

RADIO TEST REPORT

Test Report No. 16088617S-A-R2

Customer	Circuit Design, Inc.
Description of EUT	2.4G Transceiver module
Model Number of EUT	NK-2.4Y
FCC ID	V9X-NK24Y
Test Regulation	FCC Part 15 Subpart C
Test Result	Complied
Issue Date	December 23, 2025
Remarks	Radiated Spurious Emission only

Representative Test Engineer

Yuta Shiba
Engineer

Approved By

Kazutaka Takeyama
Leader

CERTIFICATE 1266.03

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

Report Cover Page - Form-ULID-003532 (DCS:13-EM-F0429) Issue# 25.0

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)
- The 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 any test report referred in this report, the latest version (including any revisions) is always referred to.
- If the latest version is a revision, it replaces the previous version. See the table below for revisions and versions.

REVISION HISTORY

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	16088617S-A	December 16, 2025	-
1	16088617S-A-R1	December 22, 2025	<u>SECTION 4.1</u> Addition of the description “*EUT is operated with Input Mode and Output Mode...” <u>SECTION 5</u> Update of *1) in Test Procedure <u>APPENDIX 1</u> Addition of data of Burst Rate Confirmation
2	16088617S-A-R2	December 23, 2025	<u>APPENDIX 1</u> Correction in Burst Rate Confirmation (p.12) - Frequency in Mode 2439 MHz: from “2.789788 GHz” to “2.78956 GHz” - VBW value in Mode 2439 MHz: from “341.53 Hz” to “2209.94 Hz” - Adjust the values to equal significant figures Correction in Radiated Spurious Emission (p.15) - Frequency in Mode Tx, Hopping Off, 2439 MHz: from “2789.788 MHz” to “2789.560 MHz”

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

CONTENTS	PAGE
SECTION 1: Customer Information	5
SECTION 2: Equipment Under Test (EUT).....	5
SECTION 3: Test Summary	6
SECTION 4: Operation of EUT during testing	8
SECTION 5: Radiated Spurious Emission.....	9
APPENDIX 1: Test data	11
Radiated Spurious Emission.....	13
APPENDIX 2: Test Instruments	19
APPENDIX 3: Photographs of test setup.....	20
Radiated Spurious Emission.....	20
Pre-Check of Worst Case Position	21

SECTION 1: Customer Information

Company Name	Circuit Design, Inc.
Address	7557-1, Hotaka, Azumino, Nagano 399-8303 Japan
Telephone Number	+81-263-82-1011
Contact Person	Maiko Yasunaga

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	2.4G Transceiver module
Model Number	NK-2.4Y
Serial Number	Refer to SECTION 4.2
Condition	Production model
Modification	No Modification by the test lab
Receipt Date	November 25, 2025
Test Date	November 27 and 28, 2025

2.2 Product Description

General Specification

Rating	Typical: DC 5 V (Input mode:DC 2.2 V to 5.5 V, Output mode: DC 4.7 V to DC 5.5 V)
--------	--

Radio Specification

Equipment Type	Transceiver
Frequency of Operation	2403 MHz to 2479 MHz
Type of Modulation	FHSS

Antenna Type	ANT-2G4S2	ANT-2G4S3	Pattern Antenna
External / Internal	External	External	Internal (Pattern)
RF Cable length	90 mm *1)	3 mm *1)	-
Antenna Gain with internal cable loss	2.14 dBi	2.14 dBi	-2.0 dBi

Antenna Type	ANT-2400-SF	ANT-2400-SFW-HG	ANT-2400-SMW2 *2)
External / Internal	External	External	External
RF Cable length	70 mm	70 mm	50 mm
Antenna Gain with internal cable loss	1.7 dBi	4.7 dBi	2.14 dBi

*1) ANT-2G4S2 and ANT-2G4S3 have several different length of cables. The shortest RF Cable on the specification. (The highest antenna gain)

*2) Tested antenna

SECTION 3: Test Summary

3.1 Test Specification

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

3.2 Reference Standards

ANSI/USEMCSC C63.2-2023
ANSI C63.4-2014/C63.4a-2017
ANSI C63.5-2017
ANSI C63.10-2020
ANSI/USEMCSC C63.10/Cor 1-2023
ANSI/USEMCSC C63.10a-2024 (incl. Errata) for ISSED
ANSI C63.25.1-2018
KDB 558074 D01 v05r02
KDB 662911 D01 v02r01 for FCC MIMO device

3.3 Summary of Test Results

Item	Specification	Results	Remarks
Spurious Emission & Band Edge Compliance	FCC: Section 15.247(d) ISSED: RSS-247 6.6 RSS-Gen 8.9 RSS-Gen 8.10	Complied	Radiated (above 30 MHz) *1)
Note: UL Japan, Inc.'s EMI Work Procedures: Work Instructions-ULID-003591 and Work Instructions-ULID-003593.			
*1) Radiated test was selected over 30 MHz based on section 15.247(d).			

FCC Part 15.31 (e)

The RF Module has its own regulator.
The RF Module is constantly provided voltage through the regulator regardless of input voltage.
Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

Pattern Antenna is not removable from the EUT.
Other antennas have a unique coupling/antenna connector (MHF).
Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.4 Addition to Standard

No addition, exclusion nor deviation has been made from the standard.

