



# EMI TEST REPORT

**Test Report No. : 13438454H-B-R1**

**Applicant** : DAIHATSU MOTOR CO., LTD.

**Type of EUT** : Immobilizer system (Immobilizer and RKE)

**Model Number of EUT** : DH19R-2

**FCC ID** : 2AVSADH19R-2

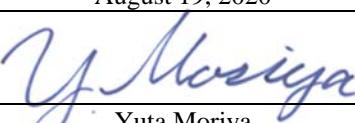
**Test regulation** : FCC Part 15 Subpart B: 2020

**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.
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 13438454H-B. 13438454H-B is replaced with this report.

**Date of test:** August 19, 2020

**Representative test engineer:**

  
Yuta Moriya  
Engineer  
Consumer Technology Division

**Approved by:**

  
Motoya Imura  
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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Report Cover Page - 13-EM-F0429 Issue # 17.0

## **REVISION HISTORY**

### **Original Test Report No.: 13438454H-B**

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13438454H-B	September 11, 2020	-	-
1	13438454H-B-R1	October 19, 2020	P.10	Correction of Cable list in Clause 4.2 Cable No.1) From DC Cable 2.0 m to Signal Cable 0.6 m Cable No.2) From Signal Cable 0.6 m to DC Cable 2.0 m

## 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 : 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 : Hideshige Nakano

\*Remarks:

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

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 : Immobilizer system (Immobilizer and RKE)  
Model Number : DH19R-2  
Serial Number : Refer to SECTION 4.2  
Rating : DC 12.0 V  
Receipt Date : June 16, 2020  
Country of Mass-production : Malaysia and Republic of Indonesia  
Condition : Production prototype  
(Not for Sale: This sample is equivalent to mass-produced items.)  
Modification : No Modification by the test lab

### **2.2 Product Description**

Model: DH19R-2 (referred to as the EUT in this report) is a Immobilizer system (Immobilizer and RKE).

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### Radio Specification

[Transmitter part]

Radio Type : LF Transmitter  
Frequency of Operation : 125 kHz  
Oscillator Frequency : 4 MHz  
Type of Modulation : ASK  
Antenna : Immobilizer Antenna  
Clock frequency (maximum) : MPU: 8 MHz

[Receiver part]

Frequency of Operation : 433.92 MHz  
Oscillator Frequency : 33.600 MHz (Crystal)  
Operating Channel Width (OCW) : 433.92 MHz  $\pm$ 60 kHz  
Local Oscillator Frequency : 433.395 MHz  
Intermediate Frequency : 525 kHz  
Type of Modulation : FSK  
Type of receiving system : Super-heterodyne  
Antenna Type : Internal antenna (Inverted F antenna)  
Receiver Bandwidth : 120 kHz

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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

### **3.2 Procedures and results**

Item	Test Procedure	Limits	Deviation	Worst margin	Result	Remarks
Conducted emission	<b>FCC: ANSI C63.4: 2014</b> 7. AC power - line conducted emission measurements	<b>FCC:Part 15 Subpart B</b> 15.107(a)	N/A	N/A	N/A	*1)
	<b>ISED: RSS-Gen 7.1</b>	<b>ISED: RSS-Gen 7.2</b>				
Radiated emission	<b>FCC: ANSI C63.4: 2014</b> 8. Radiated emission measurements	<b>FCC: Part 15 Subpart B</b> 15.109(a)	N/A	22.84 dB 433.395 MHz, Vertical, QP	Complied a)	-
	<b>ISED: RSS-Gen 7.1</b>	<b>ISED: RSS-Gen 7.3</b>				
Antenna Terminal	<b>FCC: ANSI C63.4: 2014</b> 12. Measurement of unintentional radiators other than ITE	<b>FCC: Part 15 Subpart B</b> 15.111(a)	N/A	N/A	N/A	*2)
	<b>ISED: - RSS-Gen 7.1</b>	<b>ISED: RSS-Gen 7.4</b>				

\*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.

a) Refer to APPENDIX 1 (data of Radiated 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

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### 3.5 Test Location

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A2LA Certificate Number: 5107.02

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.

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## SECTION 4: Operation of EUT during testing

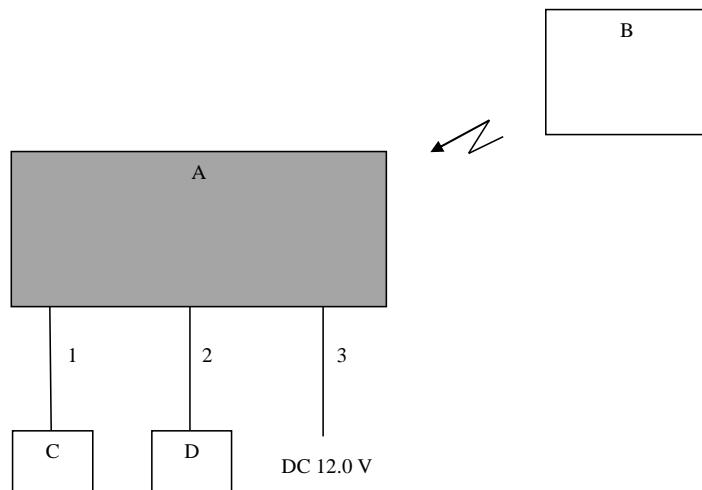
### 4.1 Operating Mode(s)

Mode	Remarks
1) RKE Receiving mode	-

\*EUT was set by the software as follows;  
 Software: DN-2390005400-01.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



\* Cabling and setup 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	DH19R-2	273	DENSO CORPORATION	EUT
B	Key	-	-	TOKAIRIKA CO.,LTD	-
C	LED	-	-	-	-
D	LED	-	-	-	-

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal cable	0.6	Unshielded	Unshielded	-
2	Signal cable	0.6	Unshielded	Unshielded	-
3	DC Cable	2.0	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : No.3 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 edge of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in Appendix 3.

