




# EMI TEST REPORT


**Test Report No. : 13881505H-B**

**Applicant** : **DAIHATSU MOTOR CO., LTD.**  
**Type of EUT** : **Keyfree System**  
**Model Number of EUT** : **DH19S-6**  
**FCC ID** : **2AVSADH19S-6**  
**Test regulation** : **FCC Part 15 Subpart B: 2021**  
**Test Result** : **Complied (Refer to SECTION 3)**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
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.

**Date of test:** July 12, 2021

**Representative test engineer:**   
Masaya Minami  
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".

**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

## **REVISION HISTORY**

### **Original Test Report No.: 13881505H-B**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13881505H-B	July 16, 2021	-	-

## 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		

**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

<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information .....</b>	<b>5</b>
<b>SECTION 2: Equipment under test (EUT).....</b>	<b>5</b>
<b>SECTION 3: Test specification, procedures &amp; results .....</b>	<b>7</b>
<b>SECTION 4: Operation of EUT during testing.....</b>	<b>10</b>
<b>SECTION 5: Radiated Emission.....</b>	<b>13</b>
<b>APPENDIX 1: Test data .....</b>	<b>15</b>
Radiated Emission .....	15
<b>APPENDIX 2: Test instruments .....</b>	<b>19</b>
<b>APPENDIX 3: Photographs of test setup.....</b>	<b>20</b>
Radiated Emission .....	20
Worst Case Position (Horizontal: X-axis / Vertical: X-axis).....	24

## **SECTION 1: Customer information**

Company Name : DAIHATSU MOTOR CO., LTD.\*  
Address : 2-1-1, Momozono, Ikeda-shi, Osaka, 563-8651, Japan  
Telephone Number : +81-72-754-4526  
Facsimile Number : +81-72-754-3857  
Contact Person : Kouji Ozawa

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.

\*Remarks:

DAIHATSU MOTOR CO., LTD. designates DENSO CORPORATION and TOKAI RIKA CO., LTD. as manufacturer of the product (Immobilizer).

## **SECTION 2: Equipment under test (EUT)**

### **2.1 Identification of EUT**

Type : Keyfree System  
Model Number : DH19S-6  
Serial Number : Refer to SECTION 4.2  
Rating : DC 12.0 V  
Receipt Date : July 9, 2021  
Country of Mass-production : Malaysia and Republic of Indonesia and Thailand  
Condition of EUT : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification : No Modification by the test lab

---

**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

## 2.2 Product Description

Model: DH19S-6 (referred to as the EUT in this report) is a Keyfree System.

### Radio Specification

[Transmitter part]

Radio Type	:	LF Transmitter
Frequency of Operation	:	125 kHz
Oscillator frequency	:	4.0000 MHz (Ceramic)
Modulation	:	ASK (A1D)
Antenna type	:	Antenna (Outside Antenna D) Antenna (Outside Antenna P) Antenna (Outside Antenna B) Antenna (Inside Antenna Fr) Antenna (Inside Antenna Mi) Antenna (Inside Antenna Rr) Immobilizer Antenna
Antenna Specification	:	LF antenna: Ferrite antenna coil Immobilizer antenna: Loop antenna coil
Clock Frequency (maximum)	:	8 MHz

[Receiver part]

Frequency of Operation	:	433.92 MHz (Keyfree) 433.90 MHz (TPMS)
Oscillator frequency	:	33.600 MHz (Crystal)
Intermediate frequency	:	525 kHz (Keyfree) 1.05 MHz (TPMS)
Modulation	:	FSK (F1D)
Type of receiving system	:	Super-heterodyne
Antenna Specification	:	Internal antenna (Inverted F antenna)

## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart B  
FCC Part 15 final revised on May 3, 2021 and effective July 2, 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	FCC: ANSI C63.4: 2014 + C63.4a: 2017 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A	N/A	N/A	*1)
	ISED: RSS-Gen 7.1	ISED: RSS-Gen 7.2				
Radiated emission	FCC: ANSI C63.4: 2014 + C63.4a: 2017 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	16.91 dB 224.199 MHz, Vertical, QP <Mode 2>	Complied a)	-
	ISED: RSS-Gen 7.1	ISED: RSS-Gen 7.3				
Antenna Terminal	FCC: ANSI C63.4: 2014 + C63.4a: 2017 12. Measurement of unintentional radiators other than ITE	FCC: Part 15 Subpart B 15.111(a) (b)	N/A	N/A	N/A	*2)
	ISED: - RSS-Gen 7.1	ISED: RSS-Gen 7.4				
<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.  *2) The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached).  Therefore, Radiated emission test was performed.</p> <p>a) Refer to APPENDIX 1 (data of Radiated 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) (Vertical)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal) (Vertical)	4.8 dB
		4.8 dB
	200 MHz to 1000 MHz (Horizontal) (Vertical)	5.0 dB
		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



### 3.5 Test Location

UL Japan, Inc. Ise EMC Lab.

