

EMI TEST REPORT

Test Report No. 15647760H-A-R2

Customer	Panasonic Automotive Systems Co., Ltd
Description of EUT	Car Navigation
Model Number of EUT	AT2401
FCC ID	ACJ932AT2401
Test Regulation	FCC Part 15 Subpart B
Test Result	Complied
Issue Date	April 23, 2025
Remarks	-

Representative test engineerTakumi Nishida
Engineer**Approved by**Takumi Shimada
Engineer

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".

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

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REVISION HISTORY

Original Test Report No. 15647760H-A

This report is a revised version of 15647760H-A-R1. 15647760H-A-R1 is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	15647760H-A	January 23, 2025	-
1	15647760H-A-R1	March 31, 2025	<u>4.2 Configuration and peripherals</u> <u>Table for List of Cables Used</u> - Corrected information of Cable 11 and 12: DC Cable (Unshielded) -> USB Cable (Shielded) <u>5.3 Test conditions</u> - Corrected Test distance: 3 m -> 3 m / 1 m <u>Figure 1: Test Setup</u> - Deleted note for 1 GHz to 10 GHz: “(The test was...conservative condition.)”
2	15647760H-A-R2	April 23, 2025	<u>4.2 Configuration and peripherals</u> <u>Table for List of Cables Used</u> - Corrected information of Cable 11 and 12: USB Cable (Shielded) -> Signal Cable (Unshielded)

Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	Hori.	Horizontal
AAN	Asymmetric Artificial Network	ICES	Interference-Causing Equipment Standard
AC	Alternating Current	I/O	Input/Output
AE	Auxiliary equipment	IEC	International Electrotechnical Commission
AM	Amplitude Modulation	IEEE	Institute of Electrical and Electronics Engineers
AMN	Artificial Mains Network	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	ISN	Impedance Stabilization Network
AP	Access Point	ISO	International Organization for Standardization
ASK	Amplitude Shift Keying	JAB	Japan Accreditation Board
Atten., ATT	Attenuator	LAN	Local Area Network
AV	Average	LCL	Longitudinal Conversion Loss
BPSK	Binary Phase-Shift Keying	LIMS	Laboratory Information Management System
BR	Bluetooth Basic Rate	LISN	Line Impedance Stabilization Network
BT	Bluetooth	MRA	Mutual Recognition Arrangement
BT LE	Bluetooth Low Energy	N/A	Not Applicable
BW	BandWidth	NIST	National Institute of Standards and Technology
C.F	Correction Factor	NS	No signal detect.
Cal Int	Calibration Interval	NSA	Normalized Site Attenuation
CAV	CISPR AV	OBW	Occupied BandWidth
CCK	Complementary Code Keying	OFDM	Orthogonal Frequency Division Multiplexing
CDN	Coupling Decoupling Network	PER	Packet Error Rate
Ch., CH	Channel	PK	Peak
CISPR	Comite International Special des Perturbations Radioelectriques	P _{LT}	long-term flicker severity
Corr.	Correction	POHC(A)	Partial Odd Harmonic Current
CPE	Customer premise equipment	Pol., Pola.	Polarization
CW	Continuous Wave	PR-ASK	Phase Reversal ASK
DBPSK	Differential BPSK	P _{ST}	short-term flicker severity
DC	Direct Current	QAM	Quadrature Amplitude Modulation
DET	Detector	QP	Quasi-Peak
D-factor, D.fac.	Distance factor	QPSK	Quadrature Phase Shift Keying
Dmax	maximum absolute voltage change during an observation period	r.m.s., RMS	Root Mean Square
DQPSK	Differential QPSK	RBW	Resolution BandWidth
DSSS	Direct Sequence Spread Spectrum	RE	Radio Equipment
DUT	Device Under Test	REV	Reverse
EDR	Enhanced Data Rate	RF	Radio Frequency
e.i.r.p., EIRP	Equivalent Isotropically Radiated Power	RFID	Radio Frequency Identifier
EM clamp	Electromagnetic clamp	RNSS	Radio Navigation Satellite Service
EMC	ElectroMagnetic Compatibility	RSS	Radio Standards Specifications
EMI	ElectroMagnetic Interference	Rx	Receiving
EMS	ElectroMagnetic Susceptibility	S.fac.	Site factor
EN	European Norm	SINAD	Ratio of (Signal + Noise + Distortion) to (Noise + Distortion)
e.r.p., ERP	Effective Radiated Power	S/N	Signal to Noise ratio
ETSI	European Telecommunications Standards Institute	SA, S/A	Spectrum Analyzer
EU	European Union	SABS	South African Bureau of Standards
EUT	Equipment Under Test	SANS	South African National Standards
Fac.	Factor	SG	Signal Generator
FCC	Federal Communications Commission	SVSWR	Site-Voltage Standing Wave Ratio
FHSS	Frequency Hopping Spread Spectrum	THC(A)	Total Harmonic Current
FM	Frequency Modulation	THD(%)	Total Harmonic Distortion
Freq.	Frequency	TR, T/R	Test Receiver
FSK	Frequency Shift Keying	Tx	Transmitting
Fund	Fundamental	UFA	Uniform field area
FWD	Forward	VBW	Video BandWidth
GFSK	Gaussian Frequency-Shift Keying	Vert.	Vertical
GNSS	Global Navigation Satellite System	WLAN	Wireless LAN
GPS	Global Positioning System	xDSL	Generic term for all types of DSL technology (DSL: Digital Subscriber Line)

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SECTION 1: Customer information

Company Name	Panasonic Automotive Systems Co., Ltd *1)
Address	4261, Ikonobe-cho, Tsuzuki-ku, Yokohama-shi, Kanagawa-ken 224-8520, Japan
Telephone Number	+81-50-1802-5117
Contact Person	Daisuke Takahata

*1) The Grantee name in the FCC application is "Panasonic Corporation of North America".

The information provided by the customer is as follows;

- Customer, Description of EUT, Model Number of EUT 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	Car Navigation
Model Number	AT2401
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	June 26, 2024
Test Date	July 28 to August 6, 2024

2.2 Product Description

General Specification

Rating	DC 13.2 V
Clock frequency (ies) in the system	(SOC) 38.4 MHz, (CPU) 20 MHz, 0.03277 MHz, (AM/FM) 36.4 MHz, 36.864 MHz, (GNSS) 26 MHz, 0.03277 MHz, (Ether) 25 MHz, (Video) 32 MHz

Radio Specification

Bluetooth (BR / EDR / BT LE)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	FHSS, GFSK / $\pi/4$ -DQPSK, 8DPSK / GFSK
Antenna Gain	4.00 dBi

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	4.00 dBi

AM/FM

Equipment Type	Receiver
Frequency of Operation	AM: 530 kHz to 1620 kHz FM: 76.0 MHz to 108.0 MHz
Type of Modulation	AM FM
Antenna Connector Type	Car manufacturer original
Impedance	AM, FM: 75 ohm

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	FCC Part 15 Subpart B The latest version on the first day of the testing period
Title	FCC 47CFR Part15 Radio Frequency Device Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 + C63.4a: 2017 7. AC power - line conducted emission measurements	FCC: Part 15 Subpart B 15.107(a)	-	N/A	*1)
Radiated emission	FCC: ANSI C63.4: 2014 + C63.4a: 2017 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	11.33 dB 625.003 MHz, QP, Vertical (Mode 2, Other)	Complied	-
Antenna Terminal	FCC: ANSI C63.4: 2014 + C63.4a: 2017 12. Measurement of unintentional radiators other than ITE	FCC: Part 15 Subpart B 15.111(a)	17.59 dB 2059.196 MHz, PK (Mode 4, Other)	Complied	-

* Note: UL Japan, Inc.'s EMI Work Procedure: Work Instructions-ULID-003591.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

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 $k = 2$.