3.5 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 (+/-)
Radiated Emission (Measurement distance: 3 m)	9 kHz to 30 MHz	3.4 dB
	30 MHz to 200 MHz	4.8 dB
	200 MHz to 1 GHz	6.0 dB
	1 GHz to 6 GHz	4.7 dB
	6 GHz to 18 GHz	5.3 dB
	18 GHz to 40 GHz	5.4 dB
Radiated Emission (Measurement distance: 1 m)	1 GHz to 18 GHz	5.6 dB
	18 GHz to 40 GHz	5.7 dB

3.6 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 (SR1)	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room (SR2)	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room (SR3)	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room (SR4)	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room (SR5)	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room (SR6)	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 Shielded room (SR8)	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room (MR1)	2.55 x 4.1 x 2.5	-	-
No.2 Measurement room (MR2)	4.5 x 3.5 x 2.5	-	-
Wireless shielded room 1 (WSR1)	3.0 x 4.5 x 2.7	3.0 x 4.5	-
Wireless shielded room 2 (WSR2)	3.0 x 4.5 x 2.7	3.0 x 4.5	-

3.7 Test Data, Test Instruments, and Test Set Up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

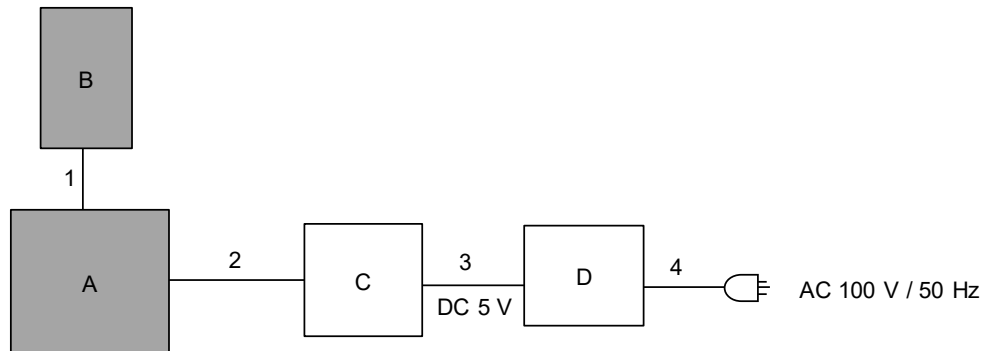
4.1 Operating Mode(s)

Mode	Remarks*
Transmitting (Tx)	Payload: PRBS9
*EUT has the power settings by the software as follows; Power Setting: Fixed Software: Firmware: U072A02_V1 Software: U072A02_V1 (Date: 2015.12.10, Storage location: EUT memory) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product. *EUT is operated with Input Mode and Output Mode by switching of setting. The difference between these 2 modes is Hopping operation. (Under Input Mode, it transmits with Hopping by itself. Under Output Mode, it transmits with Hopping by receiving signal from device of Input mode.) Under the test with Hopping Off, Input Mode was chosen as representative since these 2 modes are equal. Under the test with Hopping On, both two modes were carried out.	

Details of Operating Mode(s)

Test Item	Mode	Hopping	Tested Frequency
Radiated Spurious Emission (Below 1 GHz)	Transmitting (Tx)	Off	2403 MHz, 2439 MHz 2479 MHz
Radiated Spurious Emission (Above 1 GHz)	Transmitting (Tx)	Off	2403 MHz, 2439 MHz 2479 MHz

4.2 Configuration and Peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support Equipment

No.	Item	Model number	Serial Number	Manufacturer	Remarks
A	2.4 GHz transceiver module	NK-2.4Y	1	Circuit design	EUT
B	Antenna	ANT-2400-SMW2	1	Circuit design	EUT
C	Jig	-	-	Circuit design	-
D	Power Supply (DC)	PAN35-10A	CY002948	Kikusui Electronics Corp.	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	RF	0.06	Shielded	Shielded	-
2	Signal	0.2	Unshielded	Unshielded	-
3	DC	1.8	Unshielded	Unshielded	-
4	AC	2.8	Unshielded	Unshielded	-

SECTION 5: Radiated Spurious Emission

Test Procedure

[For below 1 GHz]

EUT was placed on the 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 the 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).

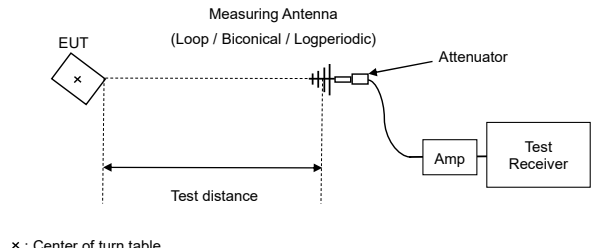
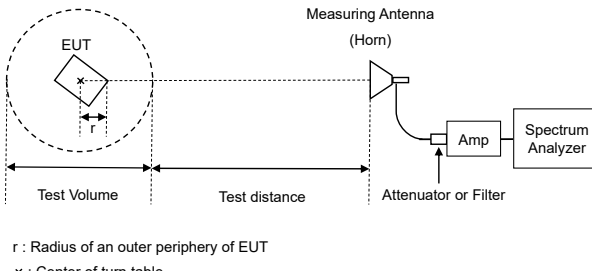
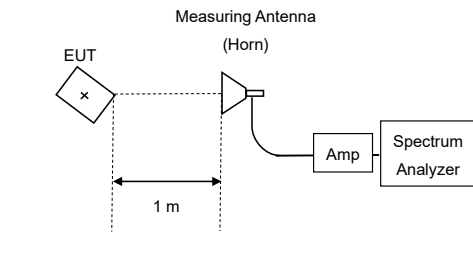
It was measured with the settings below based on ANSI C63.10.

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

*1) Measurements using an average detector are not performed for the following frequencies. The average detector limits for the following frequencies apply to peak detector measurements with the duty cycle correction factor (DCCF) applied.

