



EMI TEST REPORT

Test Report No. : 13481459H-R1

Applicant : DENSO TEN Limited
Type of EUT : Car Audio
Model Number of EUT : FT0025A
FCC ID : BABFT0025A
Test regulation : FCC Part 15 Subpart B: 2020
ICES-003 Issue 6: 2016 (updated April 2019)
Test Result : Complied (Refer to SECTION 3.2)

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2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13481459H. 13481459H is replaced with this report.

Date of test: September 14 and 15, 2020

Representative test engineer:

Hiroki Numata
Engineer
Consumer Technology Division

Approved by:

Tsubasa Takayama
Leader
Consumer Technology Division



CERTIFICATE 5107.02

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

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REVISION HISTORY

Original Test Report No.: 13481459H

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13481459H	September 28, 2020	-	-
1	13481459H-R1	October 2, 2020	P.1	Deletion of “Class B” from test regulation
1	13481459H-R1	October 2, 2020	P. 6	Correction of Limits
1	13481459H-R1	October 2, 2020	P. 6	Addition of Remarks *2)
1	13481459H-R1	October 2, 2020	P.11	Correction of Test distance: from “3 m” to “3 m (30 MHz - 10000 MHz) / 1 m (10000 MHz - 40000 MHz)”
1	13481459H-R1	October 2, 2020	P.11	Correction of sentence for *1) of above table: from Figure 2 to Figure 1
1	13481459H-R1	October 2, 2020	P.13	Correction of IF Bandwidth for Frequency range Below 1 GHz: from VBW: 100 kHz to VBW: 300 kHz

Reference: Abbreviations (Including words undescribed in this report)

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

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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
Facsimile Number	:	+81-78-682-2169
Contact Person	:	Daisuke Fukii

The information provided from the customer is as follows;

- Applicant, Type 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
- 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

Type	:	Car Audio
Model Number	:	FT0025A
Serial Number	:	Refer to SECTION 4.2
Rating	:	DC 12 V
Receipt Date	:	September 14, 2020
Country of Mass-production	:	Thailand
Condition	:	Production model
Modification	:	No Modification by the test lab

2.2 Product Description

Model: FT0025A (referred to as the EUT in this report) is a Car Audio.

General Specification

Feature of EUT:

Clock frequency(ies) in the system	:	3.93216 MHz: System Microcomputer 5 MHz: Panel Micon 16.9344 MHz, 48.0 MHz: USB Decoder IC 35.28 MHz: Crystal Oscillator
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Radio Specification

[AM / FM]

Type of Receiver	:	Receiver
Frequency of Operation	:	AM: 531 kHz to 1602 kHz FM: 87.5 MHz to 108.0 MHz
Channel spacing	:	AM: 9 kHz FM: 0.05 MHz
Antenna connector type	:	HFC

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart B
FCC Part 15 final revised on June 26, 2020 and effective July 27, 2020

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

Test specification : ICES-003 Issue 6: 2016 (updated April 2019)

Title : Spectrum Management and Telecommunications
Interference-Causing Equipment Standard
Information Technology Equipment (Including Digital Apparatus) –
Limits and Methods of Measurement

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements IEEE 187:2003 IC: ICES-003 Issue 6: 2016 + Amendment 1: 2017	FCC: Part 15 Subpart B 15.107(a)	N/A	-	N/A	*1)
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements IEEE 187:2003 IC: ICES-003 Issue 6: 2016 + Amendment 1: 2017	FCC: Part 15 Subpart B 15.109(a)	N/A	1.5 dB 84.024 MHz, Horizontal	Complied# a)	*2)
Antenna Terminal	FCC: ANSI C63.4: 2014 12. Measurement of unintentional radiators other than ITE IEEE 187:2003 IC: -	FCC: Part 15 Subpart B 15.111(a)	N/A	21.93 dB 1410.888 MHz	Complied b)	*2)
*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420. *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. *2) Measurements were limited up to 40 GHz according to the customer's request. a) Refer to APPENDIX 1 (data of Radiated Emission) b) Refer to APPENDIX 1 (data of Antenna Terminal Conducted Emission) Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.						

