



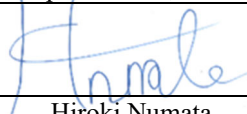
EMI TEST REPORT

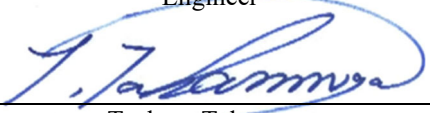
Test Report No. : 13747051H-G-R1

Applicant : DENSO TEN Limited
Type of EUT : Car Audio
Model Number of EUT : FT0108A
FCC ID : BABFT0108A
Test regulation : FCC Part 15 Subpart B: 2021
Test Result : Complied (Refer to SECTION 3)

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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.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by the A2LA accreditation body.
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 13747051H-G. 13747051H-G is replaced with this report.

Date of test: April 5 and 6, 2021

Representative test engineer: 
Hiroki Numata
Engineer

Approved by: 
Tsubasa Takayama
Leader



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.: 13747051H-G

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13747051H-G	May 18, 2021	-	-
1	13747051H-G-R1	May 25, 2021	P.23	Deletion of items - Local ID: MPM-10 and MPM-03. Addition of items - Local ID MPA-03 Correction of Test Item of Local ID MPA-24 from RE to RE/AT

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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	P _{LT}	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	P _{ST}	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, Gosho-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 : FT0108A
Serial Number : Refer to SECTION 4.2
Rating : DC 12.0 V
Receipt Date : March 24, 2021
Country of Mass-production : Mexico
Condition : Engineering prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification : No Modification by the test lab

2.2 Product Description

Model: FT0108A (referred to as the EUT in this report) is a Car Audio.

Feature of EUT:

Clock frequency(ies) in the system : 48 MHz

Radio Specification

Radio Type : Transceiver

	IEEE802.11b	IEEE802.11g/n (20 M band)	IEEE802.11a/n/ac (20 M band)	IEEE802.11n/ac (40 M band)	IEEE802.11ac (80 M band)
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5610 MHz 5775 MHz
Type of modulation	DSSS (CCK, DQPSK, DBPSK)	OFDM-CCK (64QAM, 16QAM, QPSK, BPSK)	OFDM (64QAM, 16QAM, QPSK, BPSK, 256QAM(IEEE802.11ac only))		
Channel spacing	5MHz		20MHz	40MHz	80MHz
Antenna type	Inverted F Antenna				
Antenna Connector type	U.FL-LP-066				
Antenna Gain	4.7 dBi (2.4 GHz Band), 5.7 dBi (5 GHz Band)				

	Bluetooth Ver.4.1 with EDR function
Frequency of operation	2402 MHz - 2480 MHz
Type of modulation	BT: FHSS (GFSK, $\pi/4$ -DQPSK, 8-DPSK) LE: GFSK
Channel spacing	BT: 1 MHz LE: 2 MHz
Antenna type	Inverted F Antenna
Antenna Connector type	U.FL-LP-066
Antenna Gain	4.7 dBi

	Broadcast Receiver
Radio Type	Receiver
Frequency of Operation	AM: 530 kHz - 1710 kHz FM: 87.7 MHz - 107.9 MHz
Channel spacing	AM: 10 kHz FM: 0.2 MHz
Antenna connector type	Fakra antenna terminal

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test specification : FCC Part 15 Subpart B
FCC Part 15 final revised on January 12, 2021 and effective February 11, 2021
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	ANSI C63.4: 2014 +C63.4a:2017 7. AC power - line conducted emission measurements IEEE 187:2003	Part 15 Subpart B 15.107(a)	N/A	-	N/A	*1)
Radiated emission	ANSI C63.4: 2014 +C63.4a:2017 8. Radiated emission measurements IEEE 187:2003	Part 15 Subpart B 15.109(a)	N/A	1.07 dB (828.807 MHz, Vertical, QP, Mode 2)	Complied# a)	-
Antenna Terminal	ANSI C63.4: 2014 +C63.4a:2017 12. Measurement of unintentional radiators other than ITE IEEE 187:2003	Part 15 Subpart B 15.111(a)	N/A	21.29 dB (1088.162 MHz)	Complied b)	-
<p>*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. a) Refer to APPENDIX 1 (data of Radiated Emission) b) Refer to APPENDIX 1 (data of Antenna Terminal Conducted Emission)</p>						
<p>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.</p>						

3.3 Addition to standard

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

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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Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
* A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967
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.11 measurement room	6.2 x 4.7 x 3.0	4.8 x 4.6	-	-

