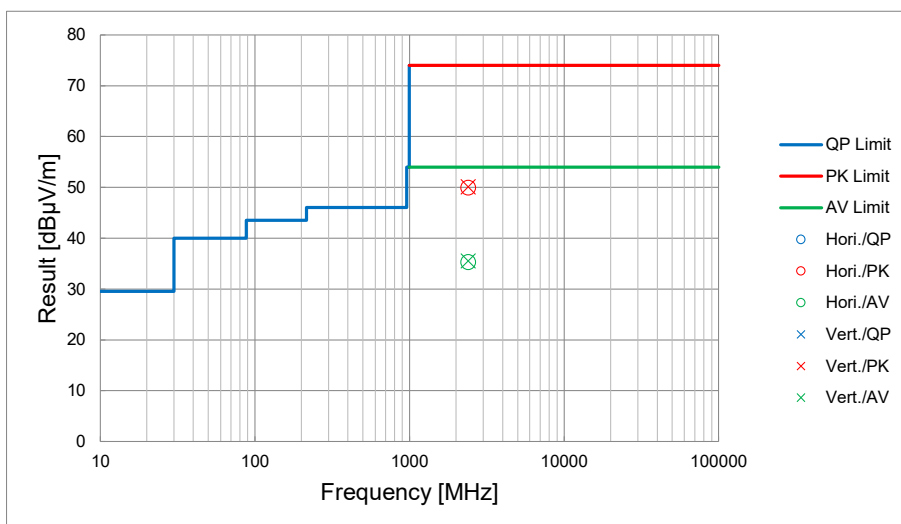
Distance factor : 1 GHz - 10 GHz : $20\log(3.94\text{ m} / 3.0\text{ m}) = 2.37\text{ dB}$

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

Radiated Spurious Emission

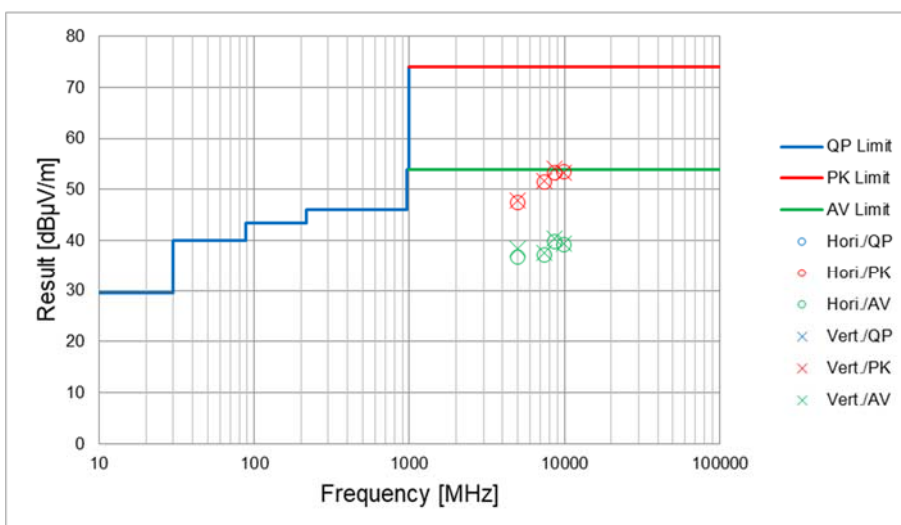
(Plot data, Worst case mode for Test Report No. 14724442S-A-R1)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	September 10, 2024
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Yosuke Murakami
	(1 GHz to 2.8 GHz)
Mode	Tx, Hopping Off, DH5 2402 MHz, Ant 1



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

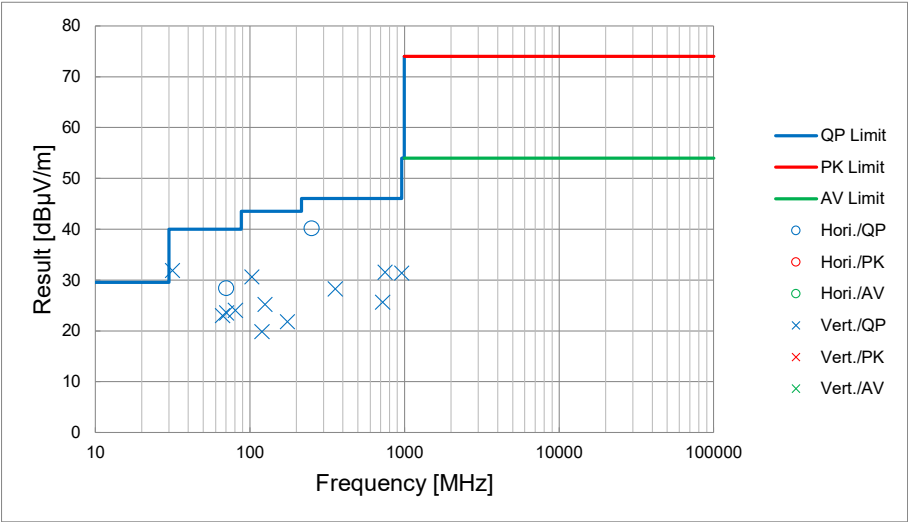
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	December 24, 2024
Temperature / Humidity	24 deg. C / 22 % RH
Engineer	Miku Ikudome
	(1 GHz to 26.5 GHz)
Mode	Tx, Hopping Off, DH5 2480 MHz, Ant 1



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

Radiated Spurious Emission
(Plot data, Worst case mode for Test Report No. 14724442S-A-R1)

Test place	Shonan EMC Lab.
Semi Anechoic Chamber	WAC2
Date	September 11, 2024
Temperature / Humidity	23 deg. C / 58 % RH
Engineer	Miku Ikudome
	(Below 1 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.