Mode: Tx Hopping Off 2403 MHz
Frequency : 2390 MHz, 4806 MHz
Mode: Tx Hopping Off 2439 MHz
Frequency : 4878 MHz
Mode: Tx Hopping Off 2479 MHz
Frequency : 2483.5 MHz, 4958 MHz

Figure 1. Test Setup

Below 1 GHz	
 × : Center of turn table	Test Distance: 3 m
1 GHz to 10 GHz	
 r : Radius of an outer periphery of EUT × : Center of turn table	Distance Factor: $20 \times \log (3.98 \text{ m}^* / 3.0 \text{ m}) = 2.46 \text{ dB}$ *(Test Distance + SVSWR Volume / 2) - r = 3.98 m Test Distance: 3 m SVSWR Volume: 2.0 m (SVSWR Volume has been calibrated based on CISPR 16-1-4.) r: 0.02 m
10 GHz to 26.5 GHz	
 × : Center of turn table	Distance Factor: $20 \times \log (1.0 \text{ m} / 3.0 \text{ m}) = -9.54 \text{ dB}$ *Test Distance: 1 m

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

Module

Polarization	Below 1 GHz	1 GHz to 2.8 GHz	Career	2.8 GHz to 10 GHz	Above 10 GHz
Horizontal	Axis-X	Axis-X	Axis-X	Axis-Z	Axis-X
Vertical	Axis-X	Axis-Z	Axis-Z	Axis-Z	Axis-X

Antenna

Polarization	Below 1 GHz	1 GHz to 2.8 GHz	Career	2.8 GHz to 10 GHz	Above 10 GHz
Horizontal	Axis-X	Axis-X	Axis-X	Axis-X	Axis-X
Vertical	Axis-Y	Axis-Y	Axis-Y	Axis-Y	Axis-X

Test results are rounded off and limit are rounded down, so some differences might be observed.

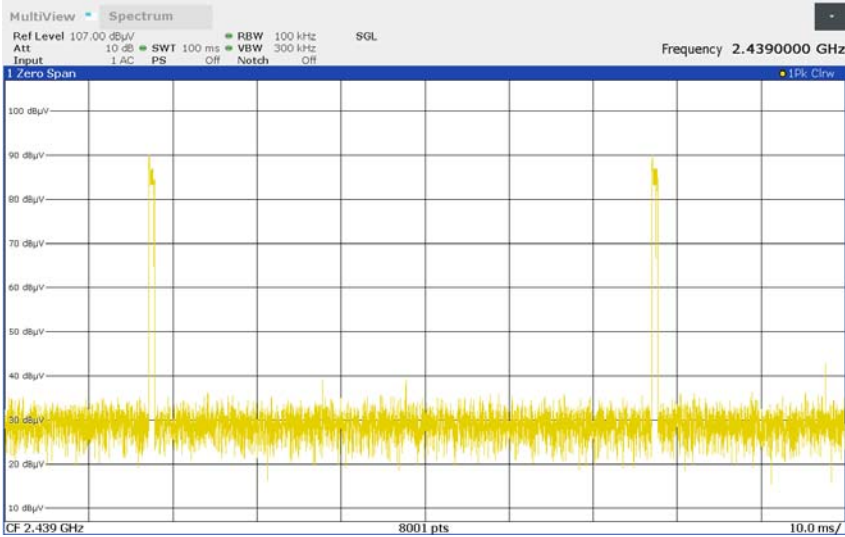
Measurement Range : 30 MHz to 26.5 GHz
 Test Data : APPENDIX
 Test Result : Pass

APPENDIX 1: Test data

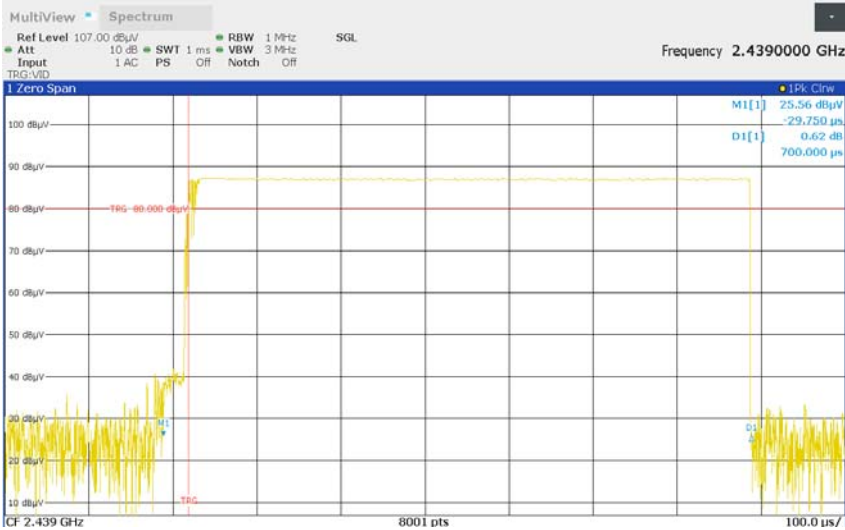
Duty Cycle Correction Factor

Mode	Tx, Hopping On			
Date	Test site	Temperature	Humidity	Engineer
November 28, 2025	WAC2	22 deg. C	33 % RH	Yuta Shiba

Tx On time 0.700 ms
Duty Cycle Correction Factor = $20 \times \log(0.700 \times 2 / 100) = -37.08 \text{ dB}$



Tx On time



Sample Calculation:
Duty Cycle Correction Factor = $20\log(\text{Tx On time} \times \text{Number of hopping in } 100 \text{ ms} / 100)$

*Duty Cycle correction factor by customer declaration, which is theoretically the maximum, was applied to Radiated Spurious Emission.

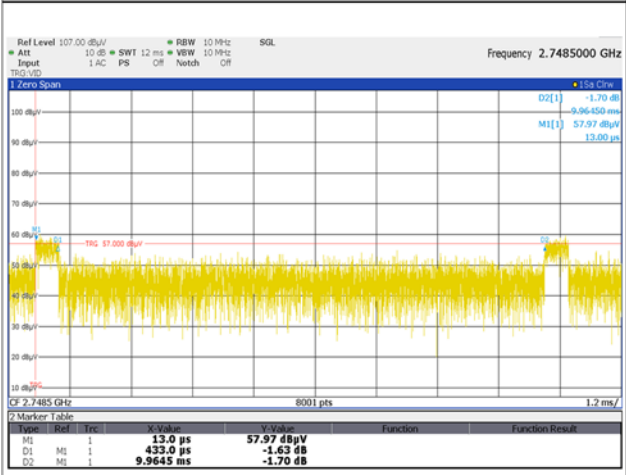
Burst Rate Confirmation

Mode	Tx, Hopping Off
------	-----------------

Date	Test site	Temperature	Humidity	Engineer
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba

