EMI TEST REPORT

Test Report No. 15367106H-A-R1

Customer	**SMC Corporation**
Description of EUT	**Power Transmitter**
Model Number of EUT	**IN574-138-0**
FCC ID	**2AJE7SMC-WEX09**
Test Regulation	**FCC Part 18**
Test Result	**Complied**
Issue Date	**October 30, 2024**
Remarks	**-**

Representative test engineer	Approved by
Hiroki Numata Engineer	Akihiko Maeda Leader

CERTIFICATE 5107.02

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

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REVISION HISTORY

Original Test Report No. 15367106H-A

This report is a revised version of 15367106H-A. 15367106H-A is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15367106H-A	August 27, 2024	-
1	15367106H-A-R1	October 30, 2024	Correction of the tested model name (page 1, 5 and 9)
1	15367106H-A-R1	October 30, 2024	Correction of the Test Date in Section 2.2 due to addition of Average Output Power test; From July 18 to 21, 2024 To July 18 to September 8, 2024
1	15367106H-A-R1	October 30, 2024	Addition of the variant models to Section 2.3.
1	15367106H-A-R1	October 30, 2024	Correction of the Worst Margin in Section 3.2; [Radiated Emission] From 13.3 dB, 901.940 MHz, Vertical (Mode 1) To 5.1 dB, 1836.000 MHz, Vertical (Mode 1) [Conducted Emission] From 5.1 dB, 1836.000 MHz, Vertical (Mode 1) To 31.53 dB, 0.18655 MHz, AV, Phase N (Mode 2)
1	15367106H-A-R1	October 30, 2024	Addition of the “Average Output Power” test contents (page 4, 7, 9, 13, 22, 23 and 29)
1	15367106H-A-R1	October 30, 2024	Correction of the "Limit" in Radiated Emission (30 MHz to 1000 MHz: Mode 1 and 2) test data (page 18 and 19); From 23.5 dBµV/m To 28.0 dBµV/m

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

Company Name	SMC Corporation
Address	4-2-2, Kinunodai, Tsukubamirai-shi Ibaraki-ken 300-249 Japan
Telephone Number	+81-297-52-6665
Contact Person	Norimasa Ozaki

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	Power Transmitter
Model Number	IN574-138-0
Serial Number	Refer to SECTION 4.2
Condition	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification	No Modification by the test lab
Receipt Date	July 9, 2024
Test Date	July 18 to September 8, 2024

2.2. Product Description

General Specification

Rating	DC 24 V
Operating temperature	-20 deg. C to +60 deg. C
Clock frequency (maximum)	33.6 MHz

Radio Specification

Operating Frequency	918 MHz / 919.2 MHz
Rated Output Power	1.0 ± 0.1 W
Coil system	Dipole antenna
Charging distance	30 cm to 100 cm

2.3. Variant model(s)

Tested model: IN574-138-0 has a variant model: IN574-138-1.
The difference of these models is only the model name, and they are identical in EMC performance.
Therefore the test was performed with IN574-138-0 as representative.

SECTION 3: Test Specification, Procedures & Results

3.1 Test specification

Test Specification	FCC Part 18 The latest version on the first day of the testing period
Title	FCC 47CFR Part18 Industrial, scientific, and medical equipment

3.2 Procedures and results

Item	Test Procedure & Limits	Worst margin	Result	Remarks
Radiated Emission	Section 18.305 FCC/OET MP-5	5.1 dB 1836.000 MHz, Vertical (Mode 1)	Complied	-
Conducted Emission	Section 18.307 FCC/OET MP-5	31.53 dB 0.18655 MHz, AV, Phase N (Mode 2)	Complied	-
* Note: UL Japan, Inc.'s EMI Work Procedure: Work Instructions-ULID-003591.				

3.3 Addition to standard

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

3.4 Uncertainty

EMI

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.

Conducted emission

Item	Frequency range	Unit	Calculated Uncertainty (+/-)
AMN (LISN)	0.15 MHz to 30 MHz	dB	3.3

Radiated emission

Measurement distance	Frequency range		Unit	Calculated Uncertainty (+/-)
3 m	9 kHz to 30 MHz		dB	3.3
10 m			dB	3.1
3 m	30 MHz to 200 MHz	Horizontal	dB	5.0
		Vertical	dB	5.0
	200 MHz to 1000 MHz	Horizontal	dB	5.2
		Vertical	dB	6.2
10 m	30 MHz to 200 MHz	Horizontal	dB	5.5
		Vertical	dB	5.4
	200 MHz to 1000 MHz	Horizontal	dB	5.5
		Vertical	dB	5.5
3 m	1 GHz to 6 GHz		dB	5.1
	6 GHz to 18 GHz		dB	5.4
1 m	10 GHz to 18 GHz		dB	5.4
	18 GHz to 26.5 GHz		dB	5.3
	26.5 GHz to 40 GHz		dB	4.8
0.5 m	26.5 GHz to 40 GHz		dB	5.0

Average Output Power

Item	Unit	Calculated Uncertainty (+/-)
Antenna terminated conducted emission / Power density / Burst power	dB	3.47

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 Japan
Telephone: +81-596-24-8999
A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 884919
ISED Lab Company Number: 2973C / CAB identifier: JP0002