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

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of EUT during testing

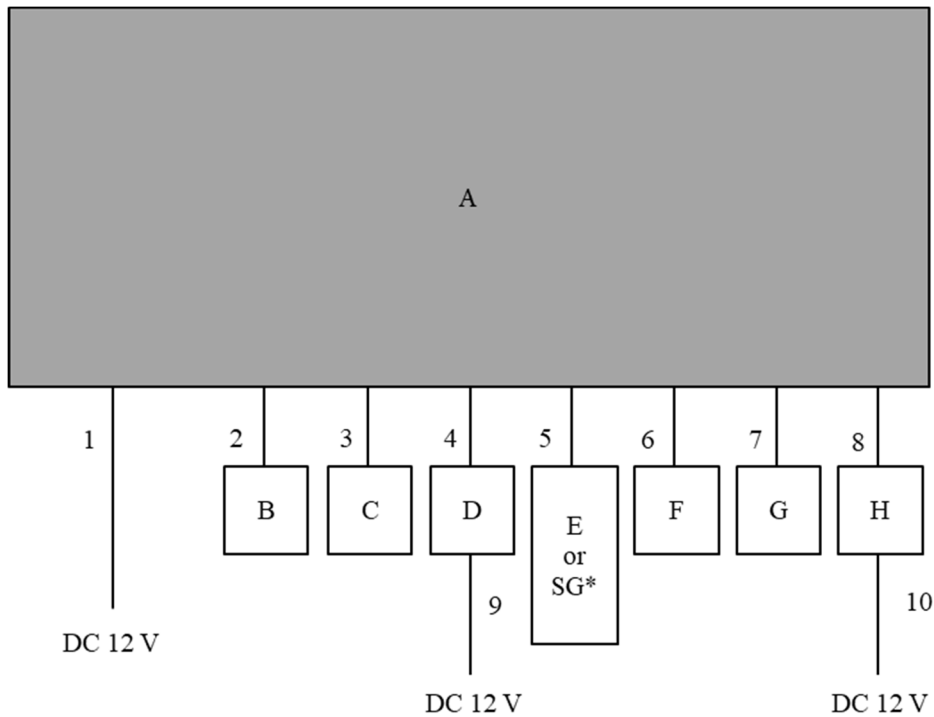
4.1 Operating Mode(s)

1. FM Receiving mode (Local / Other) (Radiated Emission test)
2. USB Memory Play mode (Radiated Emission test)
3. FM Tuning mode (Antenna Terminal test)