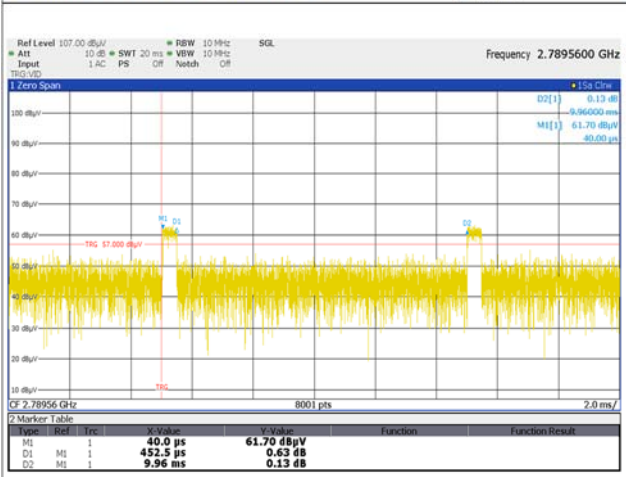
Mode : 2403 MHz(Frequency : 2.7485 GHz)

Tx on / (Tx on + Tx off) =	0.0435
Tx on / (Tx on + Tx off) * 100 =	4.35 %
Duty factor = 10 * log (9.9645 / 0.433) =	13.62 dB
VBW: 1 / on time = 2309.47 Hz <	3 kHz



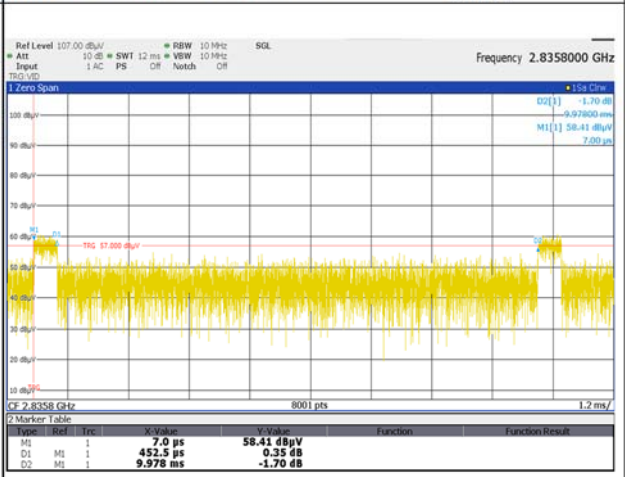
Mode : 2439 MHz(Frequency : 2.78956 GHz)

Tx on / (Tx on + Tx off) =	0.0454
Tx on / (Tx on + Tx off) * 100 =	4.54 %
Duty factor = 10 * log (9.96 / 0.4525) =	13.43 dB
VBW: 1 / on time = 2209.94 Hz <	3 kHz



Mode : 2479 MHz(Frequency : 2.8358 GHz)

Tx on / (Tx on + Tx off) =	0.0453
Tx on / (Tx on + Tx off) * 100 =	4.53 %
Duty factor = 10 * log (9.978 / 0.4525) =	13.43 dB
VBW: 1 / on time = 2209.94 Hz <	3 kHz



Radiated Spurious Emission

Mode	Tx, Hopping Off, 2403 MHz
------	---------------------------

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	30 MHz to 26.5 GHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	43.554	QP	23.60	10.95	6.49	33.00	0.00	8.04	40.0	31.9	100	0	-
Hori.	55.527	QP	23.90	9.76	6.53	33.12	0.00	7.07	40.0	32.9	100	0	-
Hori.	182.678	QP	23.40	13.48	7.43	33.13	0.00	11.18	43.5	32.3	100	0	-
Hori.	626.698	QP	22.00	19.43	8.53	31.85	0.00	18.11	46.0	27.8	100	0	-
Hori.	2390.000	PK	56.23	27.71	-28.27	-	2.46	58.13	71.4	13.3	317	181	-
Hori.	2748.500	PK	48.57	27.34	-27.96	-	2.46	50.41	71.4	21.0	138	119	-
Hori.	4806.000	PK	59.86	31.85	-35.97	-	2.46	58.20	71.4	13.2	104	169	-
Hori.	7209.000	PK	46.21	36.30	-34.40	-	2.46	50.57	71.4	20.8	150	0	Floor Noise
Hori.	9612.000	PK	45.35	38.04	-31.33	-	2.46	54.52	71.4	16.9	150	0	Floor Noise
Hori.	2748.500	AV	40.41	27.34	-27.96	-	2.46	42.25	51.4	9.1	138	119	VBW 3 kHz
Hori.	7209.000	AV	33.08	36.30	-34.40	-	2.46	37.44	51.4	14.0	150	0	Floor Noise
Hori.	9612.000	AV	32.29	38.04	-31.33	-	2.46	41.46	51.4	9.9	150	0	Floor Noise
Vert.	55.805	QP	23.90	9.75	6.53	33.13	0.00	7.05	40.0	32.9	100	0	-
Vert.	560.427	QP	22.50	18.01	8.38	32.07	0.00	16.82	46.0	29.1	100	0	-
Vert.	875.719	QP	21.00	21.94	9.07	30.60	0.00	21.41	46.0	24.5	100	6	-
Vert.	2390.000	PK	55.36	27.71	-28.27	-	2.46	57.26	71.4	14.1	152	325	-
Vert.	2748.500	PK	49.58	27.34	-27.96	-	2.46	51.42	71.4	20.0	150	149	-
Vert.	4806.000	PK	62.60	31.85	-35.97	-	2.46	60.94	71.4	10.5	100	171	-
Vert.	7209.000	PK	46.23	36.30	-34.40	-	2.46	50.59	71.4	20.8	150	0	Floor Noise
Vert.	9612.000	PK	45.40	38.04	-31.33	-	2.46	54.57	71.4	16.8	150	0	Floor Noise
Vert.	2748.500	AV	41.83	27.34	-27.96	-	2.46	43.67	51.4	7.7	150	149	VBW 3 kHz
Vert.	7209.000	AV	33.13	36.30	-34.40	-	2.46	37.49	51.4	13.9	150	0	Floor Noise
Vert.	9612.000	AV	32.43	38.04	-31.33	-	2.46	41.60	51.4	9.8	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