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms	Maximum measurement distance
No.1 semi-anechoic chamber	19.2 x 11.2 x 7.7	7.0 x 6.0	No.1 Power source room	10 m
No.2 semi-anechoic chamber	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.3 Preparation room	3 m
No.3 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.4 semi-anechoic chamber	12.0 x 8.5 x 5.9	6.8 x 5.75	No.4 Preparation room	3 m
No.4 shielded room	4.0 x 6.0 x 2.7	N/A	-	-
No.5 semi-anechoic chamber	6.0 x 6.0 x 3.9	6.0 x 6.0	-	-
No.5 measurement room	6.4 x 6.4 x 3.0	6.4 x 6.4	-	-
No.6 shielded room	4.0 x 4.5 x 2.7	4.0 x 4.5	-	-
No.6 measurement room	4.75 x 5.4 x 3.0	4.75 x 4.15	-	-
No.7 shielded room	4.7 x 7.5 x 2.7	4.7 x 7.5	-	-
No.8 measurement room	3.1 x 5.0 x 2.7	3.1 x 5.0	-	-
No.9 measurement room	8.8 x 4.6 x 2.8	2.4 x 2.4	-	-
No.10 shielded room	3.8 x 2.8 x 2.8	3.8 x 2.8	-	-
No.11 measurement room	4.0 x 3.4 x 2.5	N/A	-	-
No.12 measurement room	2.6 x 3.4 x 2.5	N/A	-	-
Large Chamber	16.9 x 22.1 x 10.17	16.9 x 22.1	-	10 m
Small Chamber	5.3 x 6.69 x 3.59	5.3 x 6.69	-	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 2.0 m for No.1, No.2, No.3, No.4, and No.5 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

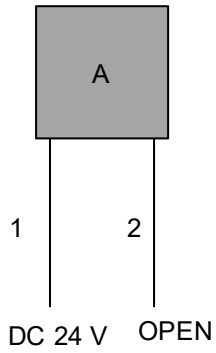
Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1. Operating mode(s)

Test mode	Remarks
1) Normal Operating mode (918.0 MHz) 2) Normal Operating mode (919.2 MHz)	-

4.2. Configuration and peripherals



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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Power Transmitter	IN574-138-0	440026 *1) 440051 *2)	SMC Corporation	EUT

*1) Used for Conducted Emission and Radiated Emission test
*2) Used for Average Output Power test

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal Cable	1.0	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

5.1 Operating environment

Date	See data
Test place	See data
Temperature	See data
Humidity	See data
Test engineer	See data
Mode	See data

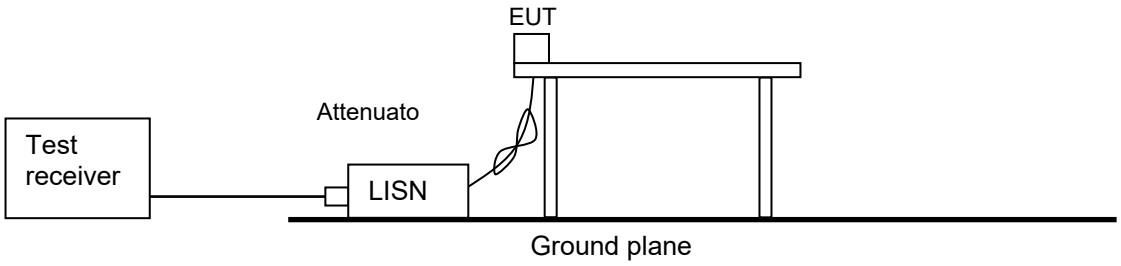
5.2 Test configuration

DC line
EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the horizontal ground plane.
The rear of tabletop was located 40 cm to the vertical ground plane. The rear of EUT and its 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 LISN/AMN and excess DC cable was bundled in center. 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. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/ an AMN to the input power source. All unused 50 ohm connectors of the LISN/ AMN were resistively terminated in 50 ohm when not connected to the measuring equipment.
Photographs of the set up are shown in APPENDIX 3.

5.3 Test conditions

Frequency range	150 kHz to 30 MHz
EUT position	Table top
EUT operation mode	See Clause 4.1

[Test Setup]



5.4 Test procedure

An overview sweep with peak detection has been performed.
The measurements had been performed with a quasi-peak detector and if required, with a CISPR average detector (CAV).
The conducted emission measurements were made with the detector (RBW) in the following table.

Frequency	150 kHz to 30 MHz
Instrument used	Test Receiver
IF Bandwidth	QP/CAV: 9 kHz / 9 kHz

5.5 Test result

Summary of the test results: Pass

SECTION 6: Radiated Emission

6.1 Operating environment

Date	See data
Test place	See data
Temperature	See data
Humidity	See data
Test engineer	See data
Mode	See data

6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 1.0 m above the conducting ground plane.
The EUT was set on the edge of the tabletop.
Test was made with the antenna positioned in 0 deg., 45 deg., 90 deg., 135 deg., 180 deg., and Horizontal.
The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
Photographs of the set up are shown in Appendix 3.
*Refer to Figure 1 about Direction of the Loop Antenna.