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

Antenna Terminal test

Item	Unit	Calculated Uncertainty (+/-)
Antenna terminal conducted emission	dB	3.1

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	-	-

3.6 Test data, Test instruments, and Test set up

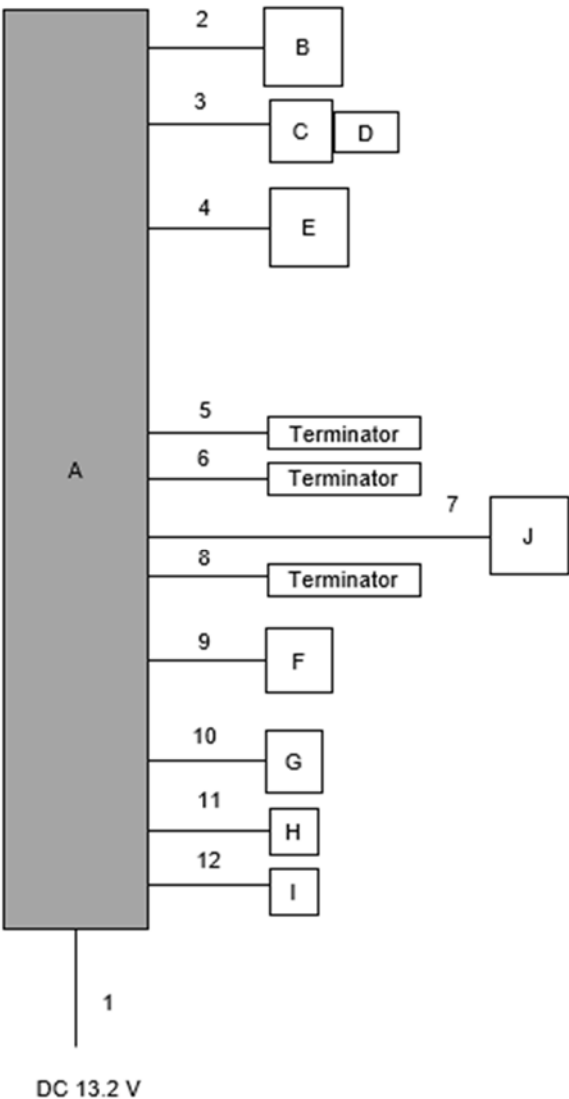
Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	1. FM Receiving (Local) mode (Analog): for RE 2. FM Receiving (Other) mode (Analog): for RE 3. Antenna Terminal mode (Local) (Analog): for AT 4. Antenna Terminal mode (Other) (Analog): for AT
Software(s)	YEP1RM09303B
Abbreviations for test items	RE: Radiated Emission, AT: Antenna Terminal Conducted Emission

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	Car Navigation	AT2401	500009	Panasonic	EUT
B	ADAS Jig	GVIF3OUT2A	8	Persol AVC Technology Co., Ltd.	-
C	USB BOX	DEP38-10029	-	Japan Aviation Electronics Industry, Ltd.	-
D	USB Memory	RUF3-K16GB	P10416	Buffalo Inc.	-
E	Speaker Dummy	HS50 4RF	-	ARCOL UK Limited	-
F	Steering Switch	-	1400	Panasonic	-
G	GPS Antenna	ANN-MS	20N40132	U-Blox	-
H	Microphone	SDA3520A	4AC011627	Panasonic	-
I	Microphone	SDA3520A	4AC011628	Panasonic	-
J	Signal Generator	SMC100A	103408	Rohde & Schwarz	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	4.3	Unshielded	Unshielded	-
2	Signal Cable	1.9	Unshielded	Unshielded	-
3	USB Cable	2.3	Shielded	Shielded	-
4	Audio Cable	2.5	Shielded	Shielded	-
5	LAN Cable	3.0	Shielded	Shielded	-
6	Signal Cable	1.0	Shielded	Shielded	-
7	FM Cable	3.0	Shielded	Shielded	-
8	FM Cable	3.0	Shielded	Shielded	-
9	Signal Cable	4.3	Unshielded	Unshielded	-
10	GPS Antenna Cable	2.0	Shielded	Shielded	-
11	Signal Cable	4.3	Unshielded	Unshielded	-
12	Signal Cable	4.3	Unshielded	Unshielded	-

SECTION 5: Radiated Emission

5.1 Operating environment

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

5.2 Test configuration

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 EUT was set on the edge of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. 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.

5.3 Test conditions

Frequency range : 30 MHz to 200 MHz (Biconical antenna)
200 MHz to 1000 MHz (Logperiodic antenna)
1000 MHz to 30000 MHz (Horn antenna)
Test distance : 3 m / 1 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

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

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

The radiated emission measurements were made with the following detector function of the Test Receiver and the Spectrum Analyzer.

The test of Local oscillator spurious has been measured up to appropriate frequency based on the result of the antenna terminal test.

Test antenna was aimed at the emission source for receiving the maximum signal and always kept. (Above 1 GHz)

Frequency	Below 1 GHz	1 GHz to 26 GHz *1)	26 GHz to 40 GHz *1)
Instrument used	Test Receiver	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CAV: BW 1 MHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *2): RBW: 1 MHz / VBW: 10 Hz

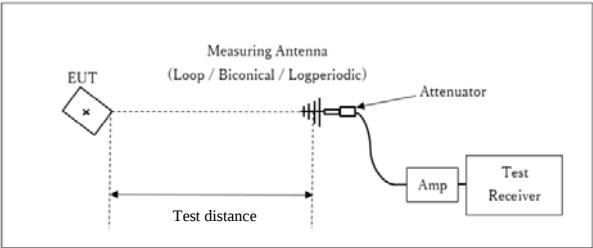
*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor: See Figure 1.

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

Figure 1: Test Setup

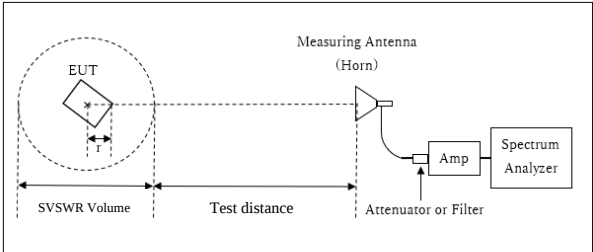
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz to 10 GHz



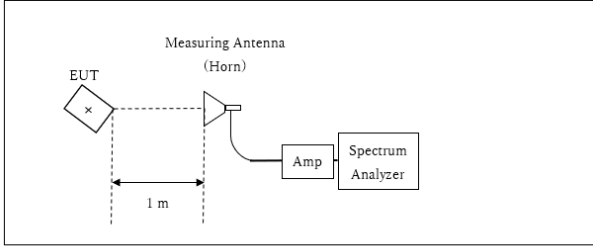
r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log(3.25 \text{ m}^* / 3.0 \text{ m}) = 0.70 \text{ dB}$
*(Test Distance + SVSWR Volume / 2) - r = 3.25 m

Test Distance: 3 m
SVSWR Volume: 2 m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r: 0.75 m

10 GHz to 30 GHz



x : 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 test was made on EUT at the normal use position.

5.5 Test result

Summary of the test results: Pass

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

SECTION 6: Antenna Terminal

6.1 Operating environment

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

6.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m from the ground. Photographs of the set up are shown in APPENDIX 3.

6.3 Test conditions

Frequency range : 30 MHz to 1000 MHz / 1000 MHz to 10000 MHz
Test distance : N/A
EUT position : Table top
EUT operation mode : See Clause 4.1

6.4 Test procedure

The Antenna Terminal was measured with a spectrum analyzer connected to the antenna port.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Spectrum Analyzer	Spectrum Analyzer *1)
IF Bandwidth	PK: RBW: 100 kHz / VBW: 100 kHz	PK: RBW: 1 MHz / VBW: 3 MHz

*1) The Spectrum Analyzer was used in 3 dB resolution bandwidth.

