

EMI TEST REPORT

Test Report No. 14758016H-D-R1

Customer	DENSO TEN Limited
Description of EUT	Car Audio
Model Number of EUT	TN0023A
FCC ID	BABTN0023A
Test Regulation	FCC Part 15 Subpart B
Test Result	Complied
Issue Date	September 28, 2023
Remarks	-

Representative test engineer

Junya Okuno
Engineer

Approved by

Ryota Yamanaka
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".

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- The information provided from the customer for this report is identified in SECTION 1.
- For test report(s) referred in this report, the latest version (including any revisions) is always referred.

REVISION HISTORY

Original Test Report No. 14758016H-D

This report is a revised version of 14758016H-D. 14758016H-D is replaced with this report.

Revision	Test Report No.	Date	Page Revised Contents
- (Original)	14758016H-D	May 29, 2023	-
1	14758016H-D-R1	September 28, 2023	SECTION 5.3, SECTION 6.3 Correction of Frequency range above 1 GHz from "1000 MHz to 4000 MHz" to "1000 MHz to 40000 MHz"

Reference: Abbreviations (Including words undescribed in this report)

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

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SECTION 1: Customer information

Company Name	DENSO TEN Limited
Address	2-28, Goshō-dori 1-Chome, Hyogo-ku, Kobe, 652-8510 Japan
Telephone Number	+81-78-682-2159
Contact Person	Kaoru Abe

The information provided from the customer is as follows;

- Customer, Description of EUT, Model Number of EUT, FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer Information
- SECTION 2: Equipment Under Test (EUT) other than the Receipt Date and Test Date
- SECTION 4: Operation of EUT during testing

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

SECTION 2: Equipment under test (EUT)

2.1 Identification of EUT

Description	Car Audio
Model Number	TN0023A
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	April 10, 2023
Test Date	April 16 and 23, 2023

2.2 Product Description

General Specification

Rating	DC 12 V
Clock frequency (ies) in the system	7.3333333 GHz (max)

Radio Specification

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

Equipment Type	Transceiver
Frequency of Operation	2412 MHz to 2462 MHz
Type of Modulation	DSSS, OFDM
Antenna Gain	-1.41 dBi

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

Equipment Type	Transceiver	
Frequency of Operation	20 MHz Band:	5180 MHz to 5240 MHz 5745 MHz to 5825 MHz
	40 MHz Band:	5190 MHz to 5230 MHz 5755 MHz to 5795 MHz
	80 MHz Band:	5210 MHz 5775 MHz
Type of Modulation	OFDM	
Antenna Gain	3.28 dBi (Peak) (ANT 1) / 1.79 dBi (Peak) (ANT 2)	

Bluetooth (BR / EDR / Low Energy)

Equipment Type	Transceiver
Frequency of Operation	2402 MHz to 2480 MHz
Type of Modulation	BT: FHSS (GFSK, $\pi/4$ DQPSK, 8 DPSK) BT LE: GFSK
Antenna Gain	0.70 dBi (Peak)

[AM/FM (incl. RBDS) / SDARS]

Equipment Type	Receiver
Frequency of Operation	AM, HD_AM: 530 kHz to 1710 kHz FM, RBDS/HD_FM: 87.75 MHz to 107.9 MHz SDARS: 2320 MHz to 2345 MHz
Type of Modulation	AM FM SDARS: QPSK(Sat) / COFDM (Terr)
Antenna Connector Type	HFC IV

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	ANSI C63.4: 2014 7. AC power - line conducted emission measurements IEEE 187:2003	Part 15 Subpart B 15.107(a)	-	N/A	*1)
Radiated emission	ANSI C63.4: 2014 8. Radiated emission measurements IEEE 187:2003	Part 15 Subpart B 15.109(a)	8.75 dB 10000.000 MHz, Horizontal, Mode 1 (Other)	Complied	-
Antenna Terminal	ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE IEEE 187:2003	Part 15 Subpart B 15.111(a)	24.9 dB 499.192 MHz	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		Uncertainty (+/-)
3 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	5.0 dB
	200 MHz to 1000 MHz	Horizontal	5.1 dB
		Vertical	6.2 dB
10 m	30 MHz to 200 MHz	Horizontal	4.8 dB
		Vertical	4.8 dB
	200 MHz to 1000 MHz	Horizontal	4.9 dB
		Vertical	5.0 dB
3 m	1 GHz to 6 GHz	Test Receiver	5.0 dB
		Spectrum analyzer	4.9 dB
	6 GHz to 18 GHz	Test Receiver	5.3 dB
		Spectrum analyzer	5.2 dB
1 m	10 GHz to 26.5 GHz	Spectrum analyzer	5.5 dB
	26.5 GHz to 40 GHz	Spectrum analyzer	5.4 dB
0.5 m	26.5 GHz to 40 GHz	Spectrum analyzer	5.4 dB
10 m	1 GHz to 18 GHz	Test Receiver	5.3 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Antenna terminal conducted emission	3.3 dB

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

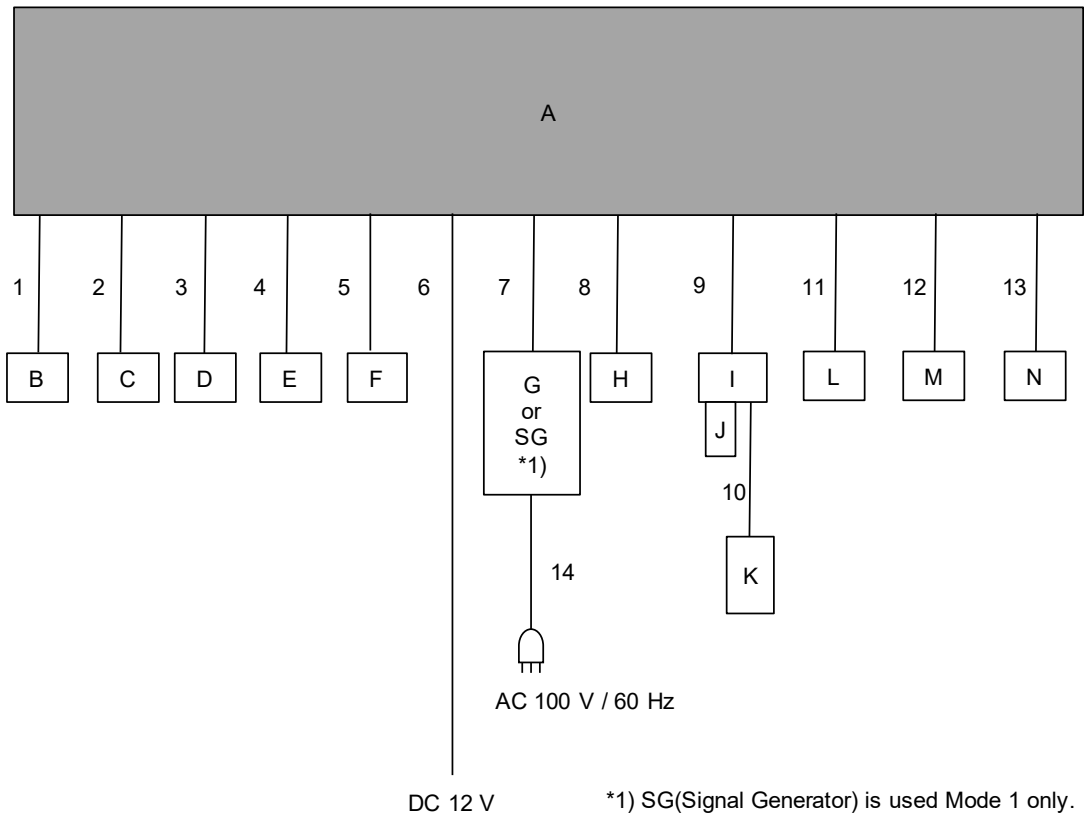
Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