### **5.3 Test conditions**

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)  
1000 MHz - 10000 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.

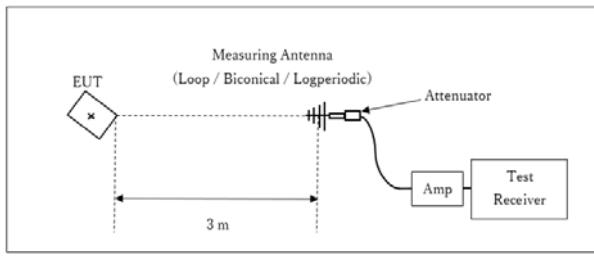
Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

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

Distance Factor: See Figure 2.

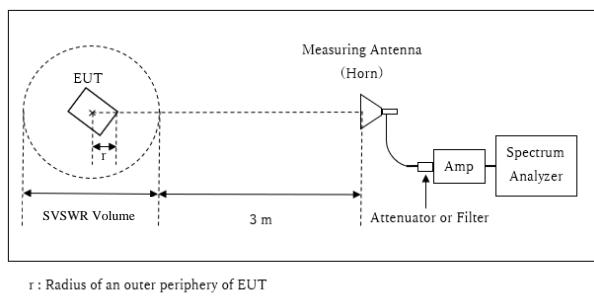
## Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 13 GHz



Distance Factor:  $20 \times \log (4.0 \text{ m} / 3.0 \text{ m}) = 2.50 \text{ dB}$   
 \* Test Distance:  $(3 + \text{SVSWR Volume} / 2) - r = 4.00 \text{ m}$

SVSWR Volume: 2 m  
 (SVSWR Volume has been calibrated based on CISPR 16-1-4.)  
 $r = 0.00 \text{ m}$

\* The test was performed with  $r = 0.0 \text{ m}$  since EUT is small and it was the rather conservative condition.

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: August 19, 2020

Test engineer: Yuta Moriya

**UL Japan, Inc.**

**Ise EMC Lab.**

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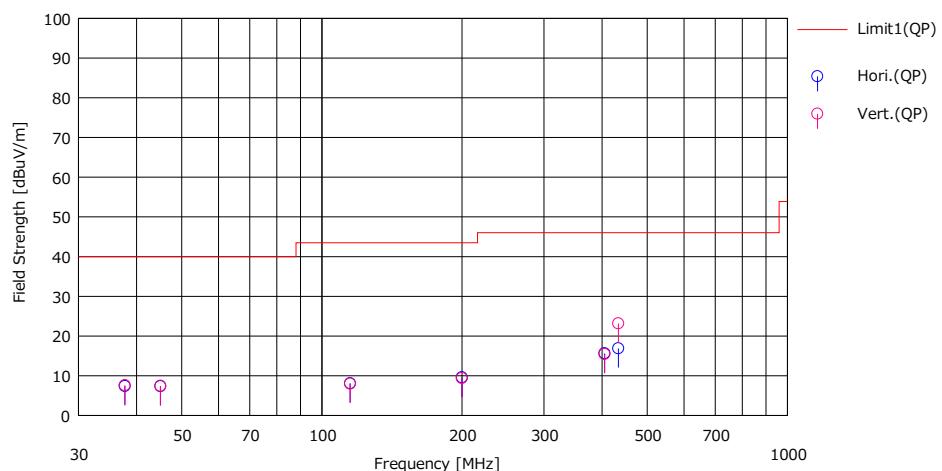
Facsimile : +81 596 24 8124

## APPENDIX 1: Test data

### Radiated Emission

Report No. 13377198H  
 Test place Ise EMC Lab.  
 Semi Anechoic Chamber No.3  
 Date August 19, 2020  
 Temperature / Humidity 25 deg. C / 58 % RH  
 Engineer Yuta Moriya  
 (Below 1 GHz)  
 Mode Mode 1

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



No.	Freq. [MHz]	Reading (QP)		Ant.Fac	Loss	Gan	Result (QP)	Limit (QP)	Margin (QP)	Pda	Height (H/V)	Angle [deg]	Ant. Type	Comment
		Reading [dBuV]	Ant.Fac [dB/m]											
1	37.750	20.80	11.53	7.26	32.19	7.40	40.00	32.60	Hori.	100	0	BA		
2	45.000	21.70	10.42	7.39	32.17	7.34	40.00	32.66	Hori.	100	0	BA		
3	115.000	21.30	10.56	8.34	32.12	8.08	43.50	35.42	Hori.	100	0	BA		
4	200.001	21.00	11.37	9.22	32.01	9.56	43.50	33.92	Hori.	100	0	LA		
5	405.000	20.90	15.93	10.80	31.99	15.64	46.00	30.36	Hori.	100	0	LA		
6	433.395	21.60	16.26	10.99	31.99	16.86	46.00	29.14	Hori.	100	0	LA		
7	37.750	21.00	11.53	7.26	32.19	7.60	40.00	32.40	Vert.	100	0	BA		
8	45.000	21.80	10.42	7.39	32.17	7.44	40.00	32.56	Vert.	100	0	