Distance Fac.: 1 GHz to 10 GHz : 20log (3.98 [m] / 3.0 [m]) = 2.46 [dB]

10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	PK	56.23	27.71	-28.27	-	-37.08	2.46	21.05	53.9	32.8	*1)
Hori.	4806.000	PK	59.86	31.85	-35.97	-	-37.08	2.46	21.12	53.9	32.7	-
Vert.	2390.000	PK	55.36	27.71	-28.27	-	-37.08	2.46	20.18	53.9	33.7	*1)
Vert.	4806.000	PK	62.60	31.85	-35.97	-	-37.08	2.46	23.86	53.9	30.0	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + DCCF + Distance Fac.

Distance Fac.: 1 GHz to 10 GHz : 20log (3.98 [m] / 3.0 [m]) = 2.46 [dB]

10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

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

20 dBc Data Sheet

(RBW 100 kHz, VBW 300 kHz)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2403.000	PK	92.26	27.74	-28.26	-	2.46	94.20	-	-	Carrier
Hori.	2400.000	PK	52.59	27.73	-28.26	-	2.46	54.52	74.2	19.6	-
Vert.	2403.000	PK	89.48	27.74	-28.26	-	2.46	91.42	-	-	Carrier
Vert.	2400.000	PK	51.44	27.73	-28.26	-	2.46	53.37	71.4	18.0	-

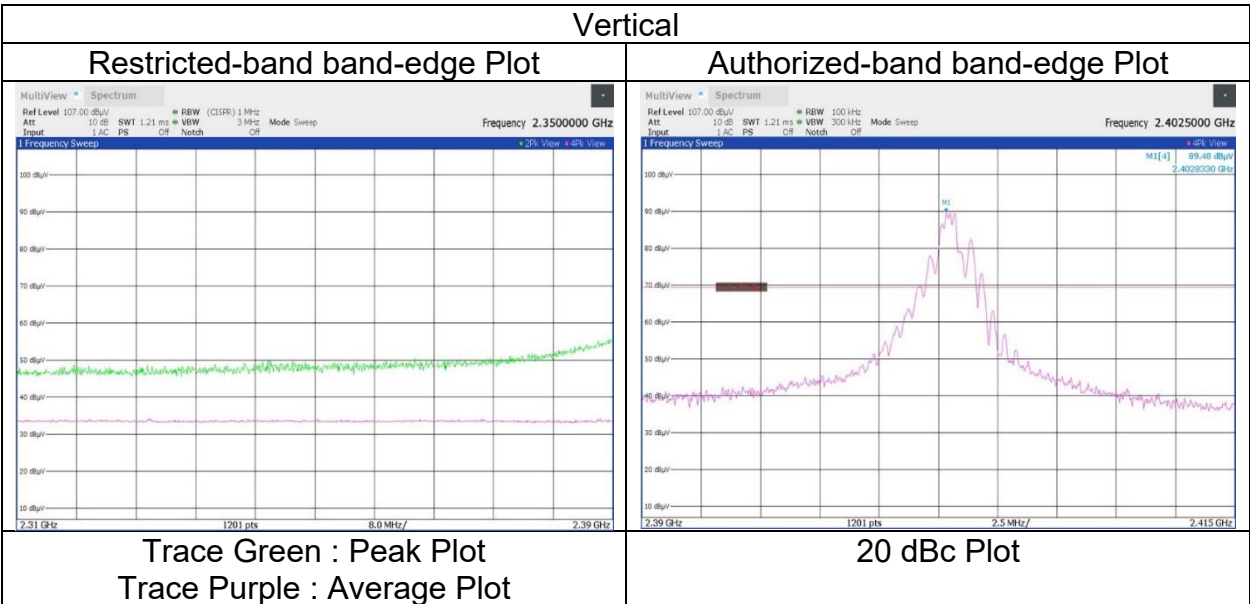
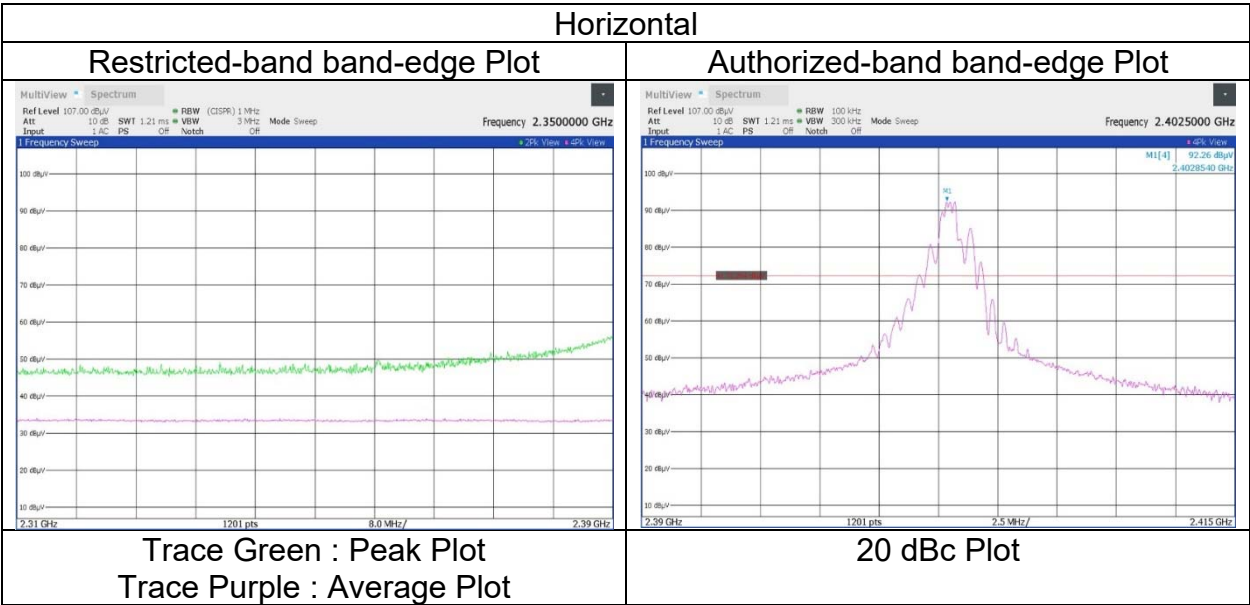
Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.