4.1 Operating Mode(s)

Mode	1. FM Port Receiving mode (Local / Other) (Radiated Emission test) 2. USB Memory Play mode (Radiated Emission test) 3. FM Port Tuning mode (Antenna Terminal test)
Software(s)	NANP01.053400A

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 Audio	TN0023A	MUA00056	DENSO TEN Limited	EUT
B	Switch	-	-	-	-
C	DCM	19MC_DCM	E-033720026/001	DENSO TEN Limited	-
D	Steering Switch	PA6-GF30	No.56	TOYOTA	-
E	Low noise Amplifier	ZX60-242GLN-S+	S 2036302044	Mini-Circuits	-
F	GPS Antenna	23D90063	No.44	DENSO TEN Limited	-
G	FM/AM connector	86300-30C30	No.7	DENSO TEN Limited	-
H	Back Camera	867B0-78070	No.10	KYOCERA	-
I	USB/AUX socket	86190-12040	No.4	Kojima Industries Corporation	-
J	USB Memory	RUF3-K16GB	P10416	Buffalo Inc.	-
K	iPod touch	A1367	CCQ50WDDCPC	Apple	-
L	Mic	86730-78010	033722017/021	Panasonic	-
M	Mic	86730-78010	033722017/022	Panasonic	-
N	Speaker Dummy	-	-	-	-

List of Cables Used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	2.4	Unshielded	Unshielded	-
2	Signal Cable	2.6	Unshielded	Unshielded	-
3	Signal Cable	2.4	Unshielded	Unshielded	-
4	Signal Cable	1.0	Unshielded	Unshielded	-
5	GNSS Antenna Cable	8.0	Shielded	Shielded	-
6	DC Cable	5.4	Unshielded	Unshielded	-
7	Antenna Cable	2.5	Shielded	Shielded	-
8	Signal Cable	6.8	Unshielded	Unshielded	-
9	USB Cable	2.5	Shielded	Shielded	-
10	Audio Cable	1.5	Shielded	Shielded	-
11	MIC Cable	2.4	Unshielded	Unshielded	-
12	MIC Cable	2.4	Unshielded	Unshielded	-
13	Speaker Cable	3.2	Unshielded	Unshielded	-
14	AC Cable	2.0	Unshielded	Unshielded	Mode 1 only

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 40000 MHz (Horn antenna)
Test distance : 3 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 - 26.5 GHz	Above 26.5 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

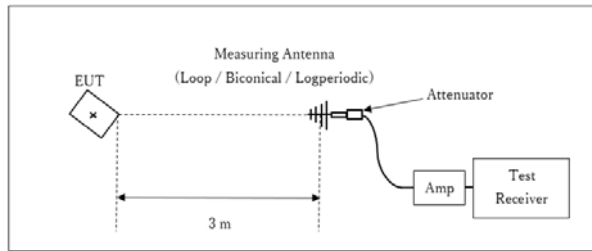
*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

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

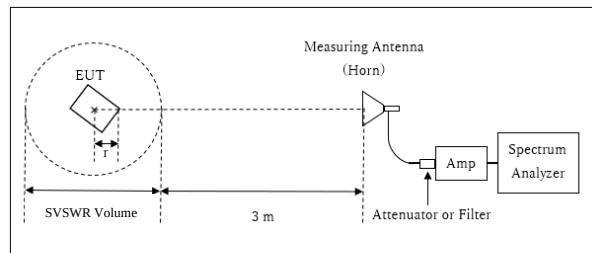
Below 1 GHz



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

For No.4 Anechoic Chamber

Distance Factor: $20 \times \log (3.1 \text{ m}^*/3.0 \text{ m}) = 0.29 \text{ dB}$

* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.1 \text{ m}$

SVSWR Volume: 2 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.9 \text{ m}$

For No.2 Anechoic Chamber

Distance Factor: $20 \times \log (3.0 \text{ m}^*/3.0 \text{ m}) = 0.00 \text{ dB}$

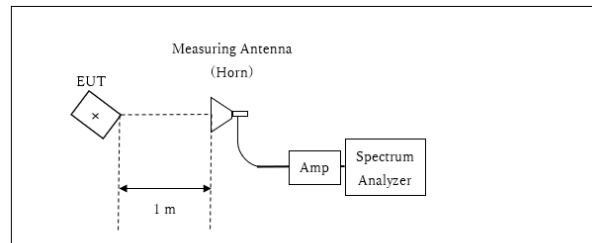
* Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.0 \text{ m}$

SVSWR Volume: 1.5 m

(SVSWR Volume has been calibrated based on CISPR 16-1-4.)

$r = 0.75 \text{ m}$

10 GHz to 40 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

The limit is rounded down to one decimal place.