6.3 Test conditions

Frequency range	9 kHz to 30 MHz (Loop antenna)
	30 MHz to 200 MHz (Biconical antenna)
	200 MHz to 400 MHz (Logperiodic antenna)
	1000 MHz to 10000 MHz (Horn antenna)
Test distance	3 m / 10 m*1)
EUT position	Table top
EUT operation mode	See Clause 4.1

*1) Above 1 GHz tested only at 3 m.

6.4 Test procedure

[Below 30 MHz]
The height of antenna was fixed in 2 m.
EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed in 0 deg., 45 deg., 90 deg., 135deg., 180 deg., and Horizontal with the Test Receiver.
0 deg. of antenna position was made as the representative position for the tests since noise level was equivalent in all three positions.
The electric field intensity at a distance of 300 m was calculated from the measurement results at distances of 3 m and 10 m.

[Above 30 MHz]
Maximum electric field intensity was confirmed with the measurements at distances of 3 m and 10 m.
The electric field intensity at a distance of 300 m was calculated from the measurement results at distances of 3 m and 10 m.
The radiated emission measurements were made with the following detector function of the test receiver.

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

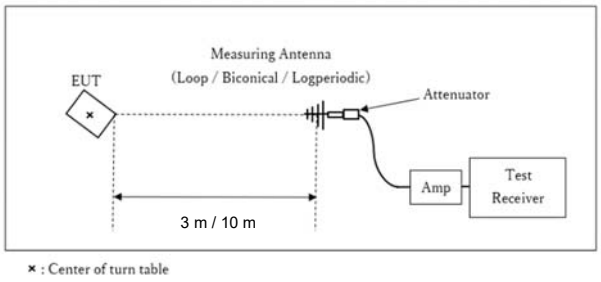
Frequency	9 kHz to 150 kHz	150 kHz to 30 MHz	30 MHz to 1000 MHz	1000 MHz to 10000 MHz
Instrument used	Test Receiver			
IF Bandwidth	AV: 200 Hz	AV: 9 kHz	AV: 120 kHz	AV: 1 MHz

The measurement result was calculated by the following formula:

[Frequency at which the signal was confirmed at both 10 m and 3 m]
Result = Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance (3 m) / Separate distance (300 m))
decade = (10 m reading - 3 m reading) / (log 3 m - log 10 m)
*Refer to Part 18 Section 305 Notes 2 and KDB 629601.

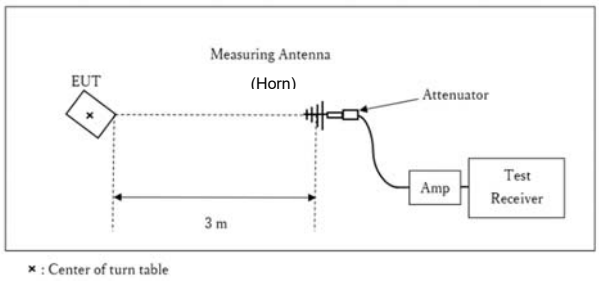
[Other Frequency]
Result = Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = 20 * Log (Test distance (3 m) / Separate distance (300 m))

<Test Setup>
Below 1 GHz



Test Distance: 3 m / 10 m

Above 1 GHz



Test Distance: 3 m

*1. Measurements are converted to 3 m by the distance factor.

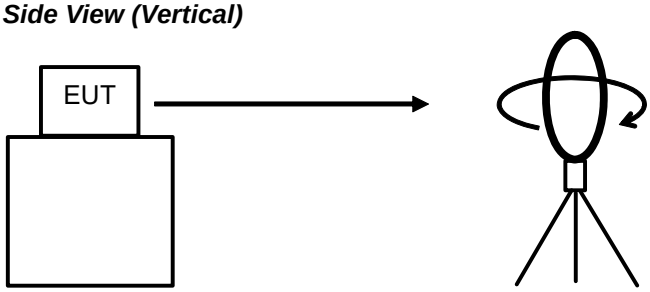
The test results and limit are rounded off to one decimal place, so some differences might be observed.

6.5 Test result

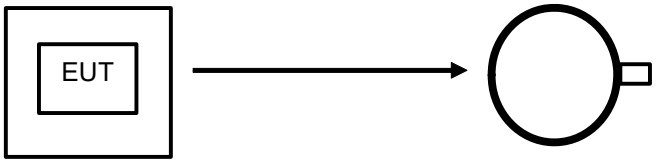
Summary of the test results: Pass

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

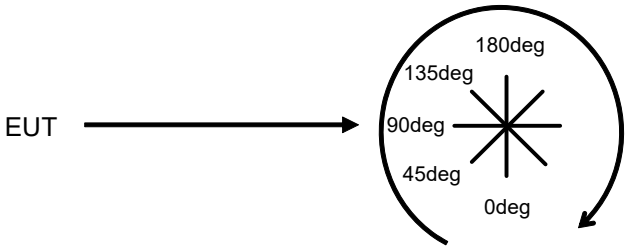


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



Front side: 0 deg.
Forward direction: clockwise

SECTION 7: Average Output Power

Test Procedure

Average Output Power was measured with a Power Meter to measure Burst Average.
The test data is reference data for RF Exposure.