3.3 Addition to standard

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

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3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

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)	5.2 dB
	(Vertical)	6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
	(Vertical)	4.8 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
	(Vertical)	5.0 dB
3 m	1 GHz to 6 GHz	4.9 dB
	6 GHz to 18 GHz	5.2 dB
1 m	10 GHz to 26.5 GHz	5.5 dB
	26.5 GHz to 40 GHz	5.5 dB
0.5 m	26.5 GHz to 40 GHz	5.5 dB
10 m	1 GHz to 18 GHz	5.2 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
Antenna terminal conducted emission / Power density / Burst power	2.6 dB

3.5 Test Location

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* A2LA Certificate Number: 5107.02/ FCC Test Firm Registration Number: 199967 / ISED Lab Company Number: 2973C

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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

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SECTION 4: Operation of EUT during testing

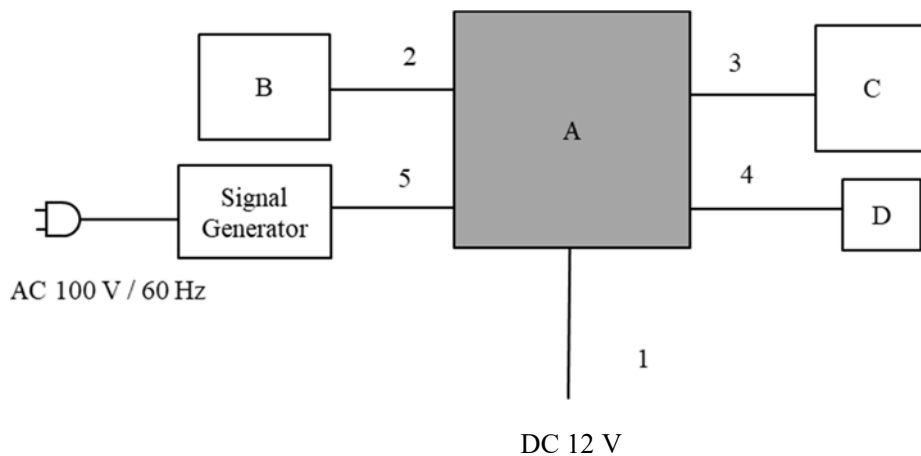
4.1 Operating Mode(s)

Mode	Remarks
1. USB Play Mode	-
2. FM Receiving Mode (Other)	-
3. FM Receiving Mode (Local)	-

Software : Main Micon Soft Ver. 0A182008

4.2 Configuration and peripherals

Radiated Emission



* 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	FT0025A	BN400183	DENSO TEN Limited	EUT
B	Speaker Dummy	-	-	-	-
C	Jig Board	-	-	-	-
D	USB memory	RUF3-K8GA-BK/N	P90611	Buffalo	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.6	Unshielded	Unshielded	-
2	Speaker Cable	1.8	Unshielded	Unshielded	-
3	Signal Cable	1.7	Unshielded	Unshielded	-
4	USB Cable	2.7	Shielded	Shielded	-
5	BNC Cable	1.5	Shielded	Shielded	-

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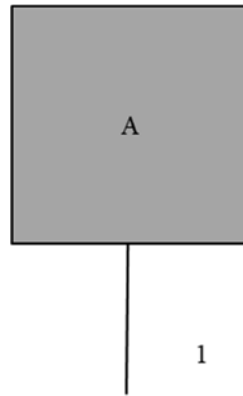
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Antenna Terminal



DC 12 V

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

Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Car Audio	FT0025A	BN400183	DENSO TEN Limited	EUT

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	1.6	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.4 semi anechoic chamber
Temperature : See data
Humidity : 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 center 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 - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 40000 MHz (Horn antenna)
Test distance : 3 m (30 MHz - 10000 MHz) / 1 m (10000 MHz - 40000 MHz)
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.

For above 1 GHz, test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.

Frequency	Below 1 GHz	1 GHz - 26.5 GHz *1)
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	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.

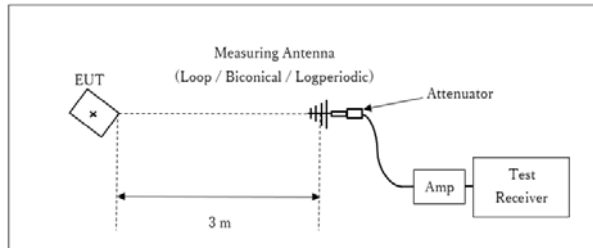
Frequency	Above 26.5 GHz *1)
Instrument used	Test Receiver
IF Bandwidth	PK: BW 1 MHz, CISPR AV: BW 1 MHz

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

Distance Factor: See Figure 1.