The test result is rounded off to one or two decimal places, 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 wooden table 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 40000 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.2
Date April 23, 2023
Temperature / Humidity 23 deg. C / 46 % RH
Engineer Hiroki Numata
 (Below 1 GHz)
Mode Mode 1 (Local) 87.75 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< QP DATA >>

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
		[dBUV]				[dBUV/m]	[dBUV/m]	[dB]					
1	88.207	22.20	8.28	7.27	28.46	9.29	43.50	34.21	Hori.	100	0	BA	
2	176.415	22.00	15.93	7.93	28.10	17.76	43.50	25.74	Hori.	100	0	BA	
3	705.659	23.10	20.04	10.56	29.26	24.44	46.00	21.56	Hori.	100	0	LA21	
4	88.207	22.30	8.28	7.27	28.46	9.39	43.50	34.11	Vert.	100	0	BA	
5	176.415	22.10	15.93	7.93	28.10	17.86	43.50	25.64	Vert.	100	0	BA	
6	705.659	22.80	20.04	10.56	29.26	24.14	46.00	21.86	Vert.	100	0	LA21	

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.2
Date April 23, 2023
Temperature / Humidity 23 deg. C / 46 % RH
Engineer Hiroki Numata
(Above 1 GHz)
Mode Mode 1 (Local) 87.75 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< AV/PK DATA >>

No.	Freq.	Reading		Ant.Fac	Loss	Gain	Result		Limit		Margin		Pola.	Height	Angle	Ant. Type	Comment
		(AV)	(PK)				(AV)	(PK)	(AV)	(PK)	(AV)	(PK)					
	[MHz]	[dBuV]	[dBuV]	[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]	[H/V]	[cm]	[deg]		
1	1047.511	33.20	45.90	24.85	1.66	35.97	23.74	36.44	53.90	73.90	30.16	37.46	Hori.	100	0	HA6	
2	1058.489	34.00	47.40	24.89	1.67	35.96	24.60	38.00	53.90	73.90	29.30	35.90	Hori.	100	0	HA6	
3	3055.242	31.20	44.70	28.51	2.90	34.62	27.99	41.49	53.90	73.90	25.91	32.41	Hori.	100	0	HA6	
4	3087.258	31.40	44.70	28.57	2.92	34.60	28.29	41.59	53.90	73.90	25.61	32.31	Hori.	100	0	HA6	
5	4277.338	31.40	44.90	30.50	3.45	34.02	31.33	44.83	53.90	73.90	22.57	29.07	Hori.	100	0	HA6	
6	5027.820	31.40	44.50	32.04	3.79	34.16	33.07	46.17	53.90	73.90	20.83	27.73	Hori.	100	0	HA6	
7	6023.191	31.10	45.30	32.59	4.12	33.99	33.82	48.02	53.90	73.90	20.08	25.88	Hori.	100	0	HA6	
8	1047.511	32.50	47.20	24.85	1.66	35.97	23.04	37.74	53.90	73.90	30.86	36.16	Vert.	100	0	HA6	
9	1058.489	34.00	46.90	24.89	1.67	35.96	24.60	37.50	53.90	73.90	29.30	36.40	Vert.	100	0	HA6	
10	3055.242	31.20	44.60	28.51	2.90	34.62	27.99	41.39	53.90	73.90	25.91	32.51	Vert.	100	0	HA6	
11	3087.258	31.50	44.60	28.57	2.92	34.60	28.39	41.49	53.90	73.90	25.51	32.41	Vert.	100	0	HA6	
12	4277.338	31.40	45.10	30.50	3.45	34.02	31.33	45.03	53.90	73.90	22.57	28.87	Vert.	100	0	HA6	
13	5027.820	31.40	45.00	32.04	3.79	34.16	33.07	46.67	53.90	73.90	20.83	27.23	Vert.	100	0	HA6	
14	6023.191	31.10	44.50	32.59	4.12	33.99	33.82	47.22	53.90	73.90	20.08	26.68	Vert.	100	0	HA6	

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 + D-factor) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.2
Date	April 23, 2023
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
	(Below 1 GHz)
Mode	Mode 1 (Local) 97.7 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< QP DATA >>

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	97.297	22.50	9.87	7.36	28.44	11.29	43.50	32.21	Hori.	100	0	BA	
2	194.595	22.10	16.47	8.05	28.01	18.61	43.50	24.89	Hori.	100	0	BA	
3	778.378	22.70	20.56	10.79	29.16	24.89	46.00	21.11	Hori.	100	0	LA21	
4	97.297	22.50	9.87	7.36	28.44	11.29	43.50	32.21	Vert.	100	0	BA	
5	194.595	22.10	16.47	8.05	28.01	18.61	43.50	24.89	Vert.	100	0	BA	
6	778.378	22.90	20.56	10.79	29.16	25.09	46.00	20.91	Vert.	100	0	LA21	

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.2
April 23, 2023
23 deg. C / 46 % RH
Hiroki Numata
(Above 1 GHz)
Mode 1 (Local) 97.7 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< AV/PK DATA >>

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)	(PK)				(AV)	(PK)	(AV)	(PK)	(AV)	(PK)					
		[dBuV]	[dBuV]				[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1070.270	33.00	46.20	24.92	1.68	35.95	23.65	36.85	53.90	73.90	30.25	37.05	Hori.	100	0	HA6	
2	1079.130	34.40	47.90	24.96	1.69	35.94	25.11	38.61	53.90	73.90	28.79	35.29	Hori.	100	0	HA6	
3	3016.215	31.20	31.20	28.47	2.89	34.65	27.91	27.91	53.90	73.90	25.99	45.99	Hori.	100	0	HA6	
4	3041.185	32.30	45.50	28.49	2.90	34.63	29.06	42.26	53.90	73.90	24.84	31.64	Hori.	100	0	HA6	
5	4022.213	31.60	45.00	29.83	3.33	33.96	30.80	44.20	53.90	73.90	23.10	29.70	Hori.	100	0	HA6	
6	5059.457	31.20	44.80	32.11	3.80	34.15	32.96	46.56	53.90	73.90	20.94	27.34	Hori.	100	0	HA6	
7	5984.268	31.20	45.20	32.53	4.10	33.99	33.84	47.84	53.90	73.90	20.06	26.06	Hori.	100	0	HA6	
8	1070.270	32.60	46.30	24.92	1.68	35.95	23.25	36.95	53.90	73.90	30.65	36.95	Vert.	100	0	HA6	
9	1079.130	36.00	48.20	24.96	1.69	35.94	26.71	38.91	53.90	73.90	27.19	34.99	Vert.	100	0	HA6	
10	3016.215	31.30	44.80	28.47	2.89	34.65	28.01	41.51	53.90	73.90	25.89	32.39	Vert.	100	0	HA6	
11	3041.185	31.70	45.30	28.49	2.90	34.63	28.46	42.06	53.90	73.90	25.44	31.84	Vert.	100	0	HA6	
12	4022.213	31.70	45.50	29.83	3.33	33.96	30.90	44.70	53.90	73.90	23.00	29.20	Vert.	100	0	HA6	
13	5059.457	31.20	45.10	32.11	3.80	34.15	32.96	46.86	53.90	73.90	20.94	27.04	Vert.	100	0	HA6	
14	5984.268	31.20	45.10	32.53	4.10	33.99	33.84	47.74	53.90	73.90	20.06	26.16	Vert.	100	0	HA6	