\*A2LA Certificate Number: 5107.02 / FCC Test Firm Registration Number: 199967

ISED Lab Company Number: 2973C / CAB identifier: JP0002

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

Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124

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	-	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 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.

**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

## **SECTION 4: Operation of EUT during testing**

### **4.1 Operating Mode(s)**

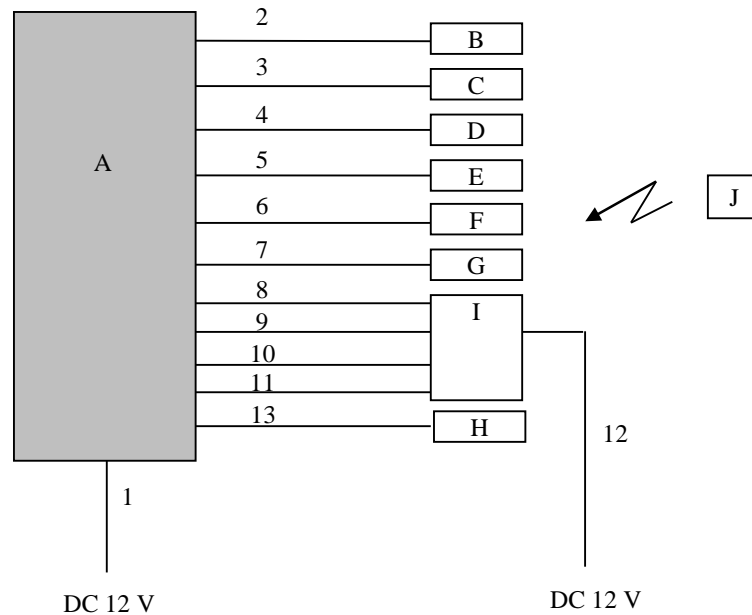
Mode	Remarks
1) RKE Receiving mode	-
2) TPMS Receiving mode	-
* EUT was set by the software as follows; Software: D92A_Main_A_1124009D.s	

\*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

\* It was confirmed by using checker that the EUT receives the signal from the transmitter (pair of EUT).

## 4.2 Configuration and peripherals

[Mode 1]



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

### Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Body ECU	DH19S-6	No.519	DENSO CORPORATION	EUT
B	Antenna	Outside Antenna D	No.519-1	TOKAI RIKAI CO., LTD.	-
C	Antenna	Outside Antenna P	No.519-2	TOKAI RIKAI CO., LTD.	-
D	Antenna	Outside Antenna B	No.519-3	TOKAI RIKAI CO., LTD.	-
E	Antenna	Inside Antenna Fr	No.519-4	TOKAI RIKAI CO., LTD.	-
F	Antenna	Inside Antenna Rr	No.519-5	TOKAI RIKAI CO., LTD.	-
G	Antenna	Immobilizer Antenna	No.519	TOKAI RIKAI CO., LTD.	-
H	Antenna	Inside Antenna Mi	No.519-6	TOKAI RIKAI CO., LTD.	-
I	Evaluation Bench	-	14	DENSO CORPORATION	-
J	Smart Key	-	No.519	DENSO CORPORATION	-

### List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Antenna Cable (AND)	3.0	Unshielded	Unshielded	-
3	Antenna Cable (ANP)	3.0	Unshielded	Unshielded	-
4	Antenna Cable (ANB)	3.0	Unshielded	Unshielded	-
5	Antenna Cable (ANF)	3.0	Unshielded	Unshielded	-
6	Antenna Cable (ANR)	3.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Signal Cable (CN-C)	3.0	Unshielded	Unshielded	-
9	Signal Cable (CN-K)	3.0	Unshielded	Unshielded	-
10	Signal Cable (CN-M)	3.0	Unshielded	Unshielded	-
11	Signal Cable (CN-P)	3.0	Unshielded	Unshielded	-
12	DC Cable	3.0	Unshielded	Unshielded	-
13	Antenna Cable (ANM)	3.0	Unshielded	Unshielded	-