APPENDIX 2: Test Instruments

Test Equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	145095	Digital Tester	SANWA	PC500	7019224	2024/05/29	12
AT	146362	Thermo-Hygrometer	CUSTOM. Inc	CTH-190	K-07	2024/08/11	12
AT	150461	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186392	2024/06/11	12
AT	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2024/09/11	12
AT	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2024/09/11	12
AT	169912	Power sensor	Keysight Technologies Inc	N1923A	MY57290005	2024/09/11	12
AT	171615	Terminator	Weinschel - API Technologies Corp	M1459A	88997	2024/05/09	12
AT	171616	Terminator	Weinschel - API Technologies Corp	M1459A	89025	2024/05/09	12
AT	196946	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	803411/2	2024/03/07	12
AT	204927	Attenuator	Weinschel Corp.	54A-10	109972	2024/02/09	12
CE	144969	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/NS4906	-/0901-270(RF Selector)	2024/04/10	12
CE	145539	LISN	Rohde & Schwarz	ENV216	100512	2024/02/06	12
CE	145541	LISN	Rohde & Schwarz	ENV216	100514	2024/02/06	12
CE	145746	Terminator	TME	CT-01 BP	-	2024/11/21	12
CE	145792	Digital Hitester	HIOKI E.E. CORPORATION	3805-50	80997812	2024/09/24	12
CE	150923	Attenuator	JFW	50HF-003N	-	2024/02/13	12
CE	207277	Tape Measure	ASKUL	-	-	-	-
CE	235739	Thermo-Hygrometer	CUSTOM. Inc	CTH-230	-	2024/04/28	12
CE,RE	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2024/08/06	12
CE,RE	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	Ver 3.1.0546	-	-
RE	145008	Pre Amplifier	Toyo Corporation	HAP18-26W	18	2024/08/21	12
RE	145136	Attenuator	Keysight Technologies Inc	8493C-010	74864	2024/10/10	12
RE	145513	Horn Antenna	ETS-Lindgren	3160-09	00094867	2024/06/20	12
RE	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2024/04/10	12
RE	199783	Attenuator	JFW	50HF-006N	-	2024/06/14	12
RE	207281	Tape Measure	ASKUL	-	-	-	-
RE	235268	Test Receiver	Rohde & Schwarz	ESW44	103212	2023/12/26	12
RE	235640	DIGITAL MULTIMETER	HIOKI E.E. CORPORATION	DT4261	230313157	2024/05/29	12
RE	235738	Thermo-Hygrometer	CUSTOM. Inc	CTH-230	-	2024/04/28	12
RE	236584	Horn Antenna	AINFO Inc.	LB-8180-NF	2030013000112	2024/04/04	12
RE	236615	Semi-Anechoic Chamber	TDK	SWAC-02(NSA)	2	2024/05/10	12
RE	236617	Semi-Anechoic Chamber	TDK	SWAC-02(SVSWR)	2	2024/06/06	12
RE	236687	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	788	2024/04/04	12
RE	236709	Coaxial Cable	Hayashi-Repic co., Ltd.	NMS079B-GL310C-SMS117B-2m	47256-02-04	2024/05/09	12
RE	236711	Coaxial Cable	Hayashi-Repic co., Ltd.	KMS020B-GL140sE-KMS020B-7.0m	47256-03-02	2024/05/09	12
RE	236720	Coaxial Cable	Huber+Suhner	SF106/SF106/SF106	2001167/2001168/2001161	2024/05/10	12
RE	236724	Coaxial Cable	Hayashi-Repic co., Ltd.	SF106(HUBER+SUHNER)/LMR400UF/GL310C/GL310C	2000430/47753-2/47256-01-04/47256-01-02	2024/05/10	12
RE	236756	Coaxial Cable	Huber+Suhner	SF106/11N/11N/6000	2001167	2024/05/10	12
RE	236967	Pre Amplifier	TSJ (Techno Science Japan)	MLA-9K01-L01	23050010	2024/06/14	12
RE	237786	RF RELAY MATRIX with preamplifier	TSJ (Techno Science Japan)	RFM-E221261R	07796	2024/11/12	12
RE	239644	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	2306S022	2024/08/21	12
RE	239650	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	2001218/2	2024/08/20	12
RE	239787	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124+BBA9106	01908	2024/08/10	12
RE	243210	Coaxial Cable	Hayashi-Repic co., Ltd.	SMS13-13A26-NFS13-1.0m	49190-01-02	2024/12/05	12

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

The expiration date of the calibration is the end of the expired month.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item:

AT: Antenna Terminal Conducted test

CE: Conducted Emission

RE: Radiated Emission