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 + D-factor) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 23, 2023
Temperature / Humidity 23 deg. C / 46 % RH
Engineer Hiroki Numata
 (Below 1 GHz)
Mode Mode 1 (Local) 107.9 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< QP DATA >>

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	107.496	23.20	11.47	7.44	28.40	13.71	43.50	29.79	Hori.	100	0	BA	
2	214.992	28.80	11.75	8.18	27.92	20.81	43.50	22.69	Hori.	100	260	LA21	
3	859.967	23.00	21.85	11.06	28.96	26.95	46.00	19.05	Hori.	100	0	LA21	
4	107.496	22.90	11.47	7.44	28.40	13.41	43.50	30.09	Vert.	100	0	BA	
5	214.992	27.70	11.75	8.18	27.92	19.71	43.50	23.79	Vert.	100	158	LA21	
6	859.967	22.90	21.85	11.06	28.96	26.85	46.00	19.15	Vert.	100	0	LA21	

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.2
Date	April 23, 2023
Temperature / Humidity	23 deg. C / 46 % RH
Engineer	Hiroki Numata
	(Above 1 GHz)
Mode	Mode 1 (Local) 107.9 MHz

Limit : FCC_Part 15 Subpart B(15.109)_Class B

<< AV/PK DATA >>

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)	(PK)				(AV)	(PK)	(AV)	(PK)	(AV)	(PK)					
		[dBuV]	[dBuV]				[dBuV/m]	[dBuV/m]	[dBuV/m]	[dBuV/m]	[dB]	[dB]					
1	1074.959	33.90	46.90	24.94	1.68	35.94	24.58	37.58	53.90	73.90	29.32	36.32	Horiz	100	0	HA6	
2	1083.041	34.00	47.40	24.98	1.69	35.93	24.74	38.14	53.90	73.90	29.16	35.76	Horiz	100	0	HA6	
3	3009.885	31.40	45.40	28.46	2.88	34.65	28.09	42.09	53.90	73.90	25.81	31.81	Horiz	100	0	HA6	
4	3032.515	31.30	44.80	28.48	2.89	34.64	28.03	41.53	53.90	73.90	25.87	32.37	Horiz	100	0	HA6	
5	4223.861	31.50	45.10	30.36	3.42	34.01	31.27	44.87	53.90	73.90	22.63	29.03	Horiz	100	0	HA6	
6	5052.306	31.30	44.50	32.10	3.80	34.15	33.05	46.25	53.90	73.90	20.85	27.65	Horiz	100	0	HA6	
7	6065.031	33.10	44.90	32.66	4.13	33.98	35.91	47.71	53.90	73.90	17.99	26.19	Horiz	100	0	HA6	
8	1074.959	33.60	47.90	24.94	1.68	35.94	24.28	38.58	53.90	73.90	29.62	35.32	Vert.	100	0	HA6	
9	1083.041	35.50	49.10	24.98	1.69	35.93	25.24	39.84	53.90	73.90	27.66	34.06	Vert.	100	0	HA6	
10	3009.885	31.90	45.60	28.46	2.88	34.65	28.59	42.29	53.90	73.90	25.31	31.61	Vert.	100	0	HA6	
11	3032.515	31.70	45.10	28.48	2.89	34.64	28.43	41.83	53.90	73.90	25.47	32.07	Vert.	100	0	HA6	
12	4223.861	31.50	45.60	30.36	3.42	34.01	31.27	45.37	53.90	73.90	22.63	28.53	Vert.	100	0	HA6	
13	5052.306	31.30	45.90	32.10	3.80	34.15	33.05	47.65	53.90	73.90	20.85	26.25	Vert.	100	0	HA6	
14	6065.031	31.30	45.00	32.66	4.13	33.98	34.11	47.81	53.90	73.90	19.79	26.09	Vert.	100	0	HA6	

CHART: WITH FACTOR

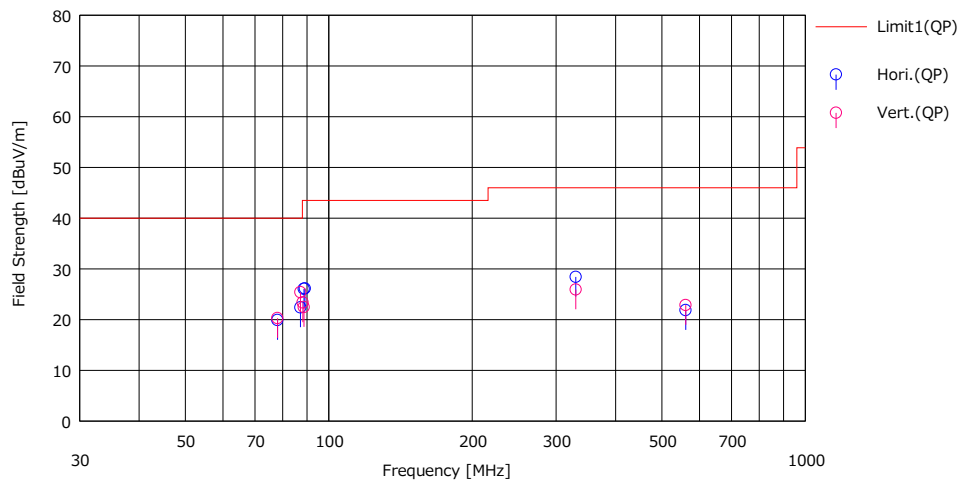
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 16, 2023
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Junya Okuno
(Below 1 GHz)
Mode Mode 1 (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	78.086	37.60	6.69	7.68	32.08	19.89	40.00	20.11	Hori.	298	21	BA	
2	87.226	38.60	8.10	7.77	32.07	22.40	40.00	17.60	Hori.	295	17	BA	
3	88.667	42.00	8.34	7.78	32.06	26.06	43.50	17.44	Hori.	323	0	BA	
4	89.149	42.00	8.41	7.78	32.06	26.13	43.50	17.37	Hori.	325	0	BA	
5	330.006	36.00	14.64	9.82	32.04	28.42	46.00	17.58	Hori.	100	270	LA23	
6	561.007	24.70	18.25	11.13	32.22	21.86	46.00	24.14	Hori.	100	76	LA23	
7	78.086	38.00	6.69	7.68	32.08	20.29	40.00	19.71	Vert.	100	42	BA	
8	87.227	41.60	8.10	7.77	32.07	25.40	40.00	14.60	Vert.	100	0	BA	
9	88.229	39.40	8.27	7.77	32.06	23.38	43.50	20.12	Vert.	100	0	BA	
10	88.667	38.40	8.34	7.78	32.06	22.46	43.50	21.04	Vert.	100	0	BA	
11	330.006	33.50	14.64	9.82	32.04	25.92	46.00	20.08	Vert.	150	153	LA23	
12	561.007	25.70	18.25	11.13	32.22	22.86	46.00	23.14	Vert.	100	330	LA23	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