Figure 1: Test Setup

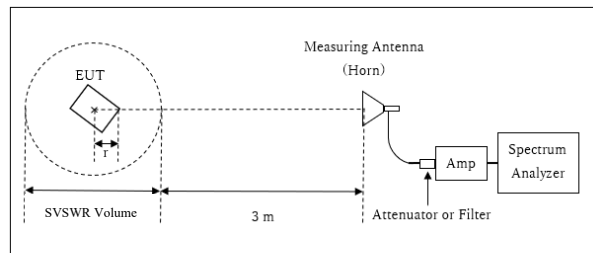
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz



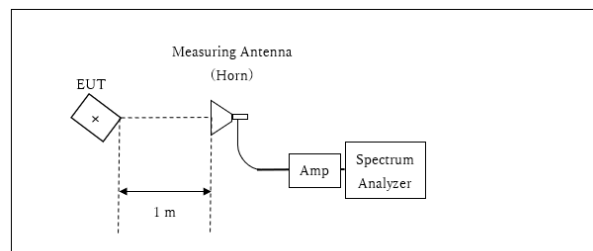
r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor: $20 \times \log(3.50 \text{ m}^* / 3.0 \text{ m}) = 1.34 \text{ dB}$
 * Test Distance: $(3 + \text{SVSWR Volume} / 2) - r = 3.50 \text{ m}$

SVSWR Volume: 2 m
 (SVSWR Volume has been calibrated based on CISPR 16-1-4.)
 $r = 0.50 \text{ m}$

10 GHz - 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.

Date: September 14, 2020
 Date: September 15, 2020

Test engineer: Kiyoshiro Okazaki
 Test engineer: Hiroki Numata

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SECTION 6: Antenna Terminal

6.1 Operating environment

Test place : No.6 Measurement room
Temperature : See data
Humidity : 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 - 1000 MHz / 1000 MHz - 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: 300 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

Date: September 14, 2020

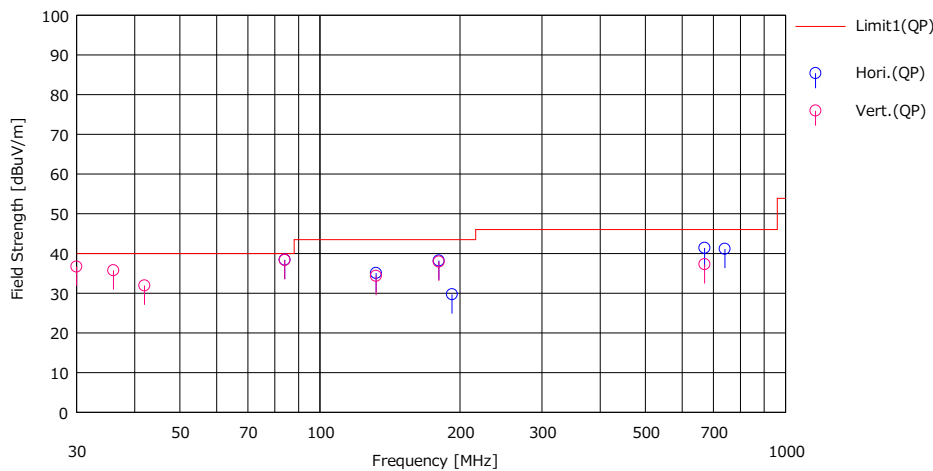
Test engineer: Masaya Minami

APPENDIX 1: Test data

Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 15, 2020
Temperature / Humidity 22 deg. C / 66 % RH
Engineer Hiroki Numata
(Below 1 GHz)
Mode Mode 1

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pol. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	84.024	55.10	7.35	7.91	31.94	38.42	40.00	1.5	Hori.	264	274	BA	
2	132.031	44.70	13.84	8.39	31.88	35.05	43.50	8.4	Hori.	185	111	BA	
3	180.043	45.20	16.03	8.82	31.84	38.21	43.50	5.2	Hori.	180	129	BA	
4	192.205	36.30	16.31	8.92	31.83	29.70	43.50	13.8	Hori.	150	309	BA	
5	670.328	42.10	19.53	11.80	32.05	41.38	46.00	4.6	Hori.	100	180	LA23	
6	740.883	40.80	20.11	12.11	31.88	41.14	46.00	4.8	Hori.	100	48	LA23	
7	30.005	43.10	18.41	7.15	31.99	36.67	40.00	3.3	Vert.	100	359	BA	
8	36.011	44.30	16.16	7.25	31.98	35.73	40.00	4.2	Vert.	100	359	BA	
9	42.000	42.50	14.07	7.35	31.98	31.94	40.00	8.0	Vert.	100	127	BA	
10	84.024	55.00	7.35	7.91	31.94	38.32	40.00	1.6	Vert.	100	359	BA	
11	132.031	44.00	13.84	8.39	31.88	34.35	43.50	9.1	Vert.	100	279	BA	
12	180.043	44.90	16.03	8.82	31.84	37.91	43.50	5.5	Vert.	100	190	BA	
13	670.328	38.00	19.53	11.80	32.05	37.28	46.00	8.7	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.