**UL Japan, Inc.**

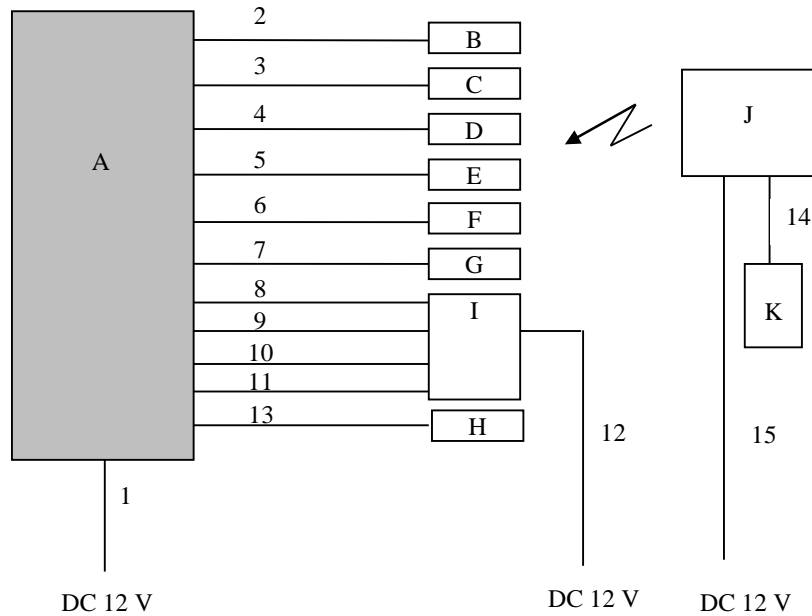
**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

[Mode 2]



\* 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	Body ECU	DH19S-6	No.459	DENSO CORPORATION	EUT
B	Antenna	Outside Antenna D	No.519-1	TOKAI RIKA CO., LTD.	-
C	Antenna	Outside Antenna P	No.519-2	TOKAI RIKA CO., LTD.	-
D	Antenna	Outside Antenna B	No.519-3	TOKAI RIKA CO., LTD.	-
E	Antenna	Inside Antenna Fr	No.519-4	TOKAI RIKA CO., LTD.	-
F	Antenna	Inside Antenna Rr	No.519-5	TOKAI RIKA CO., LTD.	-
G	Antenna	Immobilizer Antenna	No.519	TOKAI RIKA CO., LTD.	-
H	Antenna	Inside Antenna Mi	No.519-6	TOKAI RIKA CO., LTD.	-
I	Evaluation Bench	-	14	DENSO CORPORATION	-
J	TPMS bench	-	2	DENSO CORPORATION	-
K	TPMS Antenna	-	5	DENSO CORPORATION	-

**List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	Antenna Cable (AND)	3.0	Unshielded	Unshielded	-
3	Antenna Cable (ANP)	3.0	Unshielded	Unshielded	-
4	Antenna Cable (ANB)	3.0	Unshielded	Unshielded	-
5	Antenna Cable (ANF)	3.0	Unshielded	Unshielded	-
6	Antenna Cable (ANR)	3.0	Unshielded	Unshielded	-
7	Antenna Cable	3.0	Unshielded	Unshielded	-
8	Signal Cable (CN-C)	3.0	Unshielded	Unshielded	-
9	Signal Cable (CN-K)	3.0	Unshielded	Unshielded	-
10	Signal Cable (CN-M)	3.0	Unshielded	Unshielded	-
11	Signal Cable (CN-P)	3.0	Unshielded	Unshielded	-
12	DC Cable	3.0	Unshielded	Unshielded	-
13	Antenna Cable (ANM)	3.0	Unshielded	Unshielded	-
14	Signal Cable	1.0	Shielded	Shielded	-
15	DC Cable	1.0	Unshielded	Unshielded	-

**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

## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.2 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 - 5000 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.

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

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.