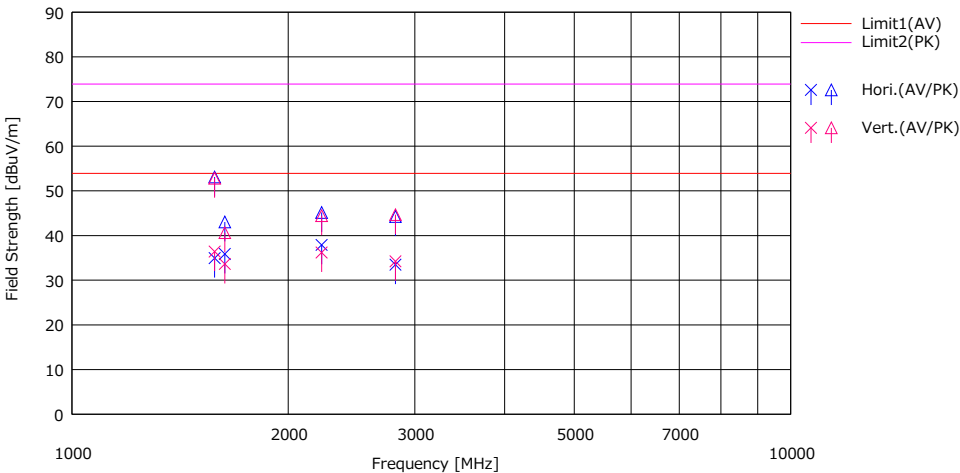
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 17, 2023
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Takumi Nishida
Mode (Above 1 GHz)
Mode 1 (Other)

Limit : FCC_Part 15 Subpart B(15.109)_Class B



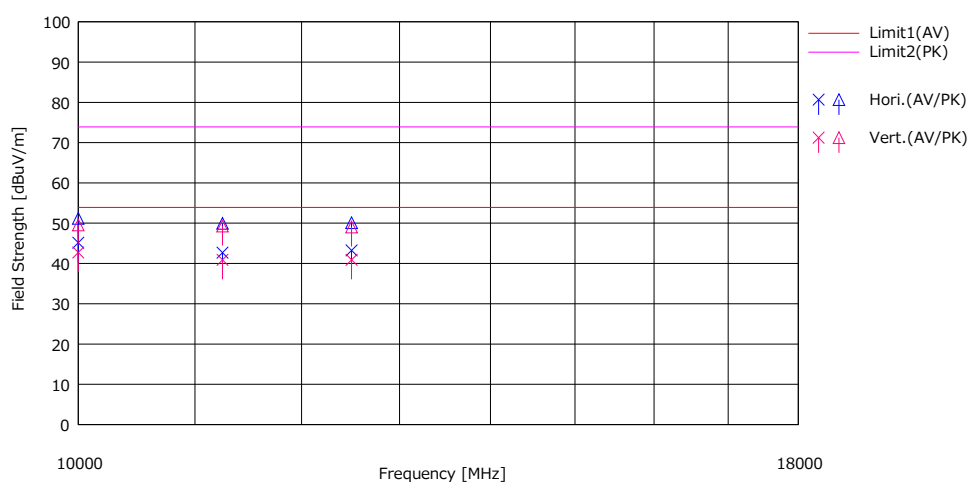
No.	Freq. [MHz]	Reading		Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result		Limit		Margin		Pda. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dB]	(PK) [dB]					
1	1579.968	40.76	58.90	25.20	2.33	33.34	34.95	53.09	53.90	73.90	18.95	20.81	Hori.	100	154	H20	
2	1631.840	41.65	48.82	25.07	2.36	33.20	35.88	43.05	53.90	73.90	18.02	30.85	Hori.	100	233	H20	
3	2225.239	38.92	46.20	28.35	2.74	32.11	37.90	45.18	53.90	73.90	16.00	28.72	Hori.	100	159	H20	
4	2819.677	33.65	44.43	28.53	3.07	31.78	33.47	44.25	53.90	73.90	20.43	29.65	Hori.	100	23	H20	
5	1579.968	42.21	58.65	25.20	2.33	33.34	36.40	52.84	53.90	73.90	17.50	21.06	Vert.	100	195	H20	
6	1631.840	39.41	46.39	25.07	2.36	33.20	33.64	40.62	53.90	73.90	20.26	33.28	Vert.	100	203	H20	
7	2225.239	37.23	45.48	28.35	2.74	32.11	36.21	44.46	53.90	73.90	17.69	29.44	Vert.	161	182	H20	
8	2819.677	34.41	44.86	28.53	3.07	31.78	34.23	44.68	53.90	73.90	19.67	29.22	Vert.	100	288	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 + D-factor) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place	Ise EMC Lab.
Semi Anechoic Chamber	No.4
Date	April 17, 2023
Temperature / Humidity	24 deg. C / 48 % RH
Engineer	Takumi Nishida (10 GHz - 18 GHz)
Mode	Mode 1 (Other)

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq.	Reading		Ant.Fac	Loss	Gain	Result		Limit		Margin		Pda.	Height	Angle	Ant. Type	Comment
		(AV)	(PK)				(AV)	(PK)	(AV)	(PK)	(AV)	(PK)					
		[MHz]	[dBuV]				[dBuV]	[dB/m]	[dB]	[dBuV/m]	[dBuV/m]	[dBuV/m]					
1	1000.000	42.37	48.41	39.67	-4.18	32.71	45.15	51.19	53.90	73.90	8.75	22.71	Hori.	100	80	H2O	
2	1124.960	39.59	46.87	39.85	-3.80	32.97	42.67	49.95	53.90	73.90	11.23	23.95	Hori.	100	135	H2O	
3	1249.960	40.21	47.09	39.07	-3.44	32.61	43.23	50.11	53.90	73.90	10.67	23.79	Hori.	100	106	H2O	
4	1000.000	39.93	46.78	39.67	-4.18	32.71	42.71	49.56	53.90	73.90	11.19	24.34	Vert.	100	129	H2O	
5	1124.960	37.80	46.19	39.85	-3.80	32.97	40.88	49.27	53.90	73.90	13.02	24.63	Vert.	100	15	H2O	
6	1249.960	37.88	46.02	39.07	-3.44	32.61	40.90	49.04	53.90	73.90	13.00	24.86	Vert.	100	123	H2O	