Software : V135118_ER_qbnc

4.2 Configuration and peripherals

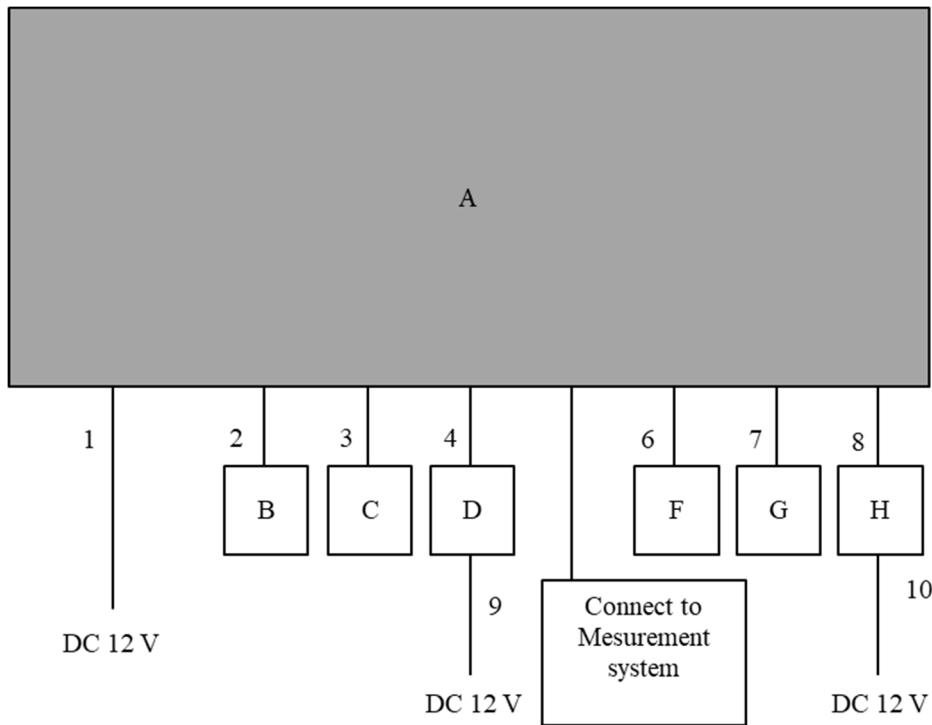
Radiated Emission



*SG(Signal Generator) for Mode 1
Item E for other

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

Antenna Terminal Conducted 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	FT0108A	MT200027	DENSO TEN Limited	EUT
B	Speaker Load	-	-	-	-
C	USB Memory	USM4GR	17116DGGNN	Sony	-
D	Ether Load	MY19TCP	711VINV651151	-	-
E	AM / FM Load	-	-	-	-
F	XM Load	-	-	-	-
G	Digital Camera	GMRVC	2392959_06	-	-
H	Jig Box	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Speaker Cable	2.4	Unshielded	Unshielded	-
3	USB Cable	1.1	Shielded	Shielded	-
4	Ether Cable	2.0	Unshielded	Unshielded	-
5	AM /FM Cable	0.4	Shielded	Shielded	-
6	XM Cable	2.5	Shielded	Shielded	-
7	Digital Camera Cable	2.4	Shielded	Shielded	-
8	Signal Cable	2.3	Unshielded	Unshielded	-
9	DC Cable	3.0	Unshielded	Unshielded	-
10	DC Cable	3.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

6.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : 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 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.

6.3 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
EUT position : Table top
EUT operation mode : See Clause 4.1

6.4 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 1GHz	Above 1GHz *1)	Above 10 GHz *1)
Instrument used	Test Receiver	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *2): RBW: 1 MHz / VBW: 10 Hz

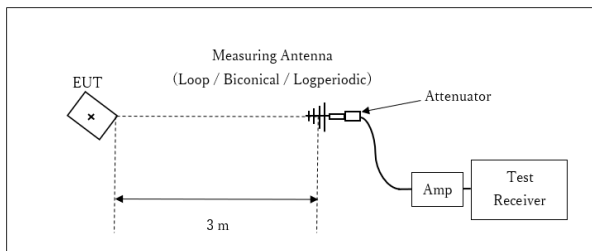
*1) The measurement data was adjusted to a 3 m distance using the following Distance Factor.

Distance Factor: See Figure 2.

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

Figure 2: Test Setup

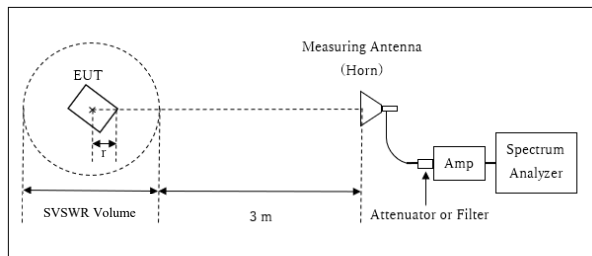
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 10 GHz

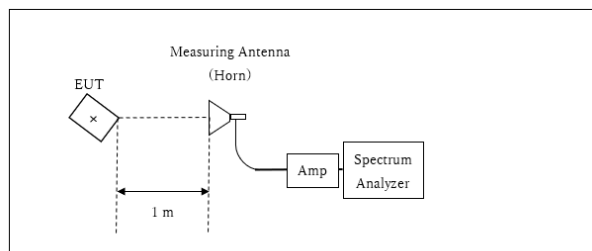


r : Radius of an outer periphery of EUT
× : Center of turn table

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: 1.5m
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)
r = 0.75 m

10 GHz - 40 GHz



× : Center of turn table

Distance Factor: $20 \times \log(1.0 \text{ m}^* / 3.0 \text{ m}) = -9.54 \text{ dB}$
*Test Distance: 1 m

The test was made on EUT at the normal use position.

6.5 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: April 5 and 6, 2021

Test engineer: Kiyoshiro Okazaki

SECTION 6: Antenna Terminal

6.1 Operating environment

Test place : No.2 Semi anechoic chamber
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: April 5, 2021