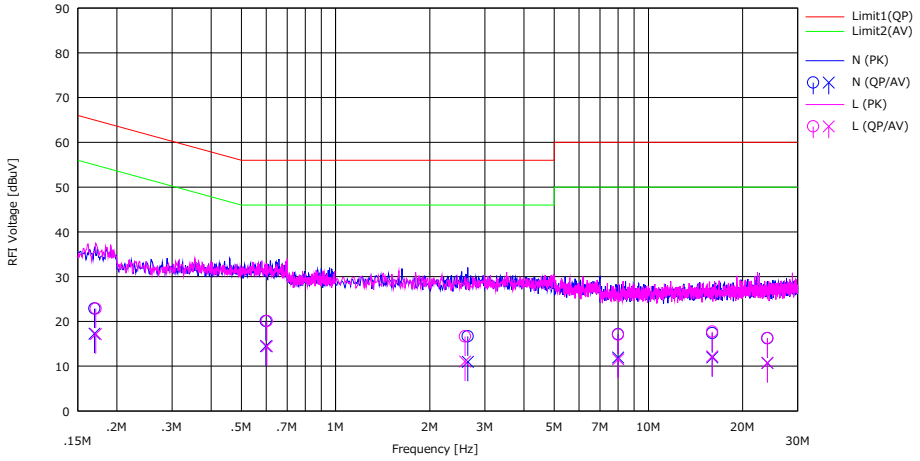
Test data: **APPENDIX**

APPENDIX 1: Test Data

Conducted Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 21, 2024
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Hiroki Numata
Mode	Mode 1

Limit : FCC_Part 18.307(b) All other part 18 consumer devices



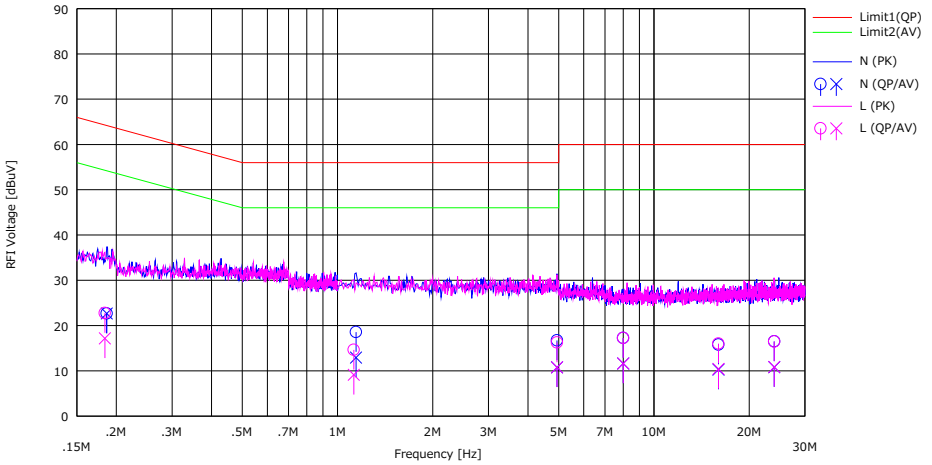
No.	Freq.	Reading ⟨QP⟩	Reading ⟨AV⟩	LISN	LOSS	Results ⟨QP⟩	Results ⟨AV⟩	Limit ⟨QP⟩	Limit ⟨AV⟩	Margin ⟨QP⟩	Margin ⟨AV⟩	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.16955	9.70	4.10	0.05	13.11	22.86	17.26	64.98	54.98	42.12	37.72	N	
2	0.59880	6.80	1.20	0.05	13.21	20.06	14.46	56.00	46.00	35.94	31.54	N	
3	2.64700	3.10	-2.60	0.09	13.47	16.66	10.96	56.00	46.00	39.34	35.04	N	
4	8.00000	3.10	-2.10	0.17	13.87	17.14	11.94	60.00	50.00	42.86	38.06	N	
5	16.00000	2.80	-2.60	0.34	14.25	17.39	11.99	60.00	50.00	42.61	38.01	N	
6	24.00000	1.20	-4.30	0.45	14.56	16.21	10.71	60.00	50.00	43.79	39.29	N	
7	0.17125	9.70	4.00	0.04	13.11	22.85	17.15	64.90	54.90	42.05	37.75	L	
8	0.60305	6.80	1.20	0.04	13.21	20.05	14.45	56.00	46.00	35.95	31.55	L	
9	2.59300	3.10	-2.50	0.07	13.47	16.64	11.04	56.00	46.00	39.36	34.96	L	
10	8.00000	3.00	-2.50	0.17	13.87	17.04	11.54	60.00	50.00	42.96	38.46	L	
11	16.00000	3.10	-2.40	0.36	14.25	17.71	12.21	60.00	50.00	42.29	37.79	L	
12	24.00000	1.20	-4.30	0.50	14.56	16.26	10.76	60.00	50.00	43.74	39.24	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Conducted Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 21, 2024
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Hiroki Numata
Mode	Mode 2