6.5 Test result

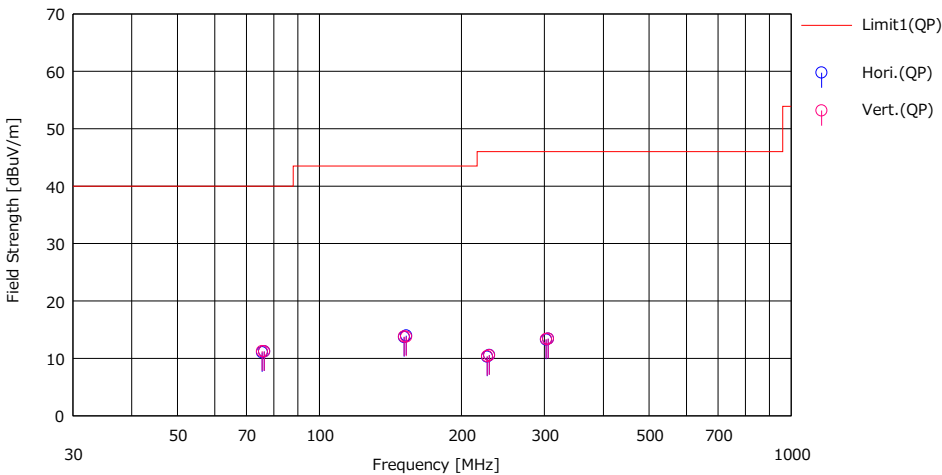
Summary of the test results: Pass

APPENDIX 1: Test data

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date August 5, 2024
Temperature / Humidity 22 deg. C / 51 % RH
Engineer Takumi Nishida
 (Below 1 GHz)
Mode Mode 1 (Local) 76.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading (QP)	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result (QP)	Limit (QP)	Margin (QP)	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV/m]	[dBuV/m]	[dB]					
1	75.612	29.00	6.51	7.61	32.09	11.03	40.00	28.97	Hori.	100	0	BA	
2	76.388	29.10	6.56	7.62	32.09	11.19	40.00	28.81	Hori.	100	0	BA	
3	151.224	22.30	15.10	8.32	32.03	13.69	43.50	29.81	Hori.	100	0	BA	
4	152.776	22.50	15.16	8.33	32.03	13.96	43.50	29.54	Hori.	100	0	BA	
5	226.836	22.00	11.30	8.98	32.01	10.27	46.00	35.73	Hori.	100	0	LA23	
6	229.164	22.21	11.35	9.00	32.01	10.55	46.00	35.45	Hori.	100	0	LA23	
7	302.448	22.00	13.68	9.59	32.02	13.25	46.00	32.75	Hori.	100	0	LA23	
8	305.552	22.10	13.73	9.61	32.02	13.42	46.00	32.58	Hori.	100	0	LA23	
9	75.612	29.20	6.51	7.61	32.09	11.23	40.00	28.77	Vert.	100	0	BA	
10	76.388	29.10	6.56	7.62	32.09	11.19	40.00	28.81	Vert.	100	0	BA	
11	151.224	22.40	15.10	8.32	32.03	13.79	43.50	29.71	Vert.	100	0	BA	
12	152.776	22.30	15.16	8.33	32.03	13.76	43.50	29.74	Vert.	100	0	BA	
13	226.836	22.10	11.30	8.98	32.01	10.37	46.00	35.63	Vert.	100	0	LA23	
14	229.164	22.20	11.35	9.00	32.01	10.54	46.00	35.46	Vert.	100	0	LA23	
15	302.448	22.10	13.68	9.59	32.02	13.35	46.00	32.65	Vert.	100	0	LA23	
16	305.552	22.10	13.73	9.61	32.02	13.42	46.00	32.58	Vert.	100	0	LA23	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

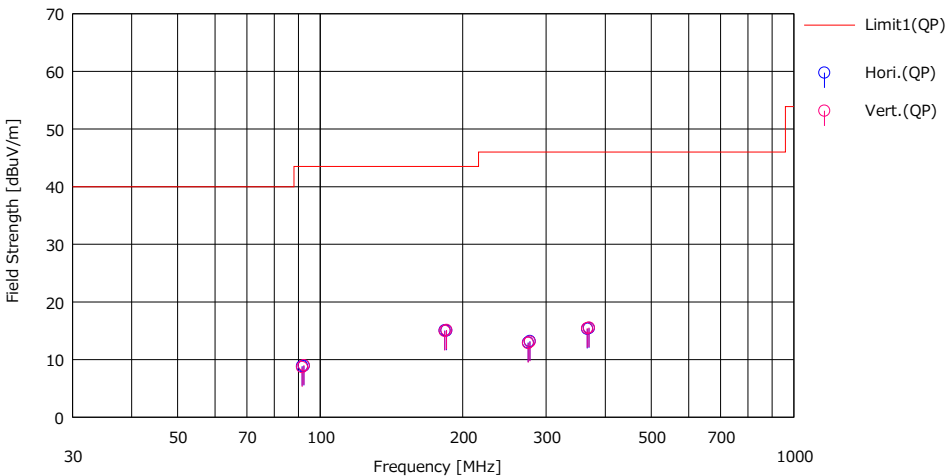
Radiated Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
August 5, 2024
22 deg. C / 51 % RH
Takumi Nishida
(Below 1 GHz)
Mode 1 (Local) 92.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit	Margn	Pola [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV/m]	[dBuV/m]	[dB]					
1	91.612	24.30	8.87	7.77	32.07	8.87	43.50	34.63	Hori.	100	0	BA	
2	92.388	24.20	9.01	7.77	32.07	8.91	43.50	34.59	Hori.	100	0	BA	
3	183.224	22.20	16.29	8.59	32.02	15.06	43.50	28.44	Hori.	100	0	BA	
4	184.776	22.10	16.34	8.60	32.02	15.02	43.50	28.48	Hori.	100	0	BA	
5	274.836	22.50	13.10	9.38	32.02	12.96	46.00	33.04	Hori.	100	0	LA23	
6	277.164	22.60	13.21	9.40	32.02	13.19	46.00	32.81	Hori.	100	0	LA23	
7	366.448	22.40	15.08	9.93	32.08	15.33	46.00	30.67	Hori.	100	0	LA23	
8	369.552	22.50	15.09	9.94	32.08	15.45	46.00	30.55	Hori.	100	0	LA23	
9	91.612	24.10	8.87	7.77	32.07	8.67	43.50	34.83	Vert.	100	0	BA	
10	92.388	24.30	9.01	7.77	32.07	9.01	43.50	34.49	Vert.	100	0	BA	
11	183.224	22.10	16.29	8.59	32.02	14.96	43.50	28.54	Vert.	100	0	BA	
12	184.776	22.20	16.34	8.60	32.02	15.12	43.50	28.38	Vert.	100	0	BA	
13	274.836	22.40	13.10	9.38	32.02	12.86	46.00	33.14	Vert.	100	0	LA23	
14	277.164	22.50	13.21	9.40	32.02	13.09	46.00	32.91	Vert.	100	0	LA23	
15	366.448	22.50	15.08	9.93	32.08	15.43	46.00	30.57	Vert.	100	0	LA23	
16	369.552	22.60	15.09	9.94	32.08	15.55	46.00	30.45	Vert.	100	0	LA23	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