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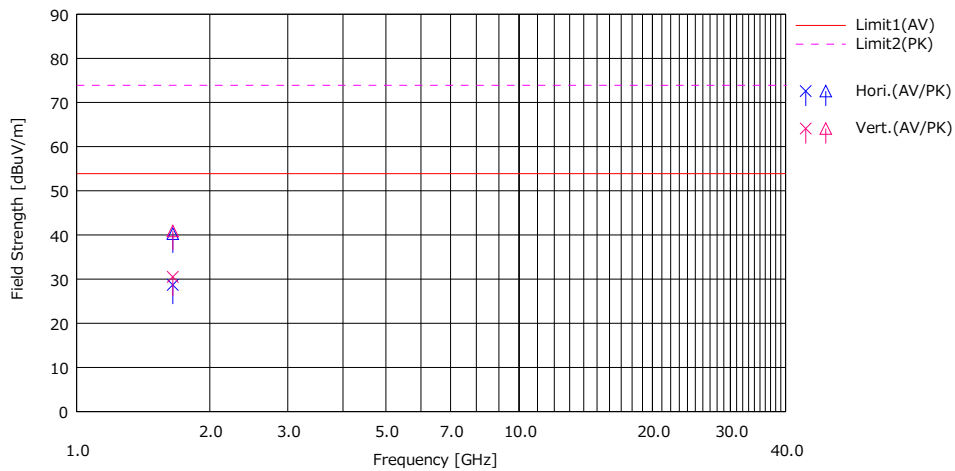
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Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 14, 2020
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode Mode 1

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	1650.000	33.50	45.10	24.88	3.27	32.95	28.70	40.30	53.90	73.90	25.2	33.6	Hori.	141	333	H2.1	
2	1650.000	35.30	45.70	24.88	3.27	32.95	30.50	40.90	53.90	73.90	23.4	33.0	Vert.	100	348	H2.1	

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.

UL Japan, Inc.

Ise EMC Lab.

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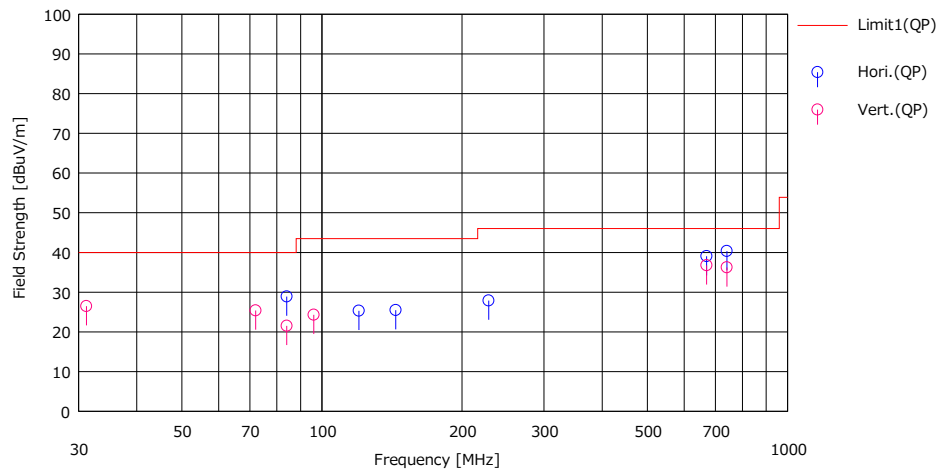
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 15, 2020
Temperature / Humidity 22 deg. C / 66 % RH
Engineer Hiroki Numata
(Below 1 GHz)
Mode Mode 2

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading [QP] [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [QP] [dBuV/m]	Limit [QP] [dBuV/m]	Margn [QP] [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	84.024	45.60	7.35	7.91	31.94	28.92	40.00	11.0	Hori.	287	258	BA	
2	120.038	36.20	12.71	8.28	31.89	25.30	43.50	18.2	Hori.	311	97	BA	
3	144.035	34.20	14.64	8.51	31.87	25.48	43.50	18.0	Hori.	215	107	BA	
4	228.093	39.20	11.27	9.21	31.80	27.88	46.00	18.1	Hori.	140	303	LA23	
5	670.328	39.80	19.53	11.80	32.05	39.08	46.00	6.9	Hori.	100	200	LA23	
6	740.893	40.00	20.11	12.11	31.88	40.34	46.00	5.6	Hori.	100	0	LA23	
7	31.190	33.40	17.90	7.17	31.99	26.48	40.00	13.5	Vert.	100	355	BA	
8	72.057	43.30	6.27	7.77	31.96	25.38	40.00	14.6	Vert.	100	188	BA	
9	84.024	38.20	7.35	7.91	31.94	21.52	40.00	18.4	Vert.	115	0	BA	
10	96.027	38.80	9.38	8.04	31.92	24.30	43.50	19.2	Vert.	100	171	BA	
11	670.328	37.50	19.53	11.80	32.05	36.78	46.00	9.2	Vert.	100	145	LA23	
12	740.893	35.90	20.11	12.11	31.88	36.24	46.00	9.7	Vert.	100	146	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.