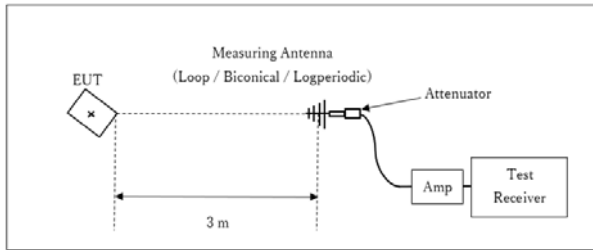
Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CAV: BW 1 MHz

\*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**

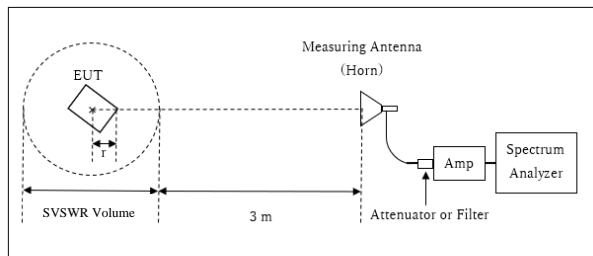
Below 1 GHz



x : Center of turn table

Test Distance: 3 m

1 GHz - 5 GHz



r : Radius of an outer periphery of EUT

x : Center of turn table

Distance Factor:  $20 \times \log(3.15 \text{ m}^*/3.0 \text{ m}) = 0.42 \text{ dB}$   
\* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 3.15 \text{ m}$

SVSWR Volume: 1.5 m  
(SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
 $r = 0.6 \text{ m}$

The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at representative X-axis since no difference was found among each 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: July 12, 2021

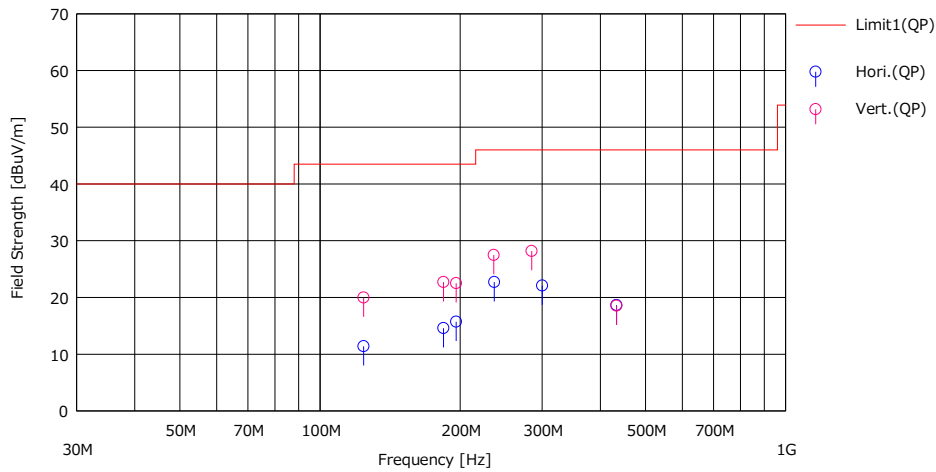
Test engineer: Masaya Minami

**APPENDIX 1: Test data**

**Radiated Emission**

Report No. 13881505H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date July 12, 2021  
Temperature / Humidity 25 deg. C / 61 % RH  
Engineer Masaya Minami  
(Below 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
		(QP) [dBuV]				(QP) [dBuV/m]	(QP) [dB]						
1	124.107	20.20	10.98	8.44	28.24	11.38	43.50	32.12	Hori.	100	180	BA	
2	184.176	19.80	13.71	9.06	27.98	14.59	43.50	28.91	Hori.	100	127	BA	
3	196.176	20.00	14.45	9.17	27.91	15.71	43.50	27.79	Hori.	100	145	BA	
4	236.816	29.00	11.87	9.54	27.72	22.69	46.00	23.31	Hori.	180	135	LAI7	
5	300.254	26.30	13.37	10.06	27.64	22.09	46.00	23.91	Hori.	117	168	LAI7	
6	433.395	19.90	16.40	10.99	28.65	18.64	46.00	27.36	Hori.	100	0	LAI7	
7	124.107	28.80	10.98	8.44	28.24	19.98	43.50	23.52	Vert.	100	170	BA	
8	184.176	27.90	13.71	9.06	27.98	22.69	43.50	20.81	Vert.	100	355	BA	
9	196.176	26.80	14.45	9.17	27.91	22.51	43.50	20.99	Vert.	100	63	BA	
10	236.206	33.80	11.85	9.53	27.72	27.46	46.00	18.54	Vert.	100	110	LAI7	
11	284.894	32.60	13.28	9.94	27.65	28.17	46.00	17.83	Vert.	100	90	LAI7	
12	433.395	19.80	16.40	10.99	28.65	18.54	46.00	27.46	Vert.	100	0	LAI7	