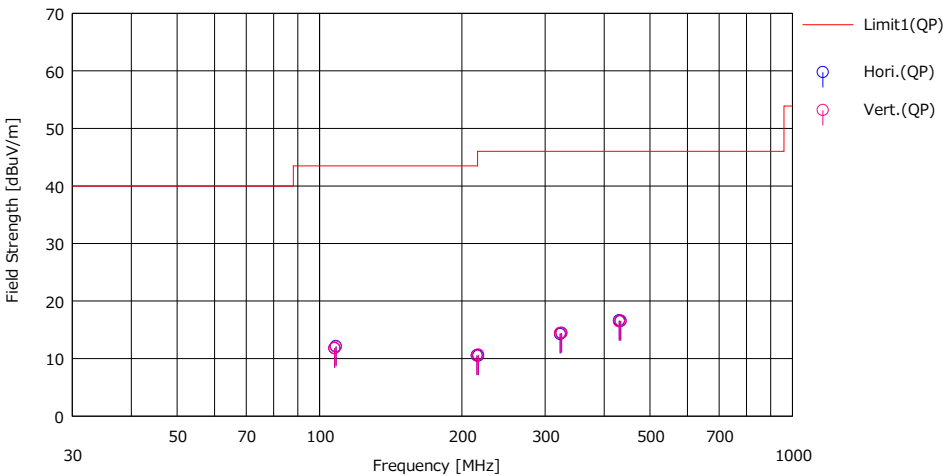
Radiated Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
August 5, 2024
22 deg. C / 51 % RH
Takumi Nishida
(Below 1 GHz)
Mode 1 (Local) 108.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margn	Pola	Height	Angle	Ant. Type	Comment
		[QP]				[QP]	[QP]	[QP]					
	[MHz]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[H/V]	[cm]	[deg.]		
1	107.612	24.50	11.44	7.92	32.06	11.80	43.50	31.70	Hori.	100	0	BA	
2	108.388	24.70	11.57	7.93	32.06	12.14	43.50	31.36	Hori.	100	0	BA	
3	215.224	22.50	11.21	8.88	32.01	10.58	43.50	32.92	Hori.	100	0	LA23	
4	216.776	22.40	11.20	8.89	32.01	10.48	46.00	35.52	Hori.	100	0	LA23	
5	322.836	22.30	14.29	9.70	32.04	14.25	46.00	31.75	Hori.	100	0	LA23	
6	325.164	22.40	14.36	9.71	32.04	14.43	46.00	31.57	Hori.	100	0	LA23	
7	430.448	22.40	16.08	10.29	32.13	16.64	46.00	29.36	Hori.	100	0	LA23	
8	433.552	22.20	16.12	10.31	32.13	16.50	46.00	29.50	Hori.	100	0	LA23	
9	107.612	24.50	11.44	7.92	32.06	11.80	43.50	31.70	Vert.	100	0	BA	
10	108.388	24.60	11.57	7.93	32.06	12.04	43.50	31.46	Vert.	100	0	BA	
11	215.224	22.40	11.21	8.88	32.01	10.48	43.50	33.02	Vert.	100	0	LA23	
12	216.776	22.60	11.20	8.89	32.01	10.68	46.00	35.32	Vert.	100	0	LA23	
13	322.836	22.50	14.29	9.70	32.04	14.45	46.00	31.55	Vert.	100	0	LA23	
14	325.164	22.40	14.36	9.71	32.04	14.43	46.00	31.57	Vert.	100	0	LA23	
15	430.448	22.20	16.08	10.29	32.13	16.44	46.00	29.56	Vert.	100	0	LA23	
16	433.552	22.30	16.12	10.31	32.13	16.60	46.00	29.40	Vert.	100	0	LA23	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

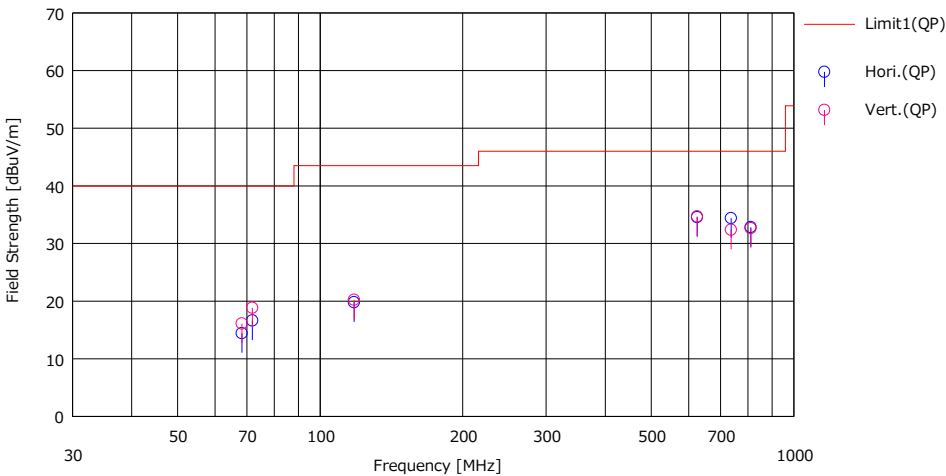
Radiated Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
August 5, 2024
22 deg. C / 51 % RH
Takumi Nishida
(Below 1 GHz)
Mode 2 Other

Limit : FCC_Part 15 Subpart B(15.109)_Class B



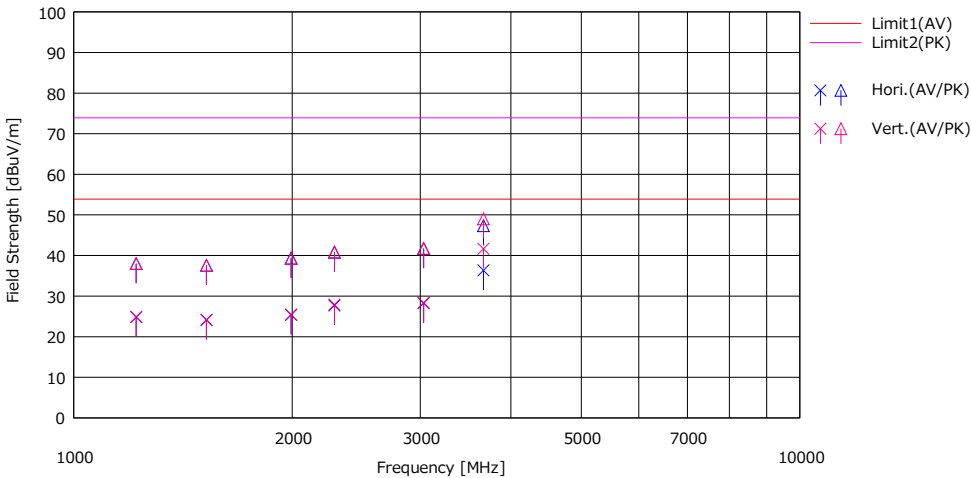
No.	Freq. [MHz]	Reading (QP)	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result (QP)	Limit (QP)	Margn (QP)	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV/m]	[dBuV/m]	[dB]					
1	68.331	32.54	6.47	7.52	32.09	14.44	40.00	25.56	Hori.	226	354	BA	
2	71.908	34.81	6.36	7.56	32.09	16.64	40.00	23.36	Hori.	217	341	BA	
3	117.931	31.12	12.71	8.01	32.05	19.79	43.50	23.71	Hori.	155	354	BA	
4	625.003	36.10	19.34	11.37	32.25	34.56	46.00	11.44	Hori.	133	345	LA23	
5	737.212	34.55	20.18	11.73	32.07	34.39	46.00	11.61	Hori.	154	48	LA23	
6	811.103	31.60	20.91	11.97	31.64	32.84	46.00	13.16	Hori.	111	194	LA23	
7	68.331	34.21	6.47	7.52	32.09	16.11	40.00	23.89	Vert.	100	277	BA	
8	71.908	37.00	6.36	7.56	32.09	18.83	40.00	21.17	Vert.	100	109	BA	
9	117.931	31.55	12.71	8.01	32.05	20.22	43.50	23.28	Vert.	100	116	BA	
10	625.003	36.21	19.34	11.37	32.25	34.67	46.00	11.33	Vert.	156	206	LA23	
11	737.212	32.54	20.18	11.73	32.07	32.38	46.00	13.62	Vert.	100	27	LA23	
12	811.103	31.40	20.91	11.97	31.64	32.64	46.00	13.36	Vert.	112	192	LA23	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 28, 2024
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Tetsuro Yoshida
Mode (Above 1 GHz)
Mode 1 (Local) 76.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	1219.068	31.40	44.60	25.29	2.35	34.24	24.80	38.00	53.90	73.90	29.10	35.90	Hori.	100	0	H20	
2	1523.499	29.80	43.20	25.33	2.55	33.51	24.17	37.57	53.90	73.90	29.73	36.33	Hori.	100	0	H20	
3	1992.698	28.80	42.80	26.08	2.86	32.38	25.36	39.36	53.90	73.90	28.54	34.54	Hori.	100	0	H20	
4	2285.643	28.90	42.00	28.03	3.01	32.25	27.69	40.79	53.90	73.90	26.21	33.11	Hori.	100	0	H20	
5	3033.266	28.20	41.60	28.63	3.39	31.95	28.27	41.67	53.90	73.90	25.63	32.23	Hori.	100	0	H20	
6	3666.587	35.10	46.10	29.20	3.67	31.64	36.33	47.33	53.90	73.90	17.57	26.57	Hori.	110	105	H20	
7	1219.068	31.50	44.60	25.29	2.35	34.24	24.90	38.00	53.90	73.90	29.00	35.90	Vert.	100	0	H20	
8	1523.499	29.70	43.20	25.33	2.55	33.51	24.07	37.57	53.90	73.90	29.83	36.33	Vert.	100	0	H20	
9	1992.698	28.90	42.70	26.08	2.86	32.38	25.46	39.26	53.90	73.90	28.44	34.64	Vert.	100	0	H20	
10	2285.643	29.10	42.10	28.03	3.01	32.25	27.89	40.89	53.90	73.90	26.01	33.01	Vert.	100	0	H20	
11	3033.266	28.30	41.70	28.63	3.39	31.95	28.37	41.77	53.90	73.90	25.53	32.13	Vert.	100	0	H20	
12	3666.587	40.40	47.80	29.20	3.67	31.64	41.63	49.03	53.90	73.90	12.27	24.87	Vert.	100	180	H20	