Limit : FCC_Part 18.307(b) All other part 18 consumer devices



No.	Freq.	Reading		LISN	LOSS	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈AV〉			〈QP〉	〈AV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.18655	9.50	9.50	0.04	13.12	22.66	22.66	64.19	54.19	41.53	31.53	N	
2	1.14400	5.20	-0.40	0.06	13.29	18.55	12.95	56.00	46.00	37.45	33.05	N	
3	4.94200	2.94	-3.00	0.12	13.67	16.73	10.79	56.00	46.00	39.27	35.21	N	
4	8.00000	3.20	-2.40	0.17	13.87	17.24	11.64	60.00	50.00	42.76	38.36	N	
5	16.00000	1.20	-4.30	0.34	14.25	15.79	10.29	60.00	50.00	44.21	39.71	N	
6	24.00000	1.50	-4.20	0.45	14.56	16.51	10.81	60.00	50.00	43.49	39.19	N	
7	0.18400	9.60	4.00	0.04	13.12	22.76	17.16	64.30	54.30	41.54	37.14	L	
8	1.12600	1.30	-4.20	0.05	13.29	14.64	9.14	56.00	46.00	41.36	36.86	L	
9	4.94200	2.50	-3.00	0.11	13.67	16.28	10.78	56.00	46.00	39.72	35.22	L	
10	8.00000	3.20	-2.40	0.17	13.87	17.24	11.64	60.00	50.00	42.76	38.36	L	
11	16.00000	1.40	-4.20	0.36	14.25	16.01	10.41	60.00	50.00	43.99	39.59	L	
12	24.00000	1.40	-4.20	0.50	14.56	16.46	10.86	60.00	50.00	43.54	39.14	L	

CHART: WITH FACTOR Peak hold data. CALCULATION : RESULT = READING + LISN + LOSS (CABLE + ATT)
Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 19, 2024
Temperature / Humidity	23 deg. C / 48 % RH
Engineer	Masaya Minami
	(Below 30 MHz)
Mode	Mode 1

FREQ [MHz]	Reading (3 m) [dBµV]	Reading (10 m) [dBµV]	ANT Factor [dB/m]	Atten + Cable loss [dB]	AMP Gain [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna [deg]	Remarks
0.30	29.0	NS	19.6	6.1	32.2	-40.0	-17.5	28.0	45.5	0	Reading(10 m) is Floor Noise *1)
0.60	26.4	NS	19.7	6.1	32.2	-40.0	-20.0	28.0	48.0	0	Reading(10 m) is Floor Noise *1)
4.00	24.1	NS	19.9	6.5	32.1	-40.0	-21.6	28.0	49.6	0	Reading(10 m) is Floor Noise *1)
8.00	23.6	NS	20.0	6.8	32.1	-40.0	-21.7	28.0	49.7	0	Reading(10 m) is Floor Noise *1)
16.00	23.3	NS	19.6	7.2	32.1	-40.0	-22.0	28.0	50.0	0	Reading(10 m) is Floor Noise *1)
24.00	22.8	NS	20.3	7.6	32.1	-40.0	-21.4	28.0	49.4	0	Reading(10 m) is Floor Noise *1)

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3 m) / Separate distance(300 m))
decade = (10 m reading - 3 m reading) / (log 3 m - log 10 m)

*1) Used for the square of an inverse linear distance extrapolation factor (20 dB/decade)
Except for the above table : adequate margin data below the limits.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 19, 2024
Temperature / Humidity	23 deg. C / 48 % RH
Engineer	Masaya Minami
	(Below 30 MHz)
Mode	Mode 2

FREQ [MHz]	Reading (3 m) [dBµV]	Reading (10 m) [dBµV]	ANT Factor [dB/m]	Atten + Cable loss [dB]	AMP Gain [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna [deg]	Remarks
0.30	29.0	NS	19.6	6.1	32.2	-40.0	-17.5	28.0	45.5	0	Reading(10 m) is Floor Noise *1)
0.60	26.4	NS	19.7	6.1	32.2	-40.0	-20.0	28.0	48.0	0	Reading(10 m) is Floor Noise *1)
4.00	24.1	NS	19.9	6.5	32.1	-40.0	-21.6	28.0	49.6	0	Reading(10 m) is Floor Noise *1)
8.00	23.6	NS	20.0	6.8	32.1	-40.0	-21.7	28.0	49.7	0	Reading(10 m) is Floor Noise *1)
16.00	23.3	NS	19.6	7.2	32.1	-40.0	-22.0	28.0	50.0	0	Reading(10 m) is Floor Noise *1)
24.00	22.8	NS	20.3	7.6	32.1	-40.0	-21.4	28.0	49.4	0	Reading(10 m) is Floor Noise *1)

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3 m) / Separate distance(300 m))
decade = (10 m reading - 3 m reading) / (log 3 m - log 10 m)

*1) Used for the square of an inverse linear distance extrapolation factor (20 dB/decade)
Except for the above table : adequate margin data below the limits.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 19, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Hiroki Numata
	(30 MHz to 1000 MHz)
Mode	Mode 1