Distance Fac.: 1 GHz to 10 GHz : 20log (3.98 [m] / 3.0 [m]) = 2.46 [dB]

10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Radiated Spurious Emission
(Reference Plot for band-edge)

Mode	Tx, Hopping Off, 2403 MHz				
Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	1 GHz to 2.8 GHz



* 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

Mode	Tx, Hopping Off, 2439 MHz
------	---------------------------

Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	Above 1 GHz
November 28, 2025	WAC2	23 deg. C	33 % RH	Yuta Shiba	Below 1 GHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	55.535	QP	23.80	9.76	6.53	33.12	0.00	6.97	40.0	33.0	100	0	-
Hori.	86.755	QP	23.30	9.04	7.03	33.23	0.00	6.14	40.0	33.8	100	0	-
Hori.	164.060	QP	22.90	12.31	7.44	33.16	0.00	9.49	43.5	34.0	100	0	-
Hori.	843.104	QP	21.00	21.39	9.02	30.81	0.00	20.60	46.0	25.4	100	0	-
Hori.	2789.560	PK	48.83	27.51	-27.92	-	2.46	50.88	71.4	20.5	125	116	-
Hori.	4878.000	PK	60.22	32.26	-35.95	-	2.46	58.99	71.4	12.4	120	170	-
Hori.	7317.000	PK	46.74	36.65	-34.20	-	2.46	51.65	71.4	19.7	150	0	Floor Noise
Hori.	9756.000	PK	45.58	38.09	-31.13	-	2.46	55.00	71.4	16.4	150	0	Floor Noise
Hori.	2789.560	AV	40.11	27.51	-27.92	-	2.46	42.16	51.4	9.2	125	116	VBW: 3 kHz
Hori.	7317.000	AV	33.71	36.65	-34.20	-	2.46	38.62	51.4	12.8	150	0	Floor Noise
Hori.	9756.000	AV	32.09	38.09	-31.13	-	2.46	41.51	51.4	9.9	150	0	Floor Noise
Vert.	56.346	QP	23.20	9.72	6.53	33.13	0.00	6.32	40.0	33.6	100	0	-
Vert.	483.439	QP	22.40	17.36	8.22	32.34	0.00	15.64	46.0	30.3	100	0	-
Vert.	792.189	QP	21.00	20.74	8.91	31.02	0.00	19.63	46.0	26.3	100	0	-
Vert.	2789.560	PK	48.78	27.51	-27.92	-	2.46	50.83	71.4	20.6	167	331	-
Vert.	4878.000	PK	63.09	32.26	-35.95	-	2.46	61.86	71.4	9.5	100	178	-
Vert.	7317.000	PK	47.15	36.65	-34.20	-	2.46	52.06	71.4	19.3	150	0	Floor Noise
Vert.	9756.000	PK	45.25	38.09	-31.13	-	2.46	54.67	71.4	16.7	150	0	Floor Noise
Vert.	2789.560	AV	39.23	27.51	-27.92	-	2.46	41.28	51.4	10.1	167	331	VBW: 3 kHz
Vert.	7317.000	AV	33.94	36.65	-34.20	-	2.46	38.85	51.4	12.5	150	0	Floor Noise
Vert.	9756.000	AV	32.34	38.09	-31.13	-	2.46	41.76	51.4	9.6	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

Distance Fac. : 1 GHz to 10 GHz : $20\log(3.98[m] / 3.0[m]) = 2.46 [dB]$

10 GHz to 40 GHz : $20\log(1.00[m] / 3.0[m]) = -9.54 [dB]$

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4878.000	PK	60.22	32.26	-35.95	-	-37.08	2.46	21.91	53.9	31.9	-
Vert.	4878.000	PK	63.09	32.26	-35.95	-	-37.08	2.46	24.78	53.9	29.1	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + DCCF + Distance Fac.