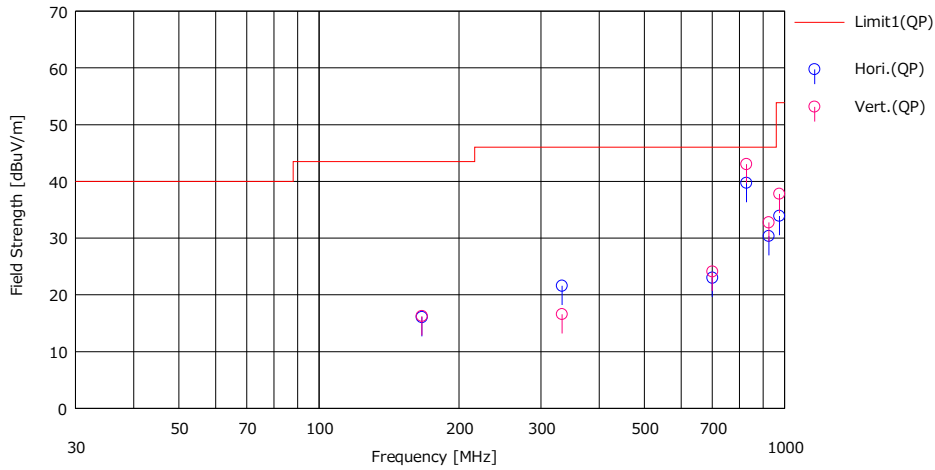
Test engineer: Hiroki Numata

APPENDIX 1: Test data

Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 6, 2021
Temperature / Humidity 20 deg. C / 45 % RH
Engineer Kiyoshiro Okazaki
(Below 1 GHz)
Mode Mode 1 (Local)

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
		(QP)				(QP)	(QP)	(QP)					
1	166.399	21.00	15.30	7.97	28.21	16.06	43.50	27.44	Hori.	100	11	BA	
2	332.788	25.90	14.59	9.10	28.00	21.59	46.00	24.41	Hori.	100	299	LA21	
3	699.991	21.90	19.79	10.58	29.27	23.00	46.00	23.00	Hori.	100	4	LA21	
4	828.779	36.70	21.05	11.07	29.09	39.73	46.00	6.27	Hori.	100	154	LA21	
5	925.261	25.70	22.09	11.40	28.84	30.35	46.00	15.65	Hori.	163	354	LA21	
6	975.028	28.60	22.43	11.58	28.71	33.90	53.90	20.00	Hori.	100	235	LA21	
7	166.399	21.20	15.30	7.97	28.21	16.26	43.50	27.24	Vert.	100	2	BA	
8	332.788	20.90	14.59	9.10	28.00	16.59	46.00	29.41	Vert.	100	350	LA21	
9	699.991	23.00	19.79	10.58	29.27	24.10	46.00	21.90	Vert.	100	25	LA21	
10	828.779	40.00	21.05	11.07	29.09	43.03	46.00	2.97	Vert.	112	188	LA21	
11	925.261	28.10	22.09	11.40	28.84	32.75	46.00	13.25	Vert.	100	154	LA21	
12	975.028	32.50	22.43	11.58	28.71	37.80	53.90	16.10	Vert.	100	155	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

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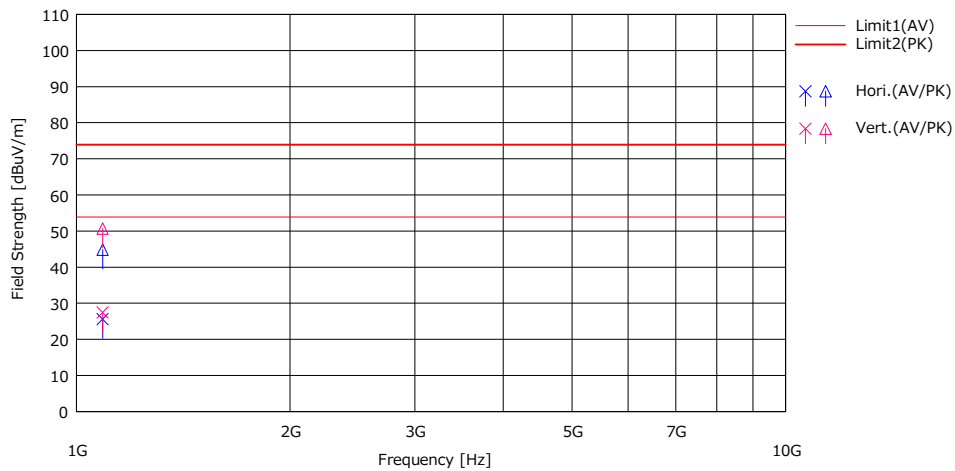
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Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 5, 2021
Temperature / Humidity 21 deg. C / 44 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode Mode 1 (Local)

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) [dB]	(PK) [dB]							
1	1088.162	35.00	54.20	24.99	1.74	36.13	25.60	44.80	53.90	73.90	28.30	29.10	Hori.	100	283	HA6	
2	1088.162	36.90	60.10	24.99	1.74	36.13	27.50	50.70	53.90	73.90	26.40	23.20	Vert.	100	142	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.