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.**

**Ise EMC Lab.**

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

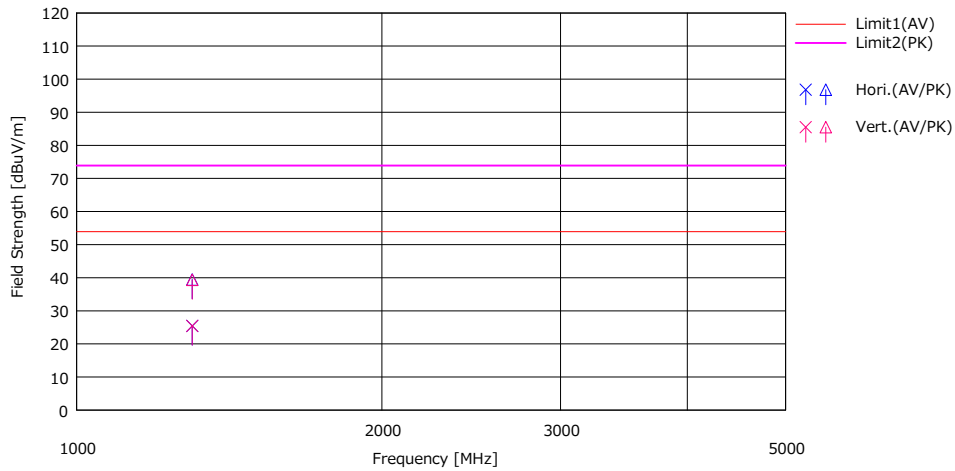
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Radiated Emission

Report No. 13881505H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date July 12, 2021  
Temperature / Humidity 25 deg. C / 61 % RH  
Engineer Masaya Minami  
(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	1300.485	32.60	46.60	26.02	2.22	35.39	25.45	39.45	53.90	73.90	28.45	34.45	Hori.	100	0	HA6	
2	1300.485	32.60	46.50	26.02	2.22	35.39	25.45	39.35	53.90	73.90	28.45	34.55	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.

**UL Japan, Inc.**

**Ise EMC Lab.**

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

Telephone : +81 596 24 8999

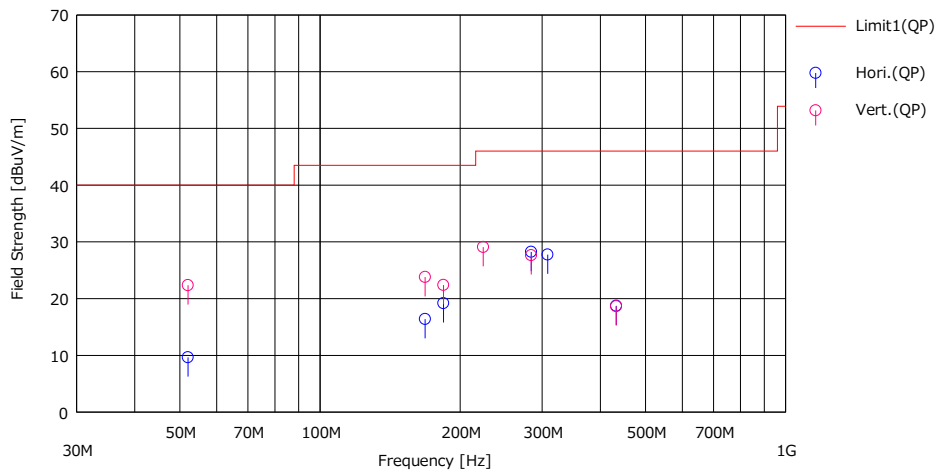
Facsimile : +81 596 24 8124



## Radiated Emission

Report No. 13881505H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date July 12, 2021  
Temperature / Humidity 25 deg. C / 61 % RH  
Engineer Masaya Minami  
(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	P.d.a. [H/V]	Height [cm]	Angle [deg]	Ant. Type	Comment
		[dBuV]				[QP]	[QP]	[dB]					
1	52.050	20.90	9.68	7.50	28.43	9.65	40.00	30.35	Hori.	355	33	BA	
2	168.156	22.70	12.85	8.91	28.06	16.40	43.50	27.10	Hori.	300	17	BA	
3	184.164	24.40	13.71	9.06	27.98	19.19	43.50	24.31	Hori.	200	66	BA	
4	284.259	32.70	13.26	9.93	27.65	28.24	46.00	17.76	Hori.	159	139	LAI7	
5	308.294	31.90	13.43	10.12	27.69	27.76	46.00	18.24	Hori.	107	182	LAI7	
6	432.850	20.00	16.40	10.99	28.65	18.74	46.00	27.26	Hori.	100	0	LAI7	
7	52.050	33.60	9.68	7.50	28.43	22.35	40.00	17.65	Vert.	100	187	BA	
8	168.156	30.10	12.85	8.91	28.06	23.80	43.50	19.70	Vert.	100	282	BA	
9	184.164	27.60	13.71	9.06	27.98	22.39	43.50	21.11	Vert.	100	290	BA	
10	224.199	36.30	11.14	9.43	27.78	29.09	46.00	16.91	Vert.	100	52	LAI7	
11	284.259	32.10	13.26	9.93	27.65	27.64	46.00	18.36	Vert.	100	339	LAI7	
12	432.850	19.90	16.40	10.99	28.65	18.64	46.00	27.36	Vert.	100	0	LAI7	