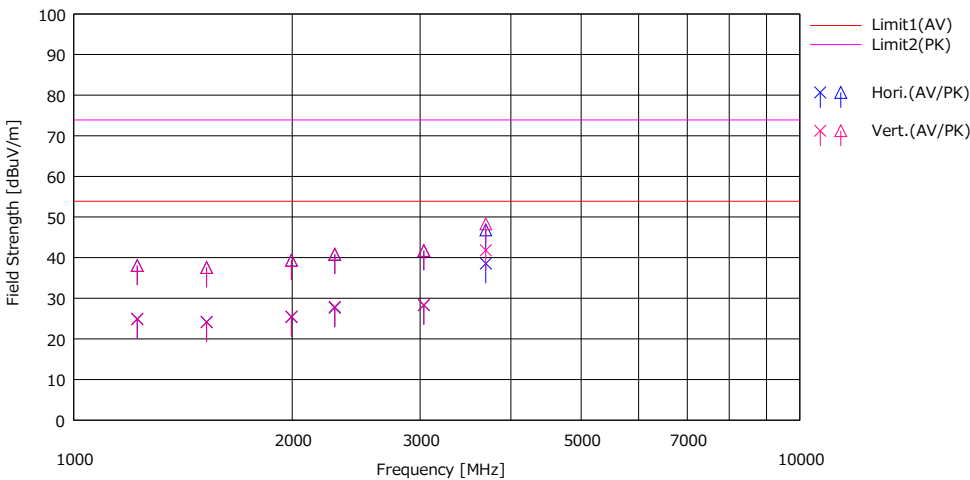
CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

* No signal was detected above 10 GHz.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 28, 2024
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Tetsuro Yoshida
Mode (Above 1 GHz)
Mode 1 (Local) 92.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading		Ant Fac. [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pda [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	1223.435	31.40	44.60	25.32	2.36	34.23	24.85	38.05	53.90	73.90	29.05	35.85	Hori.	100	0	H20	
2	1524.235	29.80	43.20	25.33	2.55	33.51	24.17	37.57	53.90	73.90	29.73	36.33	Hori.	100	0	H20	
3	1995.244	28.80	42.80	26.10	2.86	32.37	25.39	39.39	53.90	73.90	28.51	34.51	Hori.	100	0	H20	
4	2288.249	28.90	42.00	28.02	3.02	32.25	27.69	40.79	53.90	73.90	26.21	33.11	Hori.	100	0	H20	
5	3036.257	28.20	41.60	28.63	3.40	31.95	28.28	41.68	53.90	73.90	25.62	32.22	Hori.	100	0	H20	
6	3695.483	37.20	45.50	29.26	3.69	31.62	38.53	46.83	53.90	73.90	15.37	27.07	Hori.	110	144	H20	
7	1223.435	31.50	44.60	25.32	2.36	34.23	24.95	38.05	53.90	73.90	28.95	35.85	Veri.	100	0	H20	
8	1524.235	29.70	43.20	25.33	2.55	33.51	24.07	37.57	53.90	73.90	29.83	36.33	Veri.	100	0	H20	
9	1995.244	28.90	42.70	26.10	2.86	32.37	25.49	39.29	53.90	73.90	28.41	34.61	Veri.	100	0	H20	
10	2288.249	29.10	42.10	28.02	3.02	32.25	27.89	40.89	53.90	73.90	26.01	33.01	Veri.	100	0	H20	
11	3036.257	28.30	41.70	28.63	3.40	31.95	28.38	41.78	53.90	73.90	25.52	32.12	Veri.	100	0	H20	
12	3695.483	40.50	47.00	29.26	3.69	31.62	41.83	48.33	53.90	73.90	12.07	25.57	Veri.	100	180	H20	

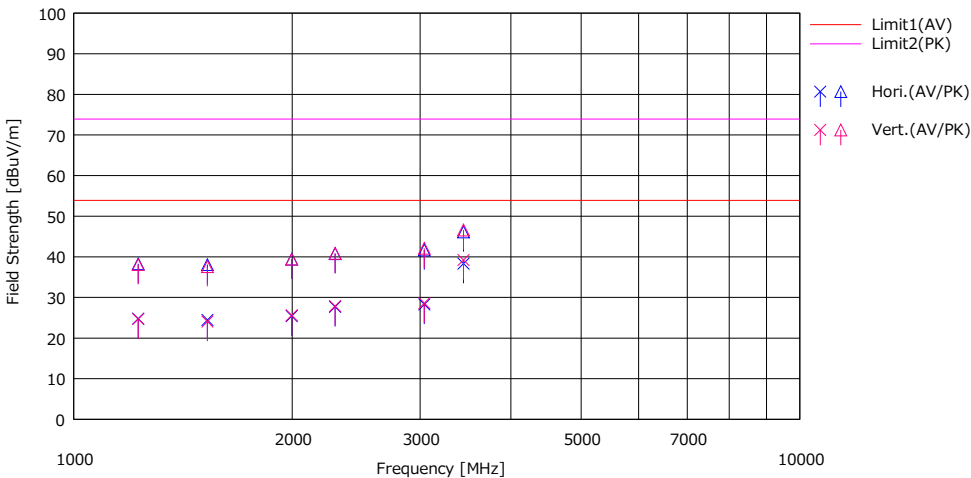
CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

* No signal was detected above 10 GHz.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 28, 2024
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Tetsuro Yoshida
Mode (Above 1 GHz)
Mode 1 (Local) 108.0 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading		Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pda [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
		[dBuV]	[dBuV]				[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1227.173	31.30	44.80	25.34	2.36	34.22	24.78	38.28	53.90	73.90	29.12	35.62	Hori.	100	0	H20	
2	1528.315	30.10	43.70	25.32	2.55	33.50	24.47	38.07	53.90	73.90	29.43	35.83	Hori.	100	0	H20	
3	1996.532	28.80	42.80	26.11	2.86	32.37	25.40	39.40	53.90	73.90	28.50	34.50	Hori.	100	0	H20	
4	2291.352	28.90	42.00	28.00	3.02	32.25	27.67	40.77	53.90	73.90	26.23	33.13	Hori.	100	0	H20	
5	3040.713	28.20	41.60	28.64	3.40	31.95	28.29	41.69	53.90	73.90	25.61	32.21	Hori.	100	0	H20	
6	3443.550	38.00	45.80	28.49	3.58	31.75	38.32	46.12	53.90	73.90	15.58	27.78	Hori.	112	163	H20	
7	1227.173	31.20	44.60	25.34	2.36	34.22	24.68	38.08	53.90	73.90	29.22	35.82	Vert.	100	0	H20	
8	1528.315	29.70	43.20	25.32	2.55	33.50	24.07	37.57	53.90	73.90	29.83	36.33	Vert.	100	0	H20	
9	1996.532	29.00	42.80	26.11	2.86	32.37	25.60	39.40	53.90	73.90	28.30	34.50	Vert.	100	0	H20	
10	2291.352	29.10	42.10	28.00	3.02	32.25	27.87	40.87	53.90	73.90	26.03	33.03	Vert.	100	0	H20	
11	3040.713	28.50	42.00	28.64	3.40	31.95	28.59	42.09	53.90	73.90	25.31	31.81	Vert.	100	0	H20	
12	3443.550	38.90	46.30	28.49	3.58	31.75	39.22	46.62	53.90	73.90	14.68	27.28	Vert.	108	193	H20	