Distance Fac. : 1 GHz to 10 GHz : $20\log(3.98[m] / 3.0[m]) = 2.46 [dB]$

10 GHz to 40 GHz : $20\log(1.00[m] / 3.0[m]) = -9.54 [dB]$

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

Radiated Spurious Emission

Mode	Tx, Hopping Off, 2479 MHz				
Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	Above 1 GHz
November 28, 2025	WAC2	23 deg. C	33 % RH	Yuta Shiba	Below 1 GHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg.]	Remark
Hori.	49.152	QP	23.40	10.25	6.54	33.07	0.00	7.12	40.0	32.8	100	0	-
Hori.	55.757	QP	23.40	9.75	6.53	33.13	0.00	6.55	40.0	33.4	100	0	-
Hori.	180.413	QP	23.30	13.32	7.46	33.14	0.00	10.94	43.5	32.5	100	0	-
Hori.	775.005	QP	21.20	20.49	8.88	31.15	0.00	19.42	46.0	26.5	100	0	-
Hori.	872.402	QP	20.80	21.92	9.06	30.62	0.00	21.16	46.0	24.8	100	0	-
Hori.	2483.500	PK	62.06	27.77	-28.21	-	2.46	64.08	71.4	7.3	113	51	-
Hori.	2835.800	PK	52.45	27.90	-35.67	-	2.46	47.14	71.4	24.3	146	325	-
Hori.	4958.000	PK	60.75	32.58	-35.92	-	2.46	59.87	71.4	11.5	109	22	-
Hori.	7437.000	PK	46.24	36.78	-33.97	-	2.46	51.51	71.4	19.9	150	263	Floor Noise
Hori.	9916.000	PK	44.78	38.15	-30.92	-	2.46	54.47	71.4	16.9	150	344	Floor Noise
Hori.	2835.800	AV	47.89	27.90	-35.67	-	2.46	42.58	51.4	8.8	146	325	VBW: 3 kHz
Hori.	7437.000	AV	33.75	36.78	-33.97	-	2.46	39.02	51.4	12.4	150	263	Floor Noise
Hori.	9916.000	AV	32.41	38.15	-30.92	-	2.46	42.10	51.4	9.3	150	344	Floor Noise
Vert.	56.327	QP	23.40	9.72	6.53	33.13	0.00	6.52	40.0	33.4	100	0	-
Vert.	605.041	QP	22.20	19.36	8.48	31.96	0.00	18.08	46.0	27.9	100	0	-
Vert.	877.221	QP	21.00	21.95	9.07	30.59	0.00	21.43	46.0	24.5	100	0	-
Vert.	2483.500	PK	61.34	27.77	-28.21	-	2.46	63.36	71.4	8.0	111	326	-
Vert.	2835.800	PK	51.69	27.90	-35.67	-	2.46	46.38	71.4	25.0	157	139	-
Vert.	4958.000	PK	62.12	32.58	-35.92	-	2.46	61.24	71.4	10.2	100	186	-
Vert.	7437.000	PK	46.54	36.78	-33.97	-	2.46	51.81	71.4	19.6	150	0	Floor Noise
Vert.	9916.000	PK	45.44	38.15	-30.92	-	2.46	55.13	71.4	16.3	150	0	Floor Noise
Vert.	2835.800	AV	46.78	27.90	-35.67	-	2.46	41.47	51.4	9.9	157	139	VBW: 3 kHz
Vert.	7437.000	AV	33.65	36.78	-33.97	-	2.46	38.92	51.4	12.5	150	0	Floor Noise
Vert.	9916.000	AV	32.39	38.15	-30.92	-	2.46	42.08	51.4	9.3	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + Distance Fac.

*Other frequency noises omitted in this report were not seen or have enough margin (more than 20 dB).

Distance Fac.: 1 GHz to 10 GHz : 20log (3.98 [m] / 3.0 [m]) = 2.46 [dB]

10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Peak measurement value with Duty cycle correction factor (DCCF)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	DCCF [dB]	Distance Fac. [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	PK	62.06	27.77	-28.21	-	-37.08	2.46	27.00	53.9	26.9	*1)
Hori.	4958.000	PK	60.75	32.58	-35.92	-	-37.08	2.46	22.79	53.9	31.1	-
Vert.	2483.500	PK	61.34	27.77	-28.21	-	-37.08	2.46	26.28	53.9	27.6	*1)
Vert.	4958.000	PK	62.12	32.58	-35.92	-	-37.08	2.46	24.16	53.9	29.7	-

Result = Reading + Ant.Fac. + Loss (Cable + (Atten or Filter)(below 18 GHz) - Gain(Amp) (1 GHz to 18 GHz)) - Gain(Amp) (only below 1 GHz & above 18 GHz) + DCCF + Distance Fac.

Distance Fac.: 1 GHz to 10 GHz : 20log (3.98 [m] / 3.0 [m]) = 2.46 [dB]

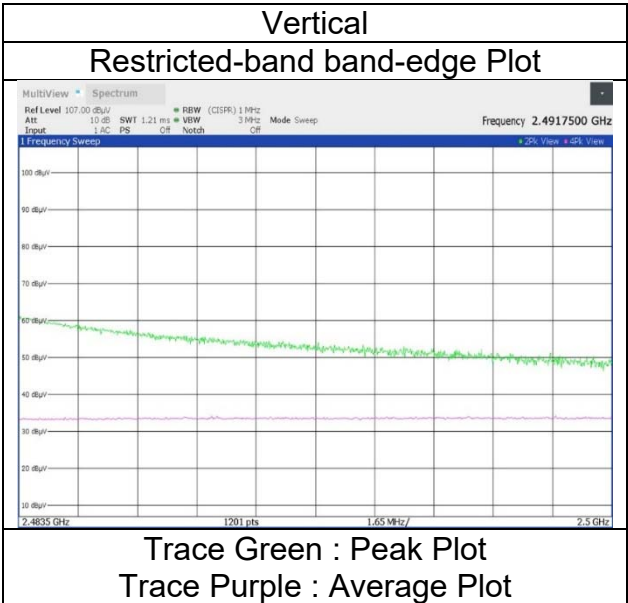
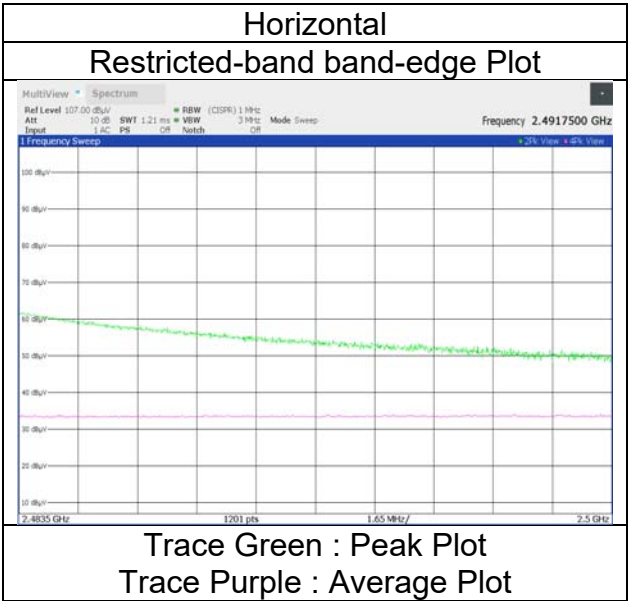
10 GHz to 40 GHz : 20log (1.00 [m] / 3.0 [m]) = -9.54 [dB]

Duty cycle correction factor (DCCF) refer to "Duty cycle correction factor" sheet.