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.**

**Ise EMC Lab.**

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

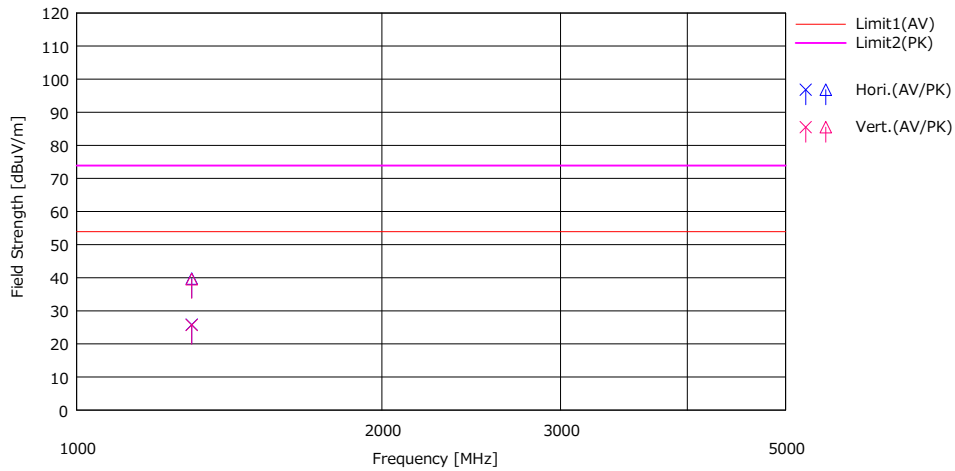
Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

## Radiated Emission

Report No. 13881505H  
Test place Ise EMC Lab.  
Semi Anechoic Chamber No.2  
Date July 12, 2021  
Temperature / Humidity 25 deg. C / 61 % RH  
Engineer Masaya Minami  
(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	1298.550	33.00	46.90	26.01	2.22	35.39	25.84	39.74	53.90	73.90	28.06	34.16	Hori.	100	0	HA6	
2	1298.550	32.90	46.70	26.01	2.22	35.39	25.74	39.54	53.90	73.90	28.16	34.36	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.

**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

## **APPENDIX 2: Test instruments**

### **Test equipment**

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-02	142004	AC2_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	05/26/2020	24
RE	MOS-41	192300	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	0013	12/06/2020	12
RE	MMM-01	141542	Digital Tester	Fluke Corporation	FLUKE 26-3	78030611	08/18/2020	12
RE	MJM-27	142228	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-ME MI-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	04/09/2021	24
RE	MHA-06	141512	Horn Antenna 1-18GHz	Schwarzbeck Mess-Elektronik OHG	BBHA9120D	254	09/14/2020	12
RE	MCC-218	141394	Microwave Cable	Junkosha	MWX221	1607S141(1 m) / 1608S264(5 m)	09/23/2020	12
RE	MPA-10	141579	Pre Amplifier	Keysight Technologies Inc	8449B	3008A02142	02/18/2021	12
RE	MAT-07	141203	Attenuator(6dB)	Weinschel Corp	2	BK7970	11/13/2020	12
RE	YBA-03	197990	Biconical Antenna	Schwarzbeck Mess-Elektronik OHG	VHBB 9124 + BBA 9106	01365	11/15/2020	12
RE	MCC-12	141317	Coaxial Cable	UL Japan Inc.	-	-	09/25/2020	12
RE	LA-17	160924	Logperiodic Antenna	Schwarzbeck Mess-Elektronik OHG	VUSLP9111B	225	11/15/2020	12
RE	MPA-24	141594	Pre Amplifier	Keysight Technologies Inc	8447D	2944A10150	02/18/2021	12
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/09/2021	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**

**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