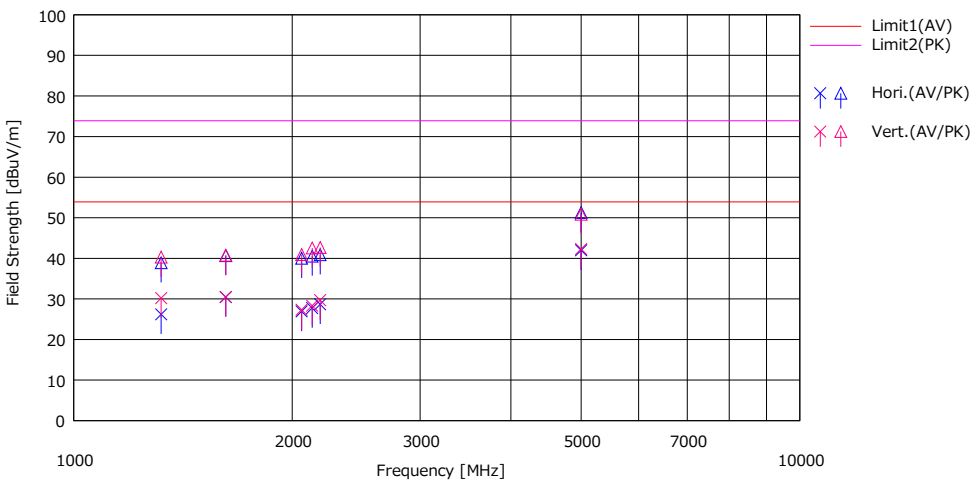
CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

* No signal was detected above 10 GHz.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.3
Date July 28, 2024
Temperature / Humidity 22 deg. C / 53 % RH
Engineer Tetsuro Yoshida
Mode (Above 1 GHz)
Mode 2 (Other)

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading		Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pola [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	1320.000	32.10	44.80	25.68	2.42	34.00	26.20	38.90	53.90	73.90	27.70	35.00	Hori.	156	142	H20	
2	1620.068	36.20	46.40	24.94	2.61	33.28	30.47	40.67	53.90	73.90	23.43	33.23	Hori.	149	148	H20	
3	2060.561	29.60	42.70	26.77	2.89	32.34	26.92	40.02	53.90	73.90	26.98	33.88	Hori.	100	0	H20	
4	2130.316	29.50	42.30	27.62	2.93	32.31	27.74	40.54	53.90	73.90	26.16	33.36	Hori.	100	0	H20	
5	2185.558	29.90	42.10	28.11	2.96	32.29	28.68	40.88	53.90	73.90	25.22	33.02	Hori.	100	0	H20	
6	5000.002	37.20	46.50	31.67	4.22	31.11	41.98	51.28	53.90	73.90	11.92	22.62	Hori.	100	122	H20	
7	1320.000	36.10	46.20	25.68	2.42	34.00	30.20	40.30	53.90	73.90	23.70	33.60	Ver.	224	202	H20	
8	1620.068	36.20	46.50	24.94	2.61	33.28	30.47	40.77	53.90	73.90	23.43	33.13	Ver.	203	186	H20	
9	2060.561	30.00	43.60	26.77	2.89	32.34	27.32	40.92	53.90	73.90	26.58	32.98	Ver.	100	0	H20	
10	2130.416	30.10	44.30	27.62	2.93	32.31	28.34	42.54	53.90	73.90	25.56	31.36	Ver.	100	0	H20	
11	2185.582	30.90	43.90	28.11	2.96	32.29	29.68	42.68	53.90	73.90	24.22	31.22	Ver.	100	0	H20	
12	5000.002	37.50	46.10	31.67	4.22	31.11	42.28	50.88	53.90	73.90	11.62	23.02	Ver.	100	172	H20	

CHART: WITH FACTOR
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

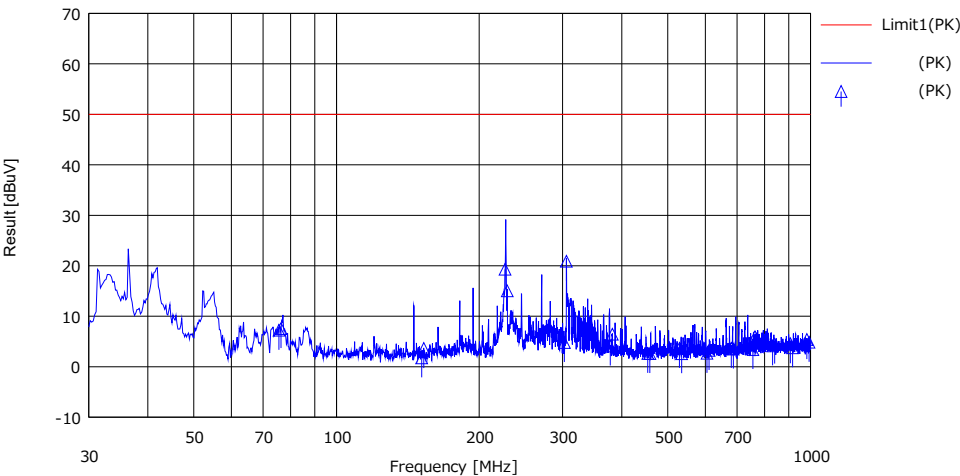
* No signal was detected above 10 GHz.

Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.4
August 6, 2024
23 deg. C / 60 % RH
Takumi Nishida
Mode 3 (76.0 MHz)

Limit : FCC15.111 Antenna terminal measurement



<< PK DATA >>

No.	Freq. [MHz]	Reading (PK)	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result (PK)	Limit*1) (PK)	Margin (PK)	Pola [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV]	[dBuV]	[dB]					
1	75.612	33.22	0.00	6.10	32.09	7.23	50.00	42.77				---	
2	76.388	33.54	0.00	6.10	32.09	7.55	50.00	42.45				---	
3	151.224	27.65	0.00	6.13	32.03	1.75	50.00	48.25				---	
4	152.776	29.52	0.00	6.13	32.03	3.62	50.00	46.38				---	
5	226.836	45.16	0.00	6.16	32.01	19.31	50.00	30.69				---	
6	229.164	40.89	0.00	6.16	32.01	15.04	50.00	34.96				---	
7	302.448	30.63	0.00	6.19	32.02	4.80	50.00	45.20				---	
8	305.552	46.72	0.00	6.19	32.02	20.89	50.00	29.11				---	
9	378.060	29.96	0.00	6.22	32.09	4.09	50.00	45.91				---	
10	381.940	32.31	0.00	6.22	32.09	6.44	50.00	43.56				---	
11	453.672	28.54	0.00	6.25	32.15	2.64	50.00	47.36				---	
12	458.328	28.51	0.00	6.25	32.15	2.61	50.00	47.39				---	
13	529.284	29.57	0.00	6.26	32.20	3.63	50.00	46.37				---	
14	534.716	28.54	0.00	6.26	32.21	2.59	50.00	47.41				---	
15	604.896	28.63	0.00	6.28	32.24	2.67	50.00	47.33				---	
16	611.104	29.20	0.00	6.28	32.25	3.23	50.00	46.77				---	
17	680.508	29.61	0.00	6.30	32.28	3.63	50.00	46.37				---	
18	687.492	29.48	0.00	6.30	32.28	3.50	50.00	46.50				---	
19	756.120	29.04	0.00	6.31	31.96	3.39	50.00	46.61				---	
20	763.880	31.54	0.00	6.31	31.92	5.93	50.00	44.07				---	
21	831.732	29.35	0.00	6.31	31.52	4.14	50.00	45.86				---	
22	840.268	29.66	0.00	6.31	31.47	4.50	50.00	45.50				---	
23	907.344	29.28	0.00	6.34	31.07	4.55	50.00	45.45				---	
24	916.656	28.42	0.00	6.34	31.02	3.74	50.00	46.26				---	
25	982.956	29.68	0.00	6.35	30.63	5.40	50.00	44.60				---	
26	993.044	29.06	0.00	6.35	30.57	4.84	50.00	45.16				---	

* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

Antenna Terminal Conducted Emission

Test place

Semi Anechoic Chamber

Date

Temperature / Humidity

Engineer

Mode

Ise EMC Lab.