CHART: WITH FACTOR

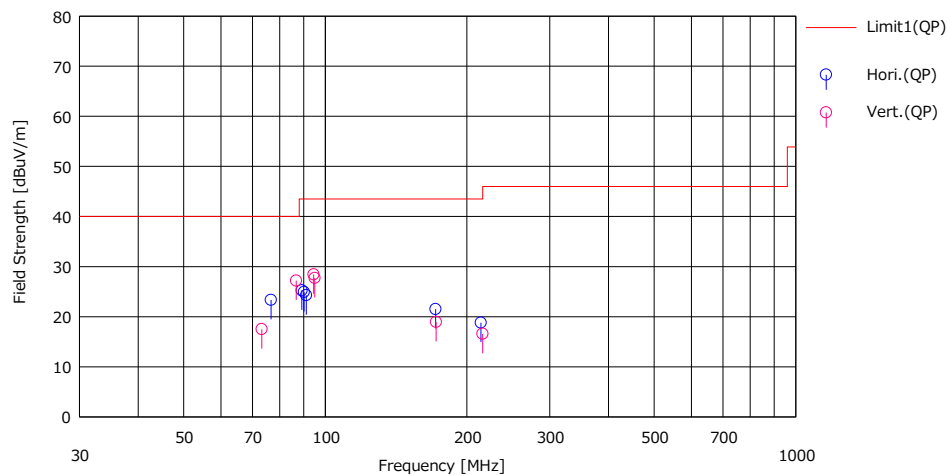
ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)
Except for the above table: adequate margin data below the limits.

* No signal was detected above 18GHz.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 16, 2023
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Junya Okuno
(Below 1 GHz)
Mode Mode 2

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	76.632	41.20	6.56	7.66	32.08	23.34	40.00	16.66	Hori.	400	0	BA	
2	89.154	41.10	8.41	7.78	32.06	25.23	43.50	18.27	Hori.	307	72	BA	
3	90.123	40.60	8.57	7.79	32.06	24.90	43.50	18.60	Hori.	307	65	BA	
4	91.080	39.80	8.74	7.80	32.06	24.28	43.50	19.22	Hori.	308	66	BA	
5	171.567	29.10	15.90	8.53	32.02	21.51	43.50	21.99	Hori.	180	327	BA	
6	214.094	30.80	11.10	8.90	32.01	18.79	43.50	24.71	Hori.	147	80	LA23	
7	73.250	35.60	6.36	7.62	32.08	17.50	40.00	22.50	Vert.	100	272	BA	
8	86.751	43.50	8.01	7.76	32.07	27.20	40.00	12.80	Vert.	100	250	BA	
9	94.460	43.30	9.35	7.83	32.05	28.43	43.50	15.07	Vert.	100	238	BA	
10	94.943	42.50	9.43	7.84	32.05	27.72	43.50	15.78	Vert.	100	238	BA	
11	172.033	26.50	15.92	8.54	32.02	18.94	43.50	24.56	Vert.	100	142	BA	
12	216.000	28.60	11.07	8.92	32.01	16.58	43.50	26.92	Vert.	100	187	LA23	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

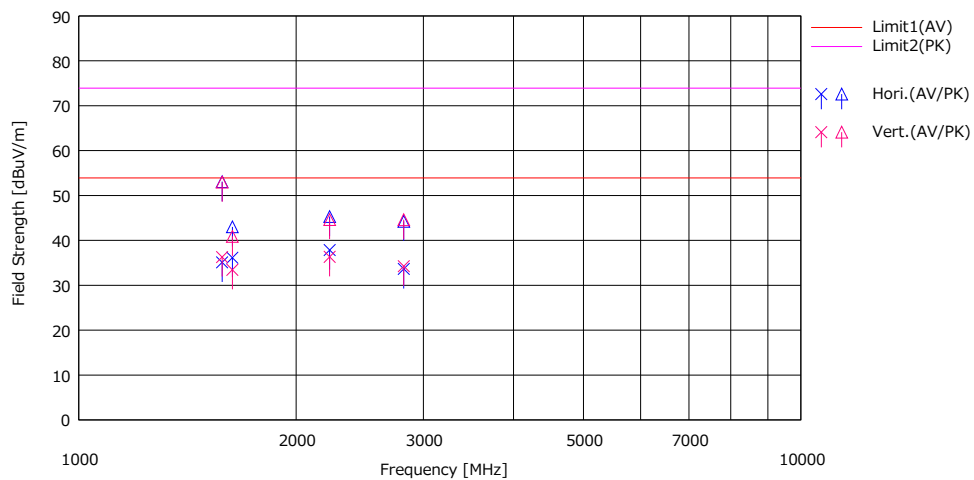
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + ATT) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 17, 2023
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Takumi Nishida
(Above 1 GHz)
Mode Mode 2

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	1579.968	40.91	58.88	25.20	2.33	33.34	35.10	53.07	53.90	73.90	18.80	20.83	Hori.	100	153	H2O	
2	1631.840	41.92	48.80	25.07	2.36	33.20	36.15	43.03	53.90	73.90	17.75	30.87	Hori.	100	234	H2O	
3	2225.239	38.87	46.32	28.35	2.74	32.11	37.85	45.30	53.90	73.90	16.05	28.60	Hori.	100	159	H2O	
4	2819.677	33.82	44.41	28.53	3.07	31.78	33.64	44.23	53.90	73.90	20.26	29.67	Hori.	100	20	H2O	
5	1579.968	42.11	58.78	25.20	2.33	33.34	36.30	52.97	53.90	73.90	17.60	20.93	Vert.	100	193	H2O	
6	1631.840	39.21	46.65	25.07	2.36	33.20	33.44	40.88	53.90	73.90	20.46	33.02	Vert.	100	202	H2O	
7	2225.239	37.35	45.64	28.35	2.74	32.11	36.33	44.62	53.90	73.90	17.57	29.28	Vert.	159	181	H2O	
8	2819.677	34.42	44.78	28.53	3.07	31.78	34.24	44.60	53.90	73.90	19.66	29.30	Vert.	100	284	H2O	