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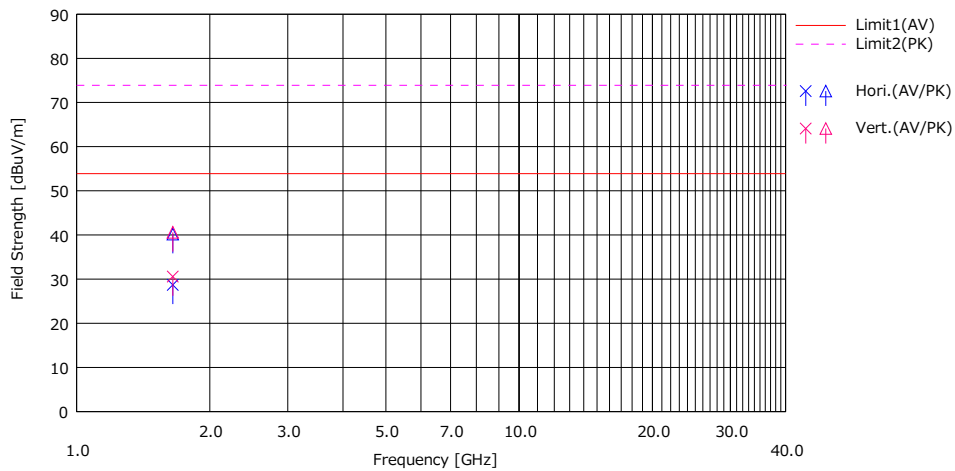
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 14, 2020
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Kiyoshiro Okazaki
(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		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	1650.040	33.50	45.00	24.88	3.27	32.95	28.70	40.20	53.90	73.90	25.2	33.7	Hori.	142	359	H2.1	
2	1650.040	35.40	45.40	24.88	3.27	32.95	30.60	40.60	53.90	73.90	23.3	33.3	Vert.	100	134	H2.1	

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.

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Ise EMC Lab.

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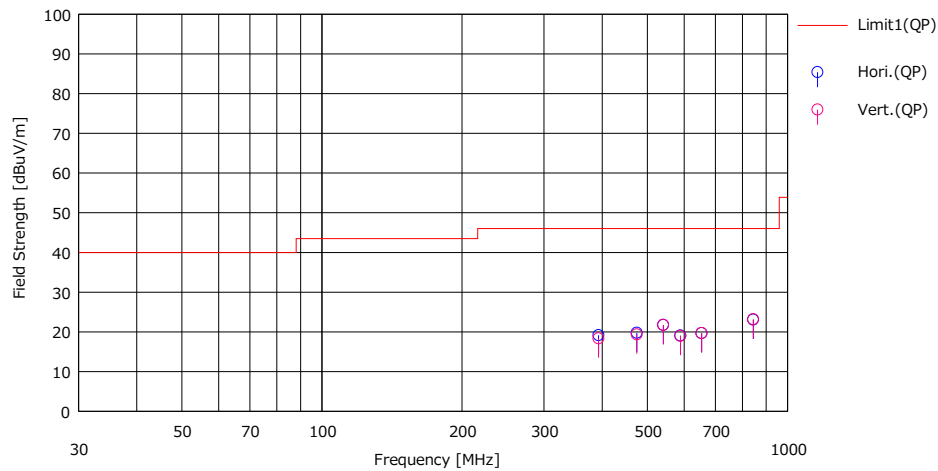
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 15, 2020
Temperature / Humidity 22 deg. C / 66 % RH
Engineer Hiroki Numata
(Below 1 GHz)
Mode Mode 3