* No signal was detected above 10 GHz.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

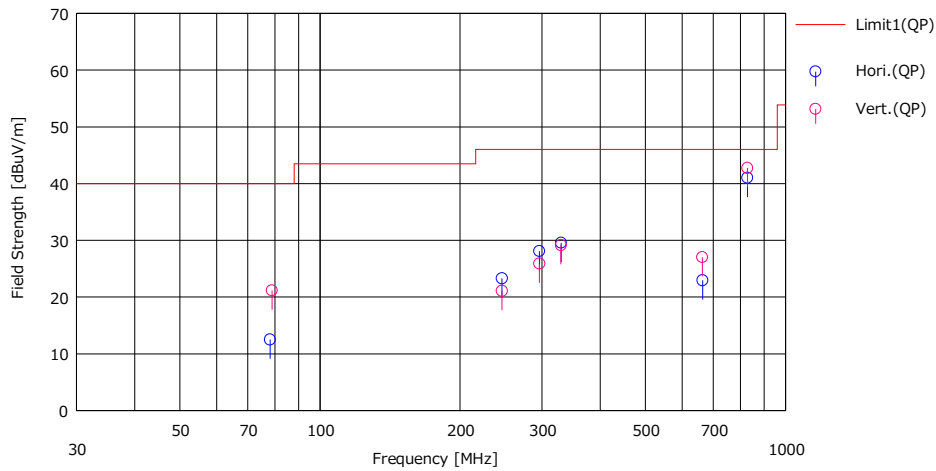
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 6, 2021
Temperature / Humidity 20 deg. C / 45 % RH
Engineer Kiyoshiro Okazaki
(Below 1 GHz)
Mode 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	Margn	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(QP) [dBuV]				(QP) [dBuV/m]	(QP) [dB]	(QP) [dBuV/m]					
1	78.110	27.30	6.42	7.27	28.51	12.48	40.00	27.52	Hori.	200	58	BA	
2	246.065	30.90	11.72	8.50	27.84	23.28	46.00	22.72	Hori.	188	359	LA21	
3	295.999	33.50	13.58	8.82	27.80	28.10	46.00	17.90	Hori.	100	73	LA21	
4	329.592	34.00	14.47	9.07	27.98	29.56	46.00	16.44	Hori.	171	231	LA21	
5	663.839	22.30	19.51	10.44	29.31	22.94	46.00	23.06	Hori.	100	1	LA21	
6	828.792	38.00	21.05	11.07	29.09	41.03	46.00	4.97	Hori.	161	141	LA21	
7	78.860	35.90	6.50	7.28	28.51	21.17	40.00	18.83	Vert.	100	337	BA	
8	246.092	28.70	11.72	8.50	27.84	21.08	46.00	24.92	Vert.	100	19	LA21	
9	296.089	31.30	13.58	8.82	27.80	25.90	46.00	20.10	Vert.	100	224	LA21	
10	329.446	33.60	14.46	9.07	27.98	29.15	46.00	16.85	Vert.	116	90	LA21	
11	662.901	26.40	19.49	10.44	29.31	27.02	46.00	18.98	Vert.	100	12	LA21	
12	828.821	39.70	21.05	11.07	29.09	42.73	46.00	3.27	Vert.	100	176	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.

UL Japan, Inc.

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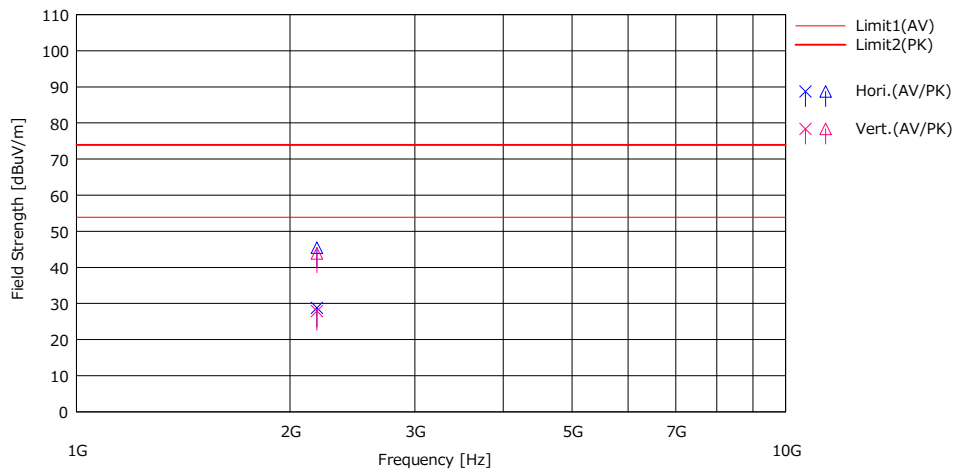
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 5, 2021
Temperature / Humidity 21 deg. C / 44 % RH
Engineer Kiyoshiro Okazaki
(Above 1 GHz)
Mode 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	2182.487	32.90	49.60	28.55	2.51	35.18	28.78	45.48	53.90	73.90	25.12	28.42	Hori.	100	219	HA6	
2	2182.487	32.00	48.00	28.55	2.51	35.18	27.88	43.88	53.90	73.90	26.02	30.02	Vert.	100	133	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.