CHART: WITH FACTOR

ANT TYPE: - 30 MHz: LOOP, 30 MHz - 200 MHz: BICONICAL, 200 MHz - 1000 MHz: LOGPERIODIC, 1000 MHz -: HORN

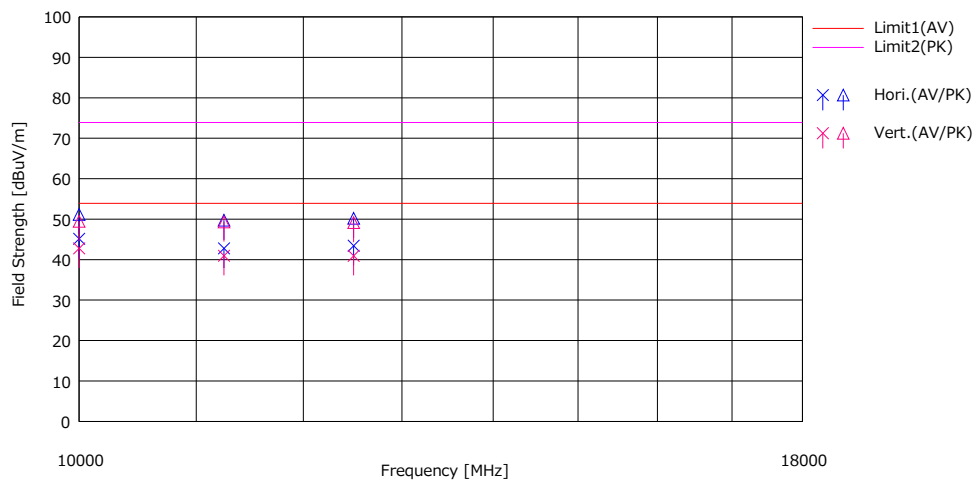
CALCULATION: RESULT = READING + ANT FACTOR + LOSS(CABLE + D-factor) - GAIN(AMP)

Except for the above table: adequate margin data below the limits.

Radiated Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 17, 2023
Temperature / Humidity 24 deg. C / 48 % RH
Engineer Takumi Nishida
(10 GHz - 18 GHz)
Mode Mode 2

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	10000.000	42.36	48.38	39.67	-4.18	32.71	45.14	51.16	53.90	73.90	8.76	22.74	Hori.	100	77	H20	
2	11249.960	39.69	46.66	39.85	-3.80	32.97	42.77	49.74	53.90	73.90	11.13	24.16	Hori.	100	136	H20	
3	12499.960	40.41	47.17	39.07	-3.44	32.61	43.43	50.19	53.90	73.90	10.47	23.71	Hori.	100	111	H20	
4	10000.000	39.99	46.67	39.67	-4.18	32.71	42.77	49.45	53.90	73.90	11.13	24.45	Vert.	100	131	H20	
5	11249.960	37.87	46.22	39.85	-3.80	32.97	40.95	49.30	53.90	73.90	12.95	24.60	Vert.	100	14	H20	
6	12499.960	37.92	46.12	39.07	-3.44	32.61	40.94	49.14	53.90	73.90	12.96	24.76	Vert.	100	125	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 + D-factor) - GAIN(AMP)

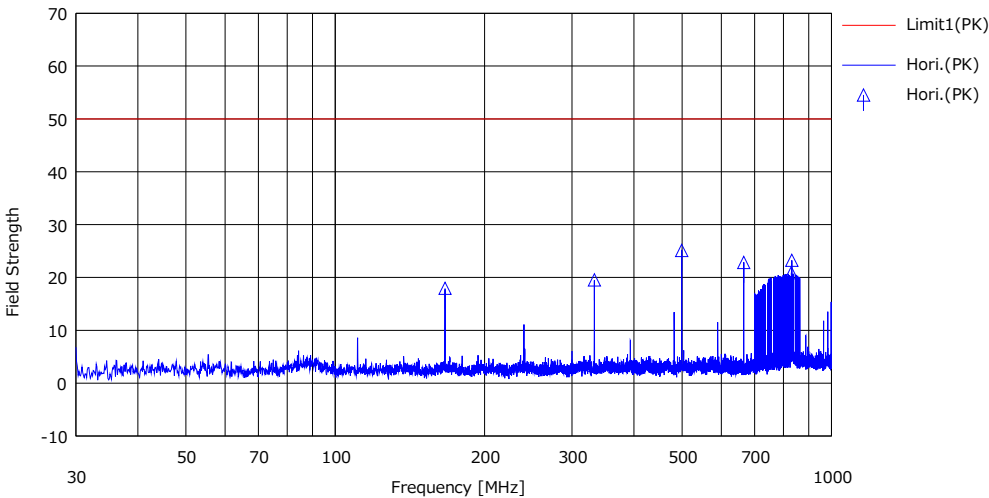
Except for the above table: adequate margin data below the limits.

* No signal was detected above 18GHz.

Antenna Terminal Conducted Emission

Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date April 16, 2023
Temperature / Humidity 20 deg. C / 50 % RH
Engineer Junya Okuno
 (Below 1 GHz)
Mode Mode 3

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]	Ant. Type	Comment
		[dBuV]				[dBuV]	[dBuV]	[dB]			
1	166.400	43.84	0.00	6.12	32.02	17.94	50.00	32.06			
2	332.800	45.40	0.00	6.17	32.04	19.53	50.00	30.47			
3	499.192	51.08	0.00	6.21	32.19	25.10	50.00	24.90			
4	665.588	48.87	0.00	6.25	32.27	22.85	50.00	27.15			
5	829.630	46.15	0.00	6.28	31.53	20.90	50.00	29.10			Local 104.1 MHz
6	831.986	48.49	0.00	6.28	31.52	23.25	50.00	26.75			

* 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.