FREQ [MHz]	Reading (3 m) [dBµV]	Reading (10 m) [dBµV]	ANT Factor [dB/m]	AMP gain [dB]	Atten + Cable loss [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna Polarization	Remarks
165.072	23.9	NS	12.8	39.0	9.6	-40.0	-32.7	28.0	60.7	Horizontal	Reading(10 m) is Floor Noise *1)
184.023	23.7	NS	13.8	39.0	9.8	-40.0	-31.7	28.0	59.7	Horizontal	Reading(10 m) is Floor Noise *1)
287.933	26.2	NS	13.5	38.8	11.0	-40.0	-28.1	28.0	56.1	Horizontal	Reading(10 m) is Floor Noise *1)
314.670	21.9	NS	14.0	38.7	11.2	-40.0	-31.6	28.0	59.6	Horizontal	Reading(10 m) is Floor Noise *1)
901.940	28.1	22.7	22.0	38.0	15.8	-20.7	7.2	28.0	20.8	Horizontal	
928.060	32.4	24.5	22.0	37.9	16.2	-30.2	2.5	28.0	25.5	Horizontal	
34.083	29.3	NS	12.6	38.9	7.5	-40.0	-29.5	28.0	57.5	Vertical	Reading(10 m) is Floor Noise *1)
60.022	27.3	NS	9.2	38.9	8.1	-40.0	-34.3	28.0	62.3	Vertical	Reading(10 m) is Floor Noise *1)
69.366	27.9	NS	9.0	38.9	8.3	-40.0	-33.8	28.0	61.8	Vertical	Reading(10 m) is Floor Noise *1)
286.425	25.8	NS	13.5	38.8	10.9	-40.0	-28.5	28.0	56.5	Vertical	Reading(10 m) is Floor Noise *1)
901.940	27.3	22.9	22.0	38.0	15.8	-16.8	10.2	28.0	17.8	Vertical	
928.060	30.7	24.6	22.0	37.9	16.2	-23.3	7.6	28.0	20.4	Vertical	

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3m) / Separate distance(300m))
decade = (10m reading - 3m reading) / (log 3m - log 10m)

*1) Used for the square of an inverse linear distance extrapolation factor (20 dB/decade)
Except for the above table : adequate margin data below the limits.

Worst direction of EUT was decided by test result performed on test distance at 3 m, and test distance at 10 m was performed worst direction.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.1
Date	July 19, 2024
Temperature / Humidity	24 deg. C / 47 % RH
Engineer	Hiroki Numata
	(30 MHz to 1000 MHz)
Mode	Mode 2

FREQ [MHz]	Reading (3 m) [dBµV]	Reading (10 m) [dBµV]	ANT Factor [dB/m]	AMP gain [dB]	Atten + Cable loss [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna Polarization	Remarks
165.072	23.8	NS	12.8	39.0	9.6	-40.0	-32.8	28.0	60.8	Horizontal	Reading(10 m) is Floor Noise *1)
184.023	23.8	NS	13.8	39.0	9.8	-40.0	-31.6	28.0	59.6	Horizontal	Reading(10 m) is Floor Noise *1)
287.933	26.1	NS	13.5	38.8	10.9	-40.0	-28.2	28.0	56.2	Horizontal	Reading(10 m) is Floor Noise *1)
314.670	21.7	NS	14.0	38.7	11.2	-40.0	-31.8	28.0	59.8	Horizontal	Reading(10 m) is Floor Noise *1)
901.940	27.8	21.6	22.0	38.0	15.8	-23.7	3.8	28.0	24.2	Horizontal	
928.060	33.3	25.0	22.0	37.9	16.2	-31.7	1.8	28.0	26.2	Horizontal	
34.083	29.2	NS	12.6	38.9	7.5	-40.0	-29.6	28.0	57.6	Vertical	Reading(10 m) is Floor Noise *1)
60.022	27.3	NS	9.2	38.9	8.1	-40.0	-34.3	28.0	62.3	Vertical	Reading(10 m) is Floor Noise *1)
69.366	27.8	NS	9.0	38.9	8.3	-40.0	-33.9	28.0	61.9	Vertical	Reading(10 m) is Floor Noise *1)
286.425	25.8	NS	13.5	38.8	10.9	-40.0	-28.5	28.0	56.5	Vertical	Reading(10 m) is Floor Noise *1)
901.940	27.0	22.3	22.0	38.0	15.8	-18.0	8.8	28.0	19.2	Vertical	
928.060	31.9	25.6	22.0	37.9	16.2	-24.1	8.1	28.0	19.9	Vertical	

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3m) / Separate distance(300m))
decade = (10m reading - 3m reading) / (log 3m - log 10m)

*1) Used for the square of an inverse linear distance extrapolation factor (20 dB/decade)
Except for the above table : adequate margin data below the limits.

Worst direction of EUT was decided by test result performed on test distance at 3 m, and test distance at 10 m was performed worst direction.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	July 18, 2024
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Masaya Minami
	(Above 1 GHz)
Mode	Mode 1