Limit : FCC_Part 15 Subpart B(15.109)_Class B



No.	Freq. [MHz]	Reading [QP] [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [QP] [dBuV/m]	Limit [QP] [dBuV/m]	Margin [QP] [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
1	392.829	25.10	15.55	10.31	31.81	19.15	46.00	26.8	Hori.	100	60	LA23	
2	474.788	23.80	17.02	10.78	31.85	19.75	46.00	26.2	Hori.	100	320	LA23	
3	540.944	24.70	17.79	11.16	31.91	21.74	46.00	24.2	Hori.	100	320	LA23	
4	589.124	20.70	18.93	11.40	31.96	19.07	46.00	26.9	Hori.	100	0	LA23	
5	653.982	20.70	19.27	11.72	32.03	19.66	46.00	26.3	Hori.	100	0	LA23	
6	844.403	20.60	21.24	12.57	31.36	23.05	46.00	22.9	Hori.	100	0	LA23	
7	392.829	24.30	15.55	10.31	31.81	18.35	46.00	27.6	Vert.	100	336	LA23	
8	474.788	23.40	17.02	10.78	31.85	19.35	46.00	26.6	Vert.	100	100	LA23	
9	540.944	24.70	17.79	11.16	31.91	21.74	46.00	24.2	Vert.	100	62	LA23	
10	589.124	20.60	18.93	11.40	31.96	18.97	46.00	27.0	Vert.	100	0	LA23	
11	653.982	20.70	19.27	11.72	32.03	19.66	46.00	26.3	Vert.	100	0	LA23	
12	844.403	20.70	21.24	12.57	31.36	23.15	46.00	22.8	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.

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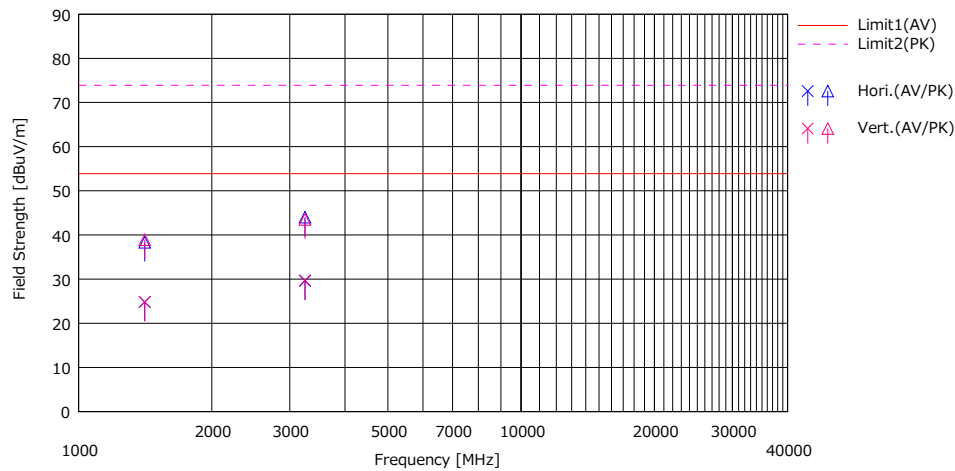
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13481459H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date September 14, 2020
Temperature / Humidity 22 deg. C / 60 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode Mode 3

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	1410.888	30.00	43.50	25.31	3.11	33.59	24.83	38.33	53.90	73.90	29.0	35.5	Hori.	100	123	H21	
2	3248.180	28.30	42.70	28.77	4.11	31.56	29.62	44.02	53.90	73.90	24.2	29.8	Hori.	100	211	H21	
3	1410.888	30.00	44.10	25.31	3.11	33.59	24.83	38.93	53.90	73.90	29.0	34.9	Vert.	100	41	H21	
4	3248.180	28.40	42.20	28.77	4.11	31.56	29.72	43.52	53.90	73.90	24.1	30.3	Vert.	100	242	H21	

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 10 GHz.

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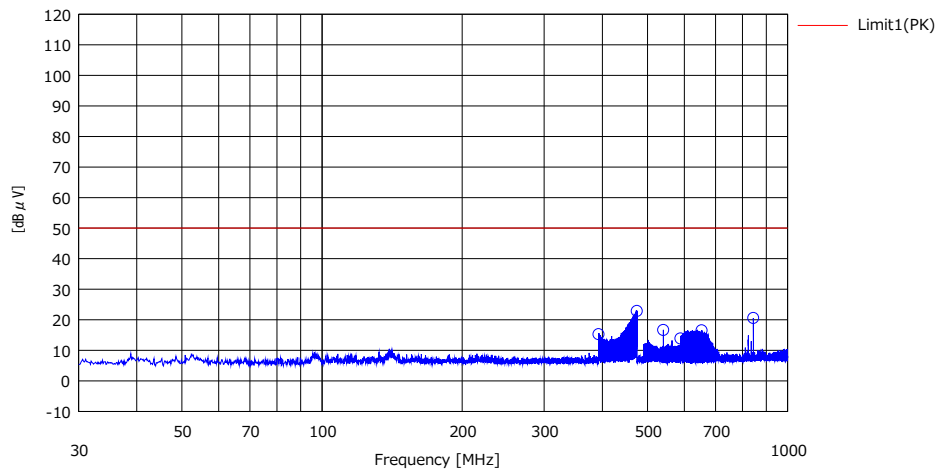
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Antenna Terminal Conducted Emission