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

Radiated Spurious Emission
(Reference Plot for band-edge)

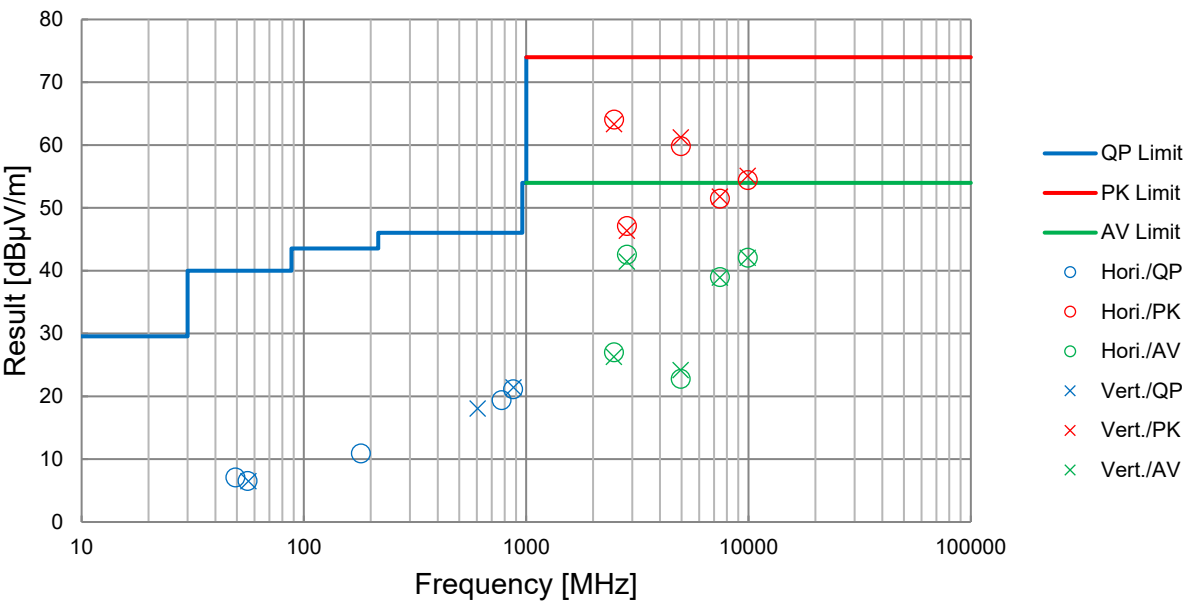
Mode	Tx, Hopping Off, 2479 MHz				
Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	1 GHz to 2.8 GHz



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

Radiated Spurious Emission
(Plot data, Worst case mode for Radiated Spurious Emission)

Mode	Tx, Hopping Off, 2479 MHz				
Date	Test site	Temperature	Humidity	Engineer	Measurement Range
November 27, 2025	WAC2	22 deg. C	39 % RH	Yuta Shiba	Above 1 GHz
November 28, 2025	WAC2	23 deg. C	33 % RH	Yuta Shiba	Below 1 GHz



*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
RE	199783	Attenuator	JFW	50HF-006N	-	2025/06/04	12
RE	239787	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124+BBA9106	01908	2025/08/14	12
RE	236709	Coaxial Cable	Hayashi-Repic co., Ltd.	NMS079B-GL310C-SMS117B-2m	47256-02-04	2025/05/28	12
RE	236711	Coaxial Cable	Hayashi-Repic co., Ltd.	KMS020B-GL140sE-KMS020B-7.0m	47256-03-02	2025/05/27	12
RE	236720	Coaxial Cable	Huber+Suhner	SF106/SF106/SF106	2001167/2001168/2001161	2025/05/28	12
RE	236724	Coaxial Cable	Hayashi-Repic co., Ltd.	SF106(HUBER+SUHNER)/LMR400UF/GL310C/GL310C	2000430/47753-2/47256-01-04/47256-01-02	2025/05/12	12
RE	236756	Coaxial Cable	Huber+Suhner	SF106/11N/11N/6000	2001167	2025/05/28	12
RE	239644	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	2306S022	2025/08/27	12
RE	243210	Coaxial Cable	Hayashi-Repic co., Ltd.	SMS13-13A26-NFS13-1.0m	49190-01-02	2024/12/05	12
RE	264042	Coaxial Cable	Hayashi-Repic co., Ltd.	SMS13-13A26-SFS13-0.5m	53292-01-02	2025/06/20	12
RE	235640	DIGITAL MULTIMETER	HIOKI E. E. CORPORATION	DT4261	230313157	2025/05/22	12
RE	170932	EMI Software	TSJ (Techno Science Japan)	TEPTO-DV3(RE,CE,ME,PE)	Ver 3.1.0612	-	-
RE	236584	Horn Antenna	AINFO Inc.	LB-8180-NF	2030013000112	2025/04/25	12
RE	236586	Horn Antenna	AINFO Inc.	LB-42-25-C2-KF	2020087000114	2025/04/25	12
RE	236687	Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	788	2025/04/25	12
RE	145528	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	195	2025/03/18	12
RE	236967	Pre Amplifier	TSJ (Techno Science Japan)	MLA-9K01-L01	23050010	2025/06/04	12
RE	237719	Pre Amplifier	TSJ (Techno Science Japan)	MLA-18265-J03	23060017	2025/06/19	12
RE	237786	RF RELAY MATRIX with preamplifier	TSJ (Techno Science Japan)	RFM-E221261R	07796	2025/11/23	12
RE	236615	Semi-Anechoic Chamber	TDK	SWAC-02(NSA)	2	2025/05/12	12
RE	236617	Semi-Anechoic Chamber	TDK	SWAC-02(SVSWR)	2	2025/06/13	12
RE	207281	Tape Measure	ASKUL	-	-	-	-
RE	235268	Test Receiver	Rohde & Schwarz	ESW44	103212	2024/12/18	12
RE	235738	Thermo-Hygrometer	CUSTOM. Inc	CTH-230	-	2025/04/16	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:

RE: Radiated Emission