* No signal was detected above 10 GHz.

UL Japan, Inc.

Ise EMC Lab.

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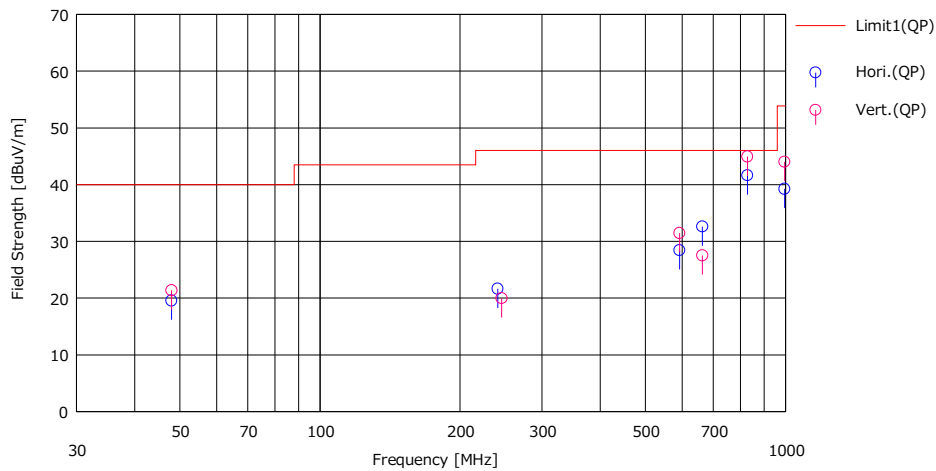
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 6, 2021
Temperature / Humidity 20 deg. C / 45 % RH
Engineer Kiyoshiro Okazaki
(Below 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	Margn	Pola. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		(QP) [dBuV]				(QP) [dBuV/m]	(QP) [dB]						
1	47.999	29.40	11.76	6.96	28.87	19.55	40.00	20.45	Hori.	387	10	BA	
2	240.864	29.50	11.55	8.46	27.87	21.64	46.00	24.36	Hori.	100	240	LA21	
3	592.117	28.50	19.15	10.15	29.36	28.44	46.00	17.56	Hori.	100	55	LA21	
4	663.022	32.00	19.49	10.44	29.31	32.62	46.00	13.38	Hori.	100	225	LA21	
5	828.802	38.60	21.05	11.07	29.09	41.63	46.00	4.37	Hori.	100	132	LA21	
6	995.905	33.70	22.53	11.64	28.64	39.23	53.90	14.67	Hori.	100	220	LA21	
7	48.020	31.20	11.76	6.96	28.87	21.35	40.00	18.65	Vert.	100	83	BA	
8	245.640	27.60	11.71	8.49	27.84	19.96	46.00	26.04	Vert.	100	290	LA21	
9	592.157	31.50	19.15	10.15	29.36	31.44	46.00	14.56	Vert.	100	10	LA21	
10	663.152	26.90	19.49	10.44	29.31	27.52	46.00	18.48	Vert.	100	4	LA21	
11	828.807	41.90	21.05	11.07	29.09	44.93	46.00	1.07	Vert.	100	186	LA21	
12	995.521	38.50	22.53	11.64	28.64	44.03	53.90	9.87	Vert.	100	185	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.