Report No. 13481459H
Test place Ise EMC Lab.
Shielded room No.6
Date September 14, 2020
Temperature / Humidity 23 deg. C / 51 % RH
Engineer Masaya Minami
(Below 1 GHz)
Mode Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit*1)	Margin	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	[dBμV]	[dB/m]	[dB]	[dB]	[dBμV]	[dBμV]	[dB]					
1	392.829	36.86	---	6.89	28.51	15.24	50.00	34.76	---	---	---	---	
2	474.788	44.88	---	7.02	29.06	22.84	50.00	27.16	---	---	---	---	LOCAL:108.0MHz
3	540.944	38.83	---	7.09	29.30	16.62	50.00	33.38	---	---	---	---	
4	589.124	36.11	---	7.10	29.37	13.84	50.00	36.16	---	---	---	---	
5	653.982	38.72	---	7.14	29.37	16.49	50.00	33.51	---	---	---	---	
6	844.403	42.28	---	7.31	29.06	20.53	50.00	29.47	---	---	---	---	

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

CHART: WITH FACTOR

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

*1) 2 nW = -57 dBm = 50 dBuV

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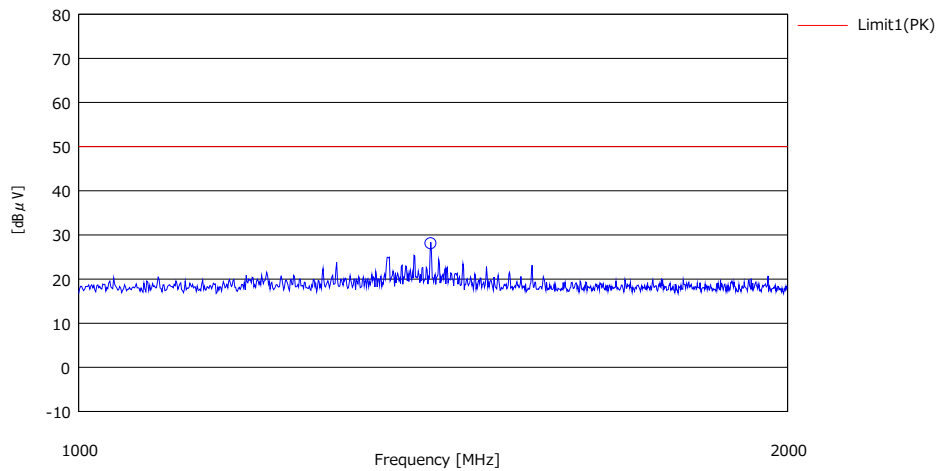
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Antenna Terminal Conducted Emission

Report No.	13481459H
Test place	Ise EMC Lab.
Shielded room	No.6
Date	September 14, 2020
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Masaya Minami
	(1 GHz - 2 GHz)
Mode	Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading	Ant.Fac.	Loss	Gain	Result	Limit*1)	Margin	Pola.	Height	Angle	Ant.	Comment
	[MHz]	[dBμV]	[dB/m]	[dB]	[dB]	[dBμV]	[dBμV]	[dB]	[H/V]	[cm]	[deg]	Type	
1	1410.888	55.95	--	8.02	35.90	28.07	50.00	21.93	--	--	--	--	