FREQ [MHz]	Reading (3 m) [dBµV]	ANT Factor [dB/m]	AMP gain [dB]	Atten + Cable loss [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna Polarization	Remarks
1836.000	65.7	25.5	34.7	4.3	-40.0	20.7	28.0	7.3	Horizontal	
2754.000	39.0	28.3	34.3	4.9	-40.0	-2.1	28.0	30.1	Horizontal	
3672.000	31.4	29.3	33.7	5.9	-40.0	-7.1	28.0	35.1	Horizontal	
4590.000	30.2	31.0	33.5	7.5	-40.0	-4.8	28.0	32.7	Horizontal	
5508.000	31.9	31.8	33.3	8.2	-40.0	-1.5	28.0	29.4	Horizontal	
6426.000	29.6	33.8	33.4	8.9	-40.0	-1.1	28.0	29.0	Horizontal	
7344.000	35.7	36.2	33.5	9.4	-40.0	7.8	28.0	20.2	Horizontal	
8262.000	34.9	36.5	33.8	9.7	-40.0	7.3	28.0	20.6	Horizontal	
9180.000	30.3	38.3	34.0	10.1	-40.0	4.8	28.0	23.2	Horizontal	
1836.000	67.9	25.5	34.7	4.3	-40.0	22.9	28.0	5.1	Vertical	
2754.000	40.2	28.3	34.3	4.9	-40.0	-0.8	28.0	28.8	Vertical	
3672.000	30.4	29.3	33.7	5.9	-40.0	-8.0	28.0	36.0	Vertical	
4590.000	30.1	31.0	33.5	7.5	-40.0	-4.9	28.0	32.8	Vertical	
5508.000	29.7	31.8	33.3	8.2	-40.0	-3.7	28.0	31.6	Vertical	
6426.000	29.6	33.8	33.4	8.9	-40.0	-1.1	28.0	29.0	Vertical	
7344.000	39.3	36.2	33.5	9.4	-40.0	11.3	28.0	16.6	Vertical	
8262.000	36.0	36.5	33.8	9.7	-40.0	8.4	28.0	19.5	Vertical	
9180.000	30.3	38.3	34.0	10.1	-40.0	4.7	28.0	23.2	Vertical	

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3m) / Separate distance(300m))
decade = (10m reading - 3m reading) / (log 3m - log 10m)

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	July 18, 2024
Temperature / Humidity	23 deg. C / 54 % RH
Engineer	Masaya Minami
	(Above 1 GHz)
Mode	Mode 2

FREQ [MHz]	Reading (3 m) [dBµV]	ANT Factor [dB/m]	AMP gain [dB]	Atten + Cable loss [dB]	Extrapolation Factor [dB]	Result (300 m) [dBµV/m]	Limit (300 m) [dBµV/m]	Margin [dB]	Antenna Polarization	Remarks
1838.400	65.4	25.5	34.7	4.3	-40.0	20.5	28.0	7.5	Horizontal	
2757.600	38.4	28.3	34.3	4.9	-40.0	-2.6	28.0	30.6	Horizontal	
3676.800	31.1	29.3	33.7	5.9	-40.0	-7.4	28.0	35.3	Horizontal	
4596.000	29.9	31.0	33.5	7.5	-40.0	-5.0	28.0	33.0	Horizontal	
5515.200	29.4	31.8	33.3	8.2	-40.0	-3.9	28.0	31.9	Horizontal	
6434.400	29.6	33.9	33.4	8.9	-40.0	-1.1	28.0	29.0	Horizontal	
7353.600	35.0	36.2	33.5	9.4	-40.0	7.1	28.0	20.8	Horizontal	
8272.800	36.3	36.5	33.8	9.7	-40.0	8.7	28.0	19.2	Horizontal	
9192.000	30.4	38.4	34.0	10.2	-40.0	4.9	28.0	23.0	Horizontal	
1838.400	67.3	25.5	34.7	4.3	-40.0	22.3	28.0	5.6	Vertical	
2757.600	39.6	28.3	34.3	4.9	-40.0	-1.4	28.0	29.4	Vertical	
3676.800	30.5	29.3	33.7	5.9	-40.0	-8.0	28.0	36.0	Vertical	
4596.000	30.0	31.0	33.5	7.5	-40.0	-4.9	28.0	32.9	Vertical	
5515.200	29.2	31.8	33.3	8.2	-40.0	-4.1	28.0	32.1	Vertical	
6434.400	29.4	33.9	33.4	8.9	-40.0	-1.2	28.0	29.2	Vertical	
7353.600	39.5	36.2	33.5	9.4	-40.0	11.6	28.0	16.4	Vertical	
8272.800	37.0	36.5	33.8	9.7	-40.0	9.4	28.0	18.5	Vertical	
9192.000	30.6	38.4	34.0	10.2	-40.0	5.1	28.0	22.8	Vertical	

CALCULATION(Result) : Reading + ANT Factor + Cable loss + Atten loss + Extrapolation Factor - AMP gain
Extrapolation Factor = decade * Log (Test distance(3m) / Separate distance(300m))
decade = (10m reading - 3m reading) / (log 3m - log 10m)

Average Output Power
(Reference data for RF Exposure)

Test place	Ise EMC Lab. No.3 Preparation room	
Date	August 29, 2024	September 8, 2024
Temperature / Humidity	22 deg. C / 79 % RH	23 deg. C / 65 % RH
Engineer	Takafumi Noguchi	Takafumi Noguchi
Mode	Mode 1, 2	