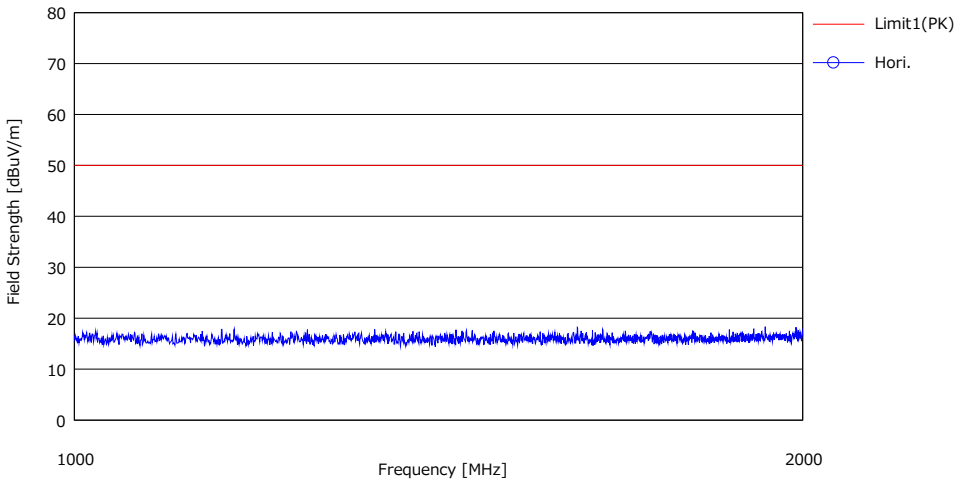
Antenna Terminal Conducted Emission

Test place
Semi Anechoic Chamber
Date
Temperature / Humidity
Engineer

Mode

Ise EMC Lab.
No.4
April 16, 2023
20 deg. C / 50 % RH
Junya Okuno
(1 - 2 GHz)
Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV]	Limit #1	Margin	Pola. [H/V]	Ant. Type	Comment
							<PK> [dBuV]	<PK> [dB]			

* 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

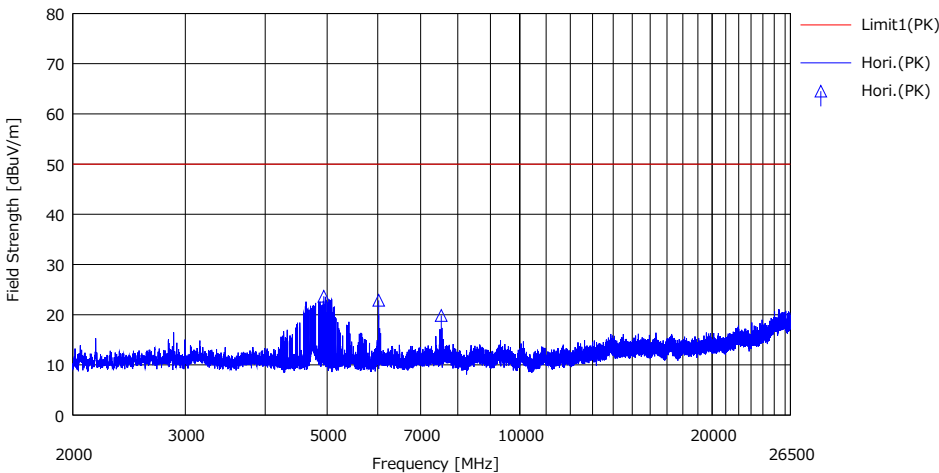
April 16, 2023

20 deg. C / 50 % RH

Junya Okuno

Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq. [MHz]	Reading	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result	Limit *1)	Margn	Pda. [H/V]	Ant. Type	Comment
		(PK) [dBuV]				(PK) [dBuV]	(PK) [dBuV]	(PK) [dB]			
1	4939.729	52.64	0.00	2.15	31.11	23.68	50.00	26.32			Local 87.7 MHz *1)
2	6019.770	52.07	0.00	2.19	31.40	22.86	50.00	27.14			
3	7539.067	50.11	0.00	2.24	32.51	19.84	50.00	30.16			Local 105.1 MHz *1)

* 2 nW = -57 dBm = 50 dBuV
CHART: WITH FACTOR
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE +75 Ohm to 50 Ohm correction factor) - GAIN
Except for the above table: adequate margin data below the limits.
*No signal was detected above 26.5 GHz.

*1) Recorded the frequency of worst level in Local Seek condition.

APPENDIX 2: Test instruments

Test equipment-1/2

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/30/2022	24
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	04/09/2021	24
RE	MAEC-04	142011	AC4_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2022	24
RE	MAEC-04-SVSWR	142017	AC4_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/12/2021	24
RE	MAT-112	220646	Attenuator	Huber+Suhner	6806 N-50-1	-	03/17/2023	12
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/01/2023	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103 +BBA9106	VHA 91031302	08/26/2022	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHA9103B +BBA9106	08031	07/30/2022	12
RE	MCC-12	141317	Coaxial Cable	UL Japan	-	-	09/27/2022	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/12/2022	12
RE	MCC-224	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	10/19/2022	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	11/18/2022	12
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	10/20/2022	12
RE	MHA-17	141506	Horn Antenna 15-40GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9170	BBHA9170307	07/22/2022	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	258	11/14/2022	12
RE	MHA-29	141517	Horn Antenna 26.5-40GHz	ETS-Lindgren	3160-10	152399	11/14/2022	12
RE	MJM-27	142228	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	MJM-29	142230	Measure, Tape, Steel	KOMELON	KMC-36	-	-	-
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-190	07/30/2022	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	9111B-192	09/21/2022	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/12/2022	12
RE	MMM-10	141545	DIGITAL HiTESTER	HIOKI E.E. CORPORATION	3805	51201148	01/18/2023	12
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/13/2023	12
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/17/2022	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/14/2023	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2022	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/05/2023	12
RE	MPA-22	141588	Pre Amplifier	L3 Narda-MITEQ	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 /1871328	01/24/2023	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/02/2023	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/13/2023	12
RE	MTR-03	141942	Test Receiver	Rohde & Schwarz	ESCI	100300	07/29/2022	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	10/11/2022	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	07/25/2022	12

Test equipment-2/2

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
AT	MCC-178	141227	Microwave Cable	Junkosha	MMX221-00500DMSDMS	1502S305	03/03/2023	12
AT	MCC-241	196413	Microwave Cable	Huber+Suhner	SF101EA/11PC24/11PC24/2500M	SN 800094/1EA	01/23/2023	12
AT	MMM-10	141545	DIGITAL HITESTER	HIOKI E.E. CORPORATION	3805	51201148	01/18/2023	12
AT	MMP-01	141550	Matching Pad Anritsu	Anritsu Corporation	MB-009	40063	07/28/2022	12
AT	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/13/2023	12
AT	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	00650	10/05/2022	12
AT	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	04/05/2023	12
AT	MPA-22	141588	Pre Amplifier	L3 Narda-MITEQ	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	01/24/2023	12
AT	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/13/2023	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