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4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

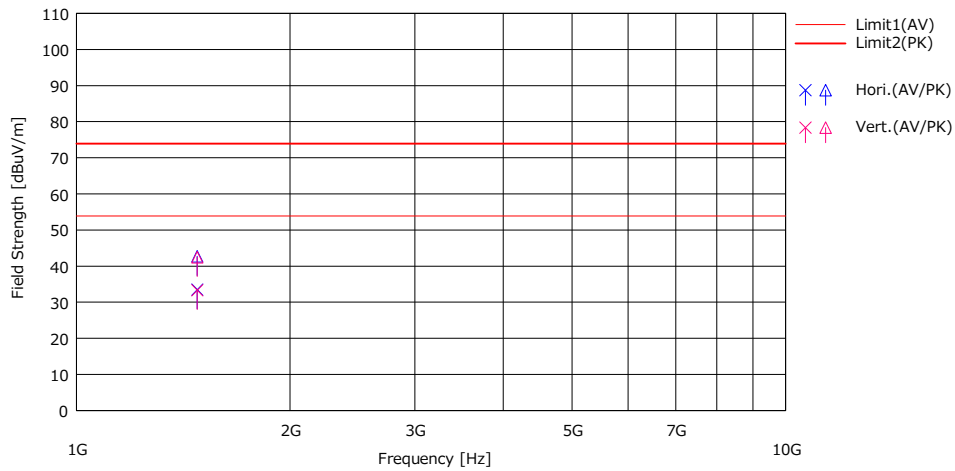
Telephone : +81 596 24 8999

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Radiated Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 5, 2021
Temperature / Humidity 21 deg. C / 44 % 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	1479.994	41.40	50.70	25.76	2.03	35.75	33.44	42.74	53.90	73.90	20.46	31.16	Hori.	100	173	HA6	
2	1479.994	41.30	50.40	25.76	2.03	35.75	33.34	42.44	53.90	73.90	20.56	31.46	Vert.	100	211	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.

* No signal was detected above 10 GHz.

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

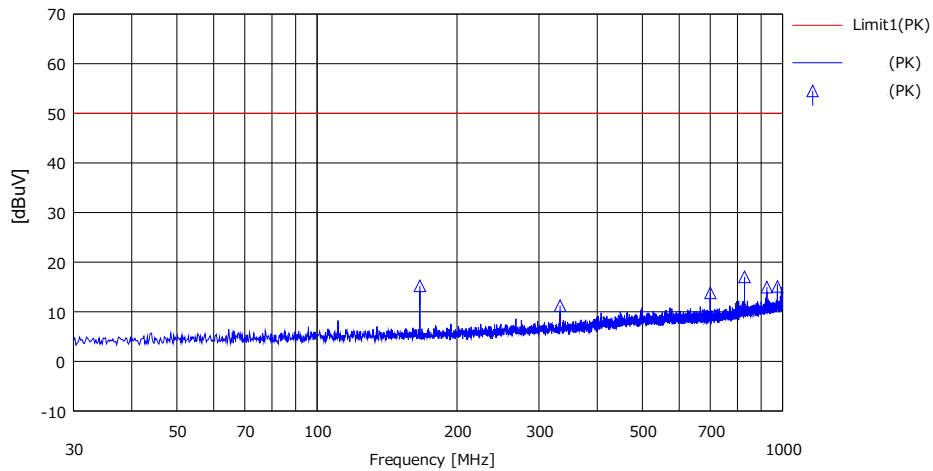
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Facsimile : +81 596 24 8124

Antenna Terminal Conducted Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 5, 2021
Temperature / Humidity 21 deg. C / 44 % RH
Engineer Hiroki Numata
(Below 1 GHz)
Mode Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Margn	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	(PK) [dBuV]	[dB/m]	[dB]	[dB]	(PK) [dBuV]	(PK) [dBuV]	(PK) [dB]	[H/V]	[cm]	[deg]		
1	166.399	37.48	0.00	9.69	31.94	15.23	50.00	34.77					
2	332.788	32.17	0.00	10.92	31.87	11.22	50.00	38.78					
3	699.991	33.22	0.00	12.77	32.16	13.83	50.00	36.17					
4	828.779	35.30	0.00	13.25	31.52	17.03	50.00	32.97					
5	925.261	32.34	0.00	13.67	31.05	14.96	50.00	35.04					
6	975.028	32.02	0.00	13.89	30.80	15.11	50.00	34.89					

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

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE +MATCHING PAD) – GAIN(AMP)

*No signal was detected above 2 GHz

UL Japan, Inc.

Ise EMC Lab.