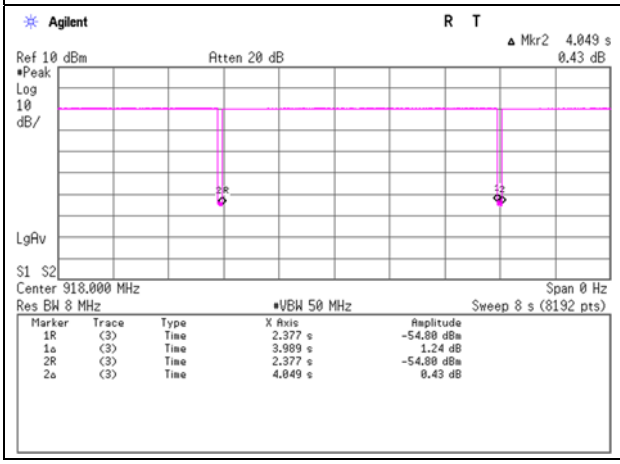
				Conducted Power				
Freq.	Reading	Cable	Atten.	Result (Time average)		Duty	Result (Burst power average)	
[MHz]	(P/M) [dBm]	Loss [dB]	Loss [dB]	[dBm]	[mW]	factor [dB]	[dBm]	[mW]
918.0	-9.86	0.35	39.65	30.14	1032.76	0.06	30.20	1047.13
919.2	-9.73	0.35	39.65	***30.27***	***1064.14***	0.06	***30.33***	***1078.95***

Sample Calculation:
Conducted Power Result (Time average) = Reading + Cable Loss + Atten. Loss
Conducted Power Result (Burst power average) = Reading + Cable Loss + Atten. Loss + Duty factor
*The equipment and cables were not used for factor 0 dB of the data sheets.

Duty cycle

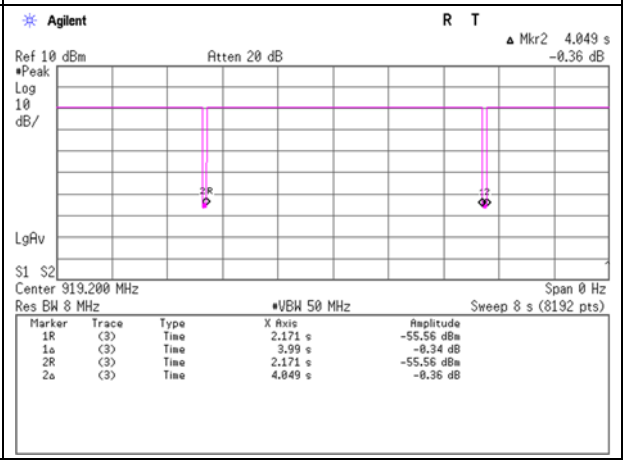
918.0 MHz

Tx on / (Tx on + Tx off) = 0.985
Tx on / (Tx on + Tx off) * 100 = 98.5 %
Duty factor = 10 * log (4049 / 3989) = 0.06 dB



919.2 MHz

Tx on / (Tx on + Tx off) = 0.985
Tx on / (Tx on + Tx off) * 100 = 98.5 %
Duty factor = 10 * log (4.049 / 3.99) = 0.06 dB



APPENDIX 2: Test Instruments

Test equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
CE	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/ RG400u/ RFM-E421(SW)	-/01068 (Switcher)	06/24/2024	12
CE	141248	Attenuator	JFW Industries, Inc.	50FP-013H2 N	-	12/08/2023	12
CE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	02/01/2024	12
CE	141538	LISN(AMN)	Schwarzbeck Mess-Elektronik OHG	NSLK8127	8127-732	07/14/2024	12
CE	141568	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	2901	01/10/2024	12
CE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	11/20/2023	12
CE	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	12/06/2023	24
CE	142226	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
CE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/16/2023	12
RE	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/ RG400u/ RFM-E421(SW)	-/01068 (Switcher)	06/24/2024	12
RE	141232	High Pass Filter 3.5-18.0GHz	UL Japan	HPF SELECTOR	001	09/04/2023	12
RE	141326	Microwave Cable	Suhner	SUCOFLEX101	2874(1m) / 2877(5m)	03/01/2024	12
RE	141327	Coaxial Cable	UL Japan	-	-	02/09/2024	12
RE	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	03/05/2024	12
RE	141402	High pass Filter 1.4-5.0GHz	Mini-Circuits	VHF-1320	10411	07/04/2024	12
RE	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	10/17/2023	12
RE	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	02/01/2024	12
RE	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/01/2023	12
RE	141568	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	2901	01/10/2024	12
RE	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/17/2024	12
RE	141585	Pre Amplifier	L3 Narda-MITEQ	MLA-10K01-B01-35	1237616	02/17/2024	12
RE	141903	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46186390	01/26/2024	12
RE	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	11/20/2023	12
RE	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	12/06/2023	24
RE	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	12/12/2023	24
RE	142152	Loop Antenna	Rohde & Schwarz	HFH2-Z2	836553/009	10/17/2023	12
RE	142226	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	159670	Coaxial Cable	UL Japan	-	-	11/21/2023	12
RE	160924	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	225	11/29/2023	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	197990	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124 + BBA 9106	01365	11/29/2023	12
RE	226574	Band Rejection Filter(915-921MHz)	Wakoh Communication Industrial Co., Ltd.	WFR-530	22054011	12/27/2023	12
RE	244707	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202102	01/25/2024	12
AT	141170	Attenuator(40dB)	Weinschel Corp	MODEL 1	BF1940	12/06/2023	12
AT	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
AT	141809	Power Meter	Anritsu Corporation	ML2495A	825002	05/22/2024	12
AT	141830	Power sensor	Anritsu Corporation	MA2411B	738285	05/22/2024	12
AT	141978	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180899	05/09/2024	12
AT	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	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:

CE: Conducted Emissions
RE: Radiated Emission
AT: Average Output Power