No.4

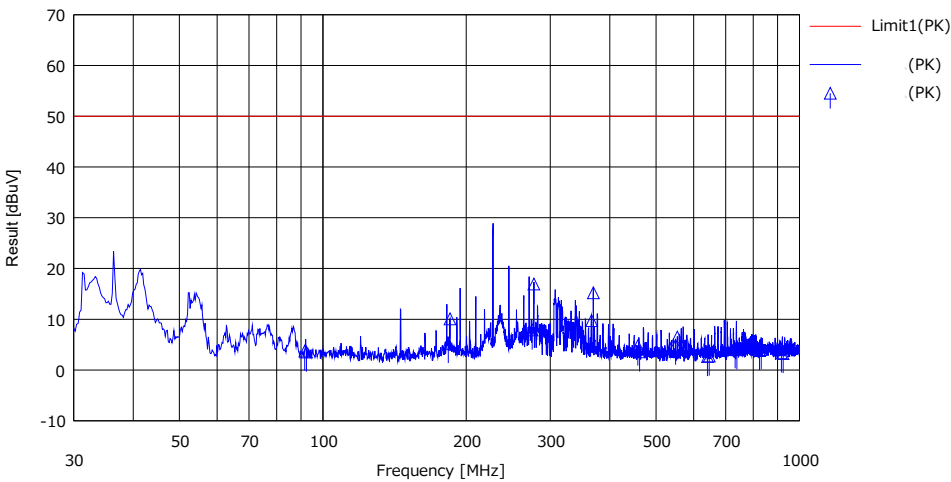
August 6, 2024

23 deg. C / 60 % RH

Takumi Nishida

Mode 3 (92.0 MHz)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading (PK)	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result (PK)	Limit *1 (PK)	Margn. (PK)	Pda. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV]	[dBuV]	[dB]					
1	91.612	29.68	0.00	6.11	32.07	3.72	50.00	46.28				---	
2	92.388	29.49	0.00	6.12	32.07	3.54	50.00	46.46				---	
3	183.224	31.14	0.00	6.14	32.02	5.26	50.00	44.74				---	
4	184.776	35.95	0.00	6.14	32.02	10.07	50.00	39.93				---	
5	274.836	33.72	0.00	6.18	32.02	7.88	50.00	42.12				---	
6	277.164	42.79	0.00	6.18	32.02	16.95	50.00	33.05				---	
7	366.448	35.60	0.00	6.21	32.08	9.73	50.00	40.27				---	
8	369.552	41.09	0.00	6.21	32.08	15.22	50.00	34.78				---	
9	458.060	30.66	0.00	6.25	32.15	4.76	50.00	45.24				---	
10	461.940	29.49	0.00	6.25	32.16	3.58	50.00	46.42				---	
11	549.672	30.84	0.00	6.26	32.21	4.89	50.00	45.11				---	
12	554.328	32.46	0.00	6.26	32.22	6.50	50.00	43.50				---	
13	641.284	28.65	0.00	6.28	32.26	2.67	50.00	47.33				---	
14	646.716	28.72	0.00	6.28	32.26	2.74	50.00	47.26				---	
15	732.896	30.01	0.00	6.30	32.10	4.21	50.00	45.79				---	
16	739.104	29.74	0.00	6.30	32.06	3.98	50.00	46.02				---	
17	824.508	29.07	0.00	6.31	31.56	3.82	50.00	46.18				---	
18	831.492	29.22	0.00	6.31	31.52	4.01	50.00	45.99				---	
19	916.120	28.08	0.00	6.34	31.02	3.40	50.00	46.60				---	
20	923.880	27.88	0.00	6.34	30.98	3.24	50.00	46.76				---	

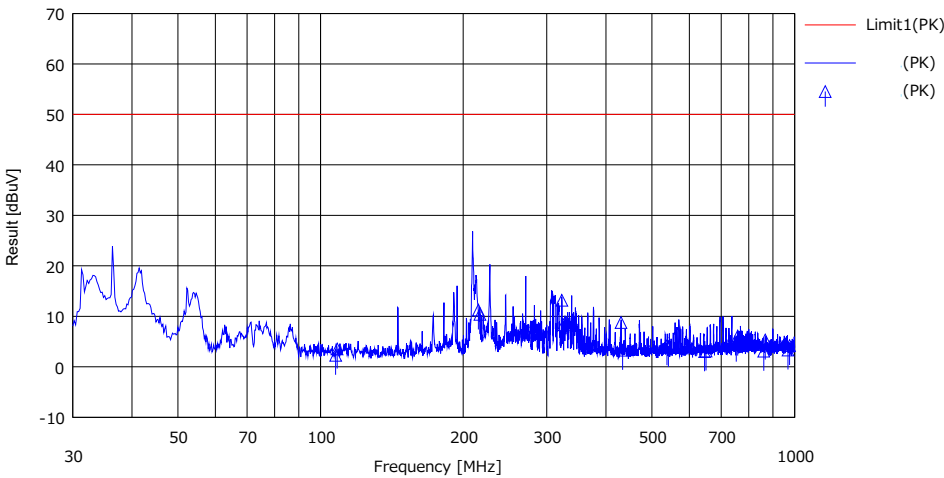
* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.4
August 6, 2024
23 deg. C / 60 % RH
Takumi Nishida
Mode 3 (108.0 MHz)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit *1)	Margn	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[dBuV]	(PK)	(PK)					
1	107.612	28.22	0.00	6.12	32.06	2.28	50.00	47.72				---	
2	108.388	29.47	0.00	6.12	32.06	3.53	50.00	46.47				---	
3	215.224	37.11	0.00	6.15	32.01	11.25	50.00	38.75				---	
4	216.776	36.23	0.00	6.16	32.01	10.38	50.00	39.62				---	
5	322.836	39.04	0.00	6.19	32.04	13.19	50.00	36.81				---	
6	325.164	34.15	0.00	6.20	32.04	8.31	50.00	41.69				---	
7	430.448	34.65	0.00	6.23	32.13	8.75	50.00	41.25				---	
8	433.552	29.18	0.00	6.23	32.13	3.28	50.00	46.72				---	
9	538.060	30.12	0.00	6.26	32.21	4.17	50.00	45.83				---	
10	541.940	29.77	0.00	6.26	32.21	3.82	50.00	46.18				---	
11	645.672	28.98	0.00	6.28	32.26	3.00	50.00	47.00				---	
12	650.328	29.10	0.00	6.30	32.27	3.13	50.00	46.87				---	
13	753.284	30.55	0.00	6.31	31.98	4.88	50.00	45.12				---	
14	758.716	31.72	0.00	6.31	31.95	6.08	50.00	43.92				---	
15	860.896	28.11	0.00	6.33	31.35	3.09	50.00	46.91				---	
16	867.104	30.28	0.00	6.33	31.31	5.30	50.00	44.70				---	
17	968.508	27.68	0.00	6.35	30.71	3.32	50.00	46.68				---	
18	975.492	28.54	0.00	6.35	30.67	4.22	50.00	45.78				---	