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

CHART: WITH FACTOR

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

*1) 2 nW = -57 dBm = 50 dBμV

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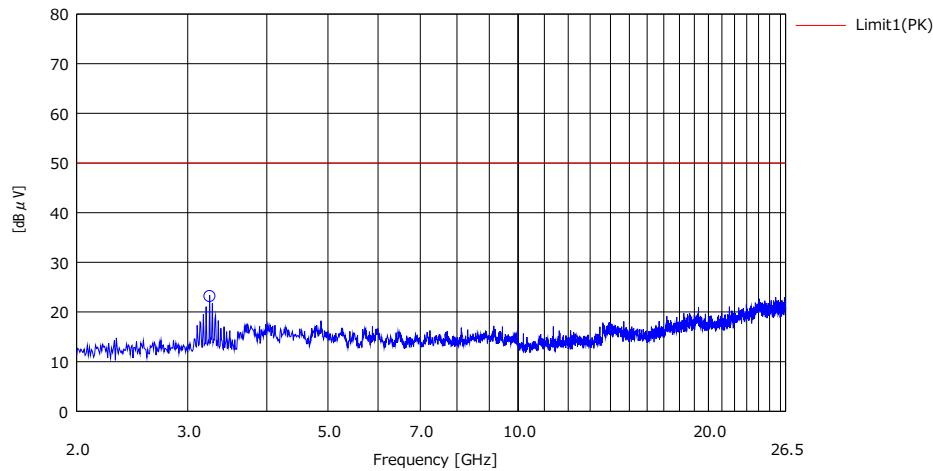
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Antenna Terminal Conducted Emission

Report No.	13481459H
Test place	Ise EMC Lab.
Shielded room	No.6
Date	September 14, 2020
Temperature / Humidity	23 deg. C / 51 % RH
Engineer	Masaya Minami
	(2 GHz - 26.5 GHz)
Mode	Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit*1)	Margin	Pola.	Height	Angle	Ant.	Comment
	[MHz]	[dBμV]	[dB/m]	[dB]	[dB]	[dBμV]	[dBμV]	[dB]	[H/V]	[cm]	[deg]	Type	
1	3248.180	53.34	---	4.60	34.78	23.16	50.00	26.84	---	---	---	---	

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

CHART: WITH FACTOR

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

*1) 2 nW = -57 dBm = 50 dBuV

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APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	MSA-17	141904	Spectrum Analyzer	Keysight Technologies Inc	N9030A	US51350215	09/20/2019	12
AT	MCC-64	141327	Coaxial Cable	UL Japan	-	-	02/04/2020	12
AT	MCC-38	141395	Coaxial Cable	UL Japan	-	-	11/12/2019	12
AT	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/10/2020	12
AT	MMP-01	141550	Matching Pad Anritsu	ANRITSU	MB-009	40063	07/02/2020	12
AT	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 537073/126E(5 m)	02/18/2020	12
AT	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	01/07/2020	12
AT	MCC-55	141326	Microwave Cable	Suhner	SUCOFLEX101	2874(1m) / 2877(5m)	03/24/2020	12
AT	MPA-03	141577	Microwave System Power Amplifier	Keysight Technologies Inc	83050A	MY39500610	10/01/2019	12
AT	MOS-34	141572	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	3401	01/07/2020	12
AT	MMM-16	141360	DIGITAL HiTESTER	Hioki	3805	70900532	01/06/2020	12
AT	MJM-04	142178	Measure	PROMART	SEN1635	-	-	-
RE	MAEC-04	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/25/2020	24
RE	MOS-15	141562	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0010	01/07/2020	12
RE	MMM-10	141545	DIGITAL HiTESTER	Hioki	3805	51201148	01/06/2020	12
RE	MJM-29	142230	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-04-SVSWR	142017	AC4 Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/04/2019	24
RE	MHA-21	141508	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	557	05/22/2020	12
RE	MPA-12	141581	MicroWave System Amplifier	Keysight Technologies Inc	83017A	650	10/16/2019	12
RE	MSA-03	141884	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY44020357	03/04/2020	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/10/2020	12
RE	MCC-246	199563	Microwave Cable	HUBER+SUNER	SF126E/11PC35/11PC35/1000M,5000M	537061/126E / 537072/126E	06/11/2020	12
RE	MCC-224	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	11/22/2019	12
RE	MPA-22	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 / 1871328	09/27/2019	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	06/15/2020	12
RE	MHA-29	141517	Horn Antenna 26.5-40GHz	ETS LINDGREN	3160-10	152399	08/03/2020	12
RE	MSG-02	141905	Signal Generator	Rohde & Schwarz	SML03	100332	09/03/2019	12
RE	MMP-01	141550	Matching Pad Anritsu	ANRITSU	MB-009	40063	07/02/2020	12
RE	MJM-26	142227	Measure	KOMELON	KMC-36	-	-	-
RE	MAT-34	141331	Attenuator(6dB)	TME	UFA-01	-	02/05/2020	12
RE	MBA-05	141425	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	VHA 91031302	08/31/2020	12
RE	MCC-50	141397	Coaxial Cable	UL Japan	-	-	03/24/2020	12
RE	MLA-23	141267	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-192	09/02/2020	12
RE	MPA-14	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	02/18/2020	12

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*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 test