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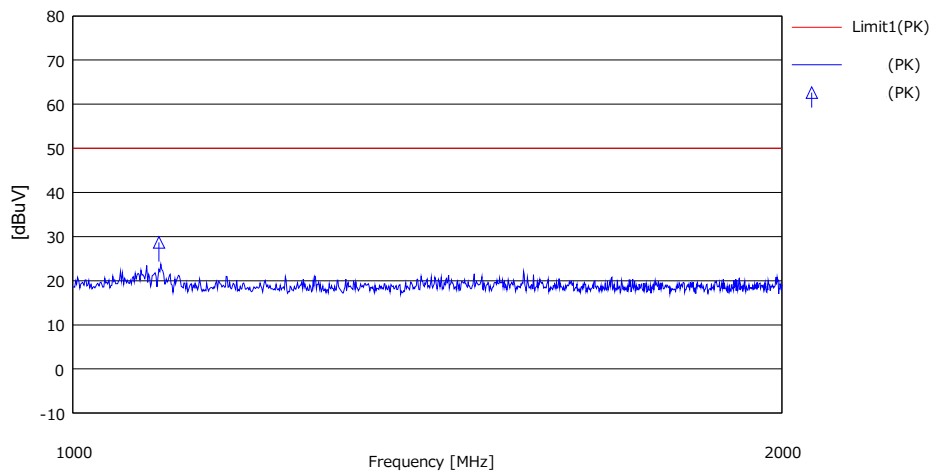
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

Antenna Terminal Conducted Emission

Report No. 13747051H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date April 5, 2021
Temperature / Humidity 21 deg. C / 44 % RH
Engineer Hiroki Numata
(1 GHz - 2 GHz)
Mode Mode 3

Limit : FCC15.111 Antenna terminal measurement



No.	Freq.	Reading	Ant.Fac	Loss	Gain	Result	Limit	Moran	Pola.	Height	Angle	Ant. Type	Comment
	[MHz]	(PK) [dBuV]	[dB/m]	[dB]	[dB]	(PK) [dBuV]	(PK) [dBuV]	(PK) [dB]	[H/V]	[cm]	[deg]		
1	1088.162	55.27	0.00	9.02	35.58	28.71	50.00	21.29					

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

CHART: WITH FACTOR

CALCULATION: RESULT = READING + LOSS (CABLE +MATCHING PAD) – GAIN(AMP)

*No signal was detected above 2 GHz

UL Japan, Inc.

Ise EMC Lab.

4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN

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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-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	2020/08/04	12
AT/RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	2021/02/18	12
AT	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 537073/126E(5 m)	2021/02/03	12
AT	MPA-03	141577	Microwave System Power Amplifier	Keysight Technologies Inc	83050A	MY39500610	2020/10/19	12
AT	MCC-54	141325	Microwave Cable	Suhner	SUCOFLEX101	2873(1m) / 2876(5m)	2021/03/02	12
AT	MDCB-02	141485	DC Block Filter	Keysight Technologies Inc	N9398C	51053	2020/11/06	12
AT	MMP-01	141550	Matching Pad Anritsu	Anritsu Corporation	MB-009	40063	2020/07/02	12
AT	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	2020/05/26	24
AT	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	2020/12/06	12
AT	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	2020/08/18	12
AT	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
AT	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	2019/04/01	24
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	2020/05/26	24
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	2020/12/06	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	2020/08/18	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MAEC-02-SVSWR	142006	AC2_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-06902	2019/04/01	24
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	254	2020/09/14	12
RE	MCC-216	141392	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 537073/126E(5 m)	2021/02/03	12
RE	MHA-02	141503	Horn Antenna 18-26.5GHz	EMCO	3160-09	1265	2020/06/15	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	2020/06/03	12
RE	MSA-10	141899	Spectrum Analyzer	Keysight Technologies Inc	E4448A	MY46180655	2020/08/04	12
RE	MPA-22	141588	Pre Amplifier	MITEQ, Inc	AMF-6F-2600400-33-8P / AMF-4F-2600400-33-8P	1871355 /1871328	2020/09/07	12
RE	MHA-29	141517	Horn Antenna 26.5-40GHz	ETS-Lindgren	3160-10	152399	2020/08/03	12
RE	MCC-224	160324	Coaxial Cable	Huber+Suhner	SUCOFLEX 102A	MY009/2A	2020/11/17	12
RE	MAT-07	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	2020/11/13	12
RE	MBA-08	141427	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103B+BBA9106	8031	2020/07/29	12
RE	MCC-12	141317	Coaxial Cable	UL Japan Inc.	-	-	2020/09/25	12
RE	MLA-21	141265	Logperiodic Antenna (200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-190	2020/07/29	12
RE/AT	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	2021/02/18	12
RE	MTR-08	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	2020/08/18	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