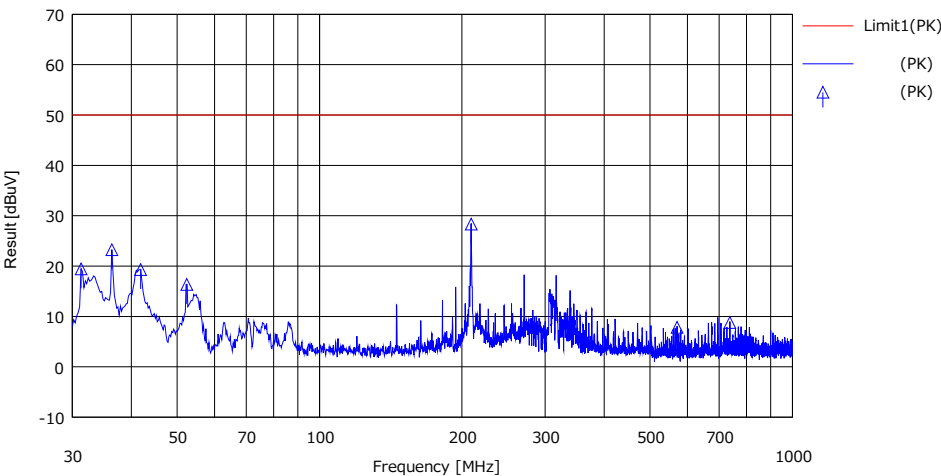
* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.4
August 6, 2024
23 deg. C / 60 % RH
Takumi Nishida
Mode 4 (Other)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit *1)	Margn	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dBuV]	(PK) [dB]					
1	31.331	45.50	0.00	6.06	32.12	19.44	50.00	30.56				---	
2	36.379	49.29	0.00	6.06	32.11	23.24	50.00	26.76				---	
3	41.825	45.34	0.00	6.08	32.10	19.32	50.00	30.68				---	
4	52.401	42.38	0.00	6.08	32.09	16.37	50.00	33.63				---	
5	209.308	54.21	0.00	6.15	32.01	28.35	50.00	21.65				---	Local 105.1 MHz
6	570.353	33.81	0.00	6.26	32.23	7.84	50.00	42.16				---	
7	737.308	34.55	0.00	6.30	32.07	8.78	50.00	41.22				---	

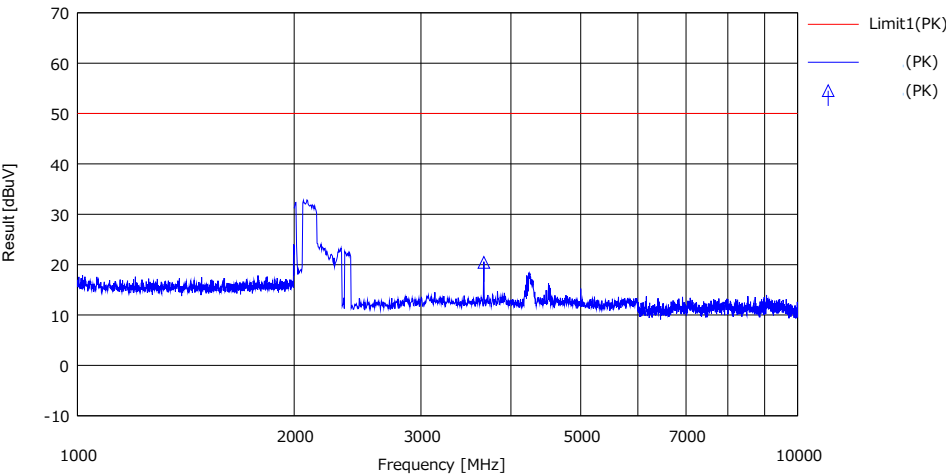
* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.4
August 6, 2024
23 deg. C / 60 % RH
Takumi Nishida
Mode 3 (76.0 MHz)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit *1)	Margin [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dBuV]						
1	3667.867	49.48	0.00	2.16	31.17	20.47	50.00	29.53				---	

* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

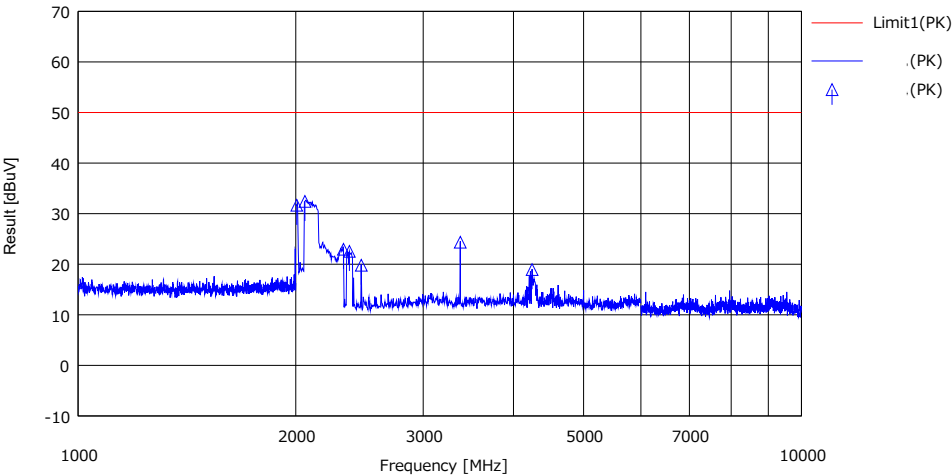
* No signal was detected above 10 GHz.

Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer
Mode

Ise EMC Lab.
No.4
August 6, 2024
23 deg. C / 60 % RH
Takumi Nishida
Mode 4 (Other)

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit*1)	Margn	Pola [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dBuV]	(PK) [dB]					
1	2006.323	55.47	0.00	8.20	32.01	31.66	50.00	18.34				---	
2	2059.196	56.18	0.00	8.21	31.98	32.41	50.00	17.59				---	
3	2328.104	52.70	0.00	2.09	31.83	22.96	50.00	27.04				---	
4	2372.625	52.26	0.00	2.09	31.80	22.55	50.00	27.45				---	
5	2464.074	49.45	0.00	2.10	31.75	19.80	50.00	30.20				---	
6	3376.062	53.50	0.00	2.14	31.29	24.35	50.00	25.65				---	Local 105.1 MHz
7	4244.616	47.71	0.00	2.19	30.97	18.93	50.00	31.07				---	

* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + LOSS (CABLE + Matching Pad) – GAIN (AMP)
Except for the above table: adequate margin data below the limits.

* No signal was detected above 10 GHz.

APPENDIX 2: Test instruments

Test equipment

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	141227	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S305	03/04/2024	12
AT	141485	DC Block Filter	Keysight Technologies Inc	N9398C	51053	10/05/2023	12
AT	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
AT	141550	Matching Pad Anritsu	Anritsu Corporation	MB-009	40063	07/04/2024	12
AT	141581	Microwave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2023	12
AT	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/04/2024	12
AT	141902	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187105	05/30/2024	12
AT	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/13/2023	24
AT	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
AT	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-192	09/21/2023	12
RE	141331	Attenuator(6dB)	TME	UFA-01	-	02/17/2024	12
RE	141397	Coaxial Cable	UL Japan	-	-	11/22/2023	12
RE	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103+BBA9106	VHA 91031302	08/10/2023	12
RE	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	08/09/2023	12
RE	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/20/2023	12
RE	141517	Horn Antenna 26.5-40GHz	ETS-Lindgren	3160-10	152399	11/20/2023	12
RE	141532	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	051201197	01/31/2024	12
RE	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	02/01/2024	12
RE	141580	Microwave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/08/2024	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/04/2024	12
RE	141588	Pre Amplifier	L3 Narda-MITEQ	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	01/22/2024	12
RE	141894	Signal Generator	Rohde & Schwarz	SMC100A	103408	10/05/2023	12
RE	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	05/09/2024	12
RE	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	05/17/2024	12
RE	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	12/13/2023	24
RE	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2023	24
RE	142183	Measure	KOMELON	KMC-36	-	10/20/2023	12
RE	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	10/05/2023	12
RE	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	244709	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202103	01/25/2024	12
RE	244710	Thermo-Hygrometer	HIOKI E.E. CORPORATION	LR5001	231202104	01/25/2024	12
RE	245787	Double Ridge Horn Antenna	Schwarzbeck Mess-Elektronik OHG	BBHA 9120 C	689	03/06/2024	12
RE	246001	Microwave Cable	Huber+Suhner	SF103/11PC35/ 11PC35/1000mm / SF126E/5000mm	800673(1m) / 610204(5m)	03/06/2024	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:

RE: Radiated emission

AT: Antenna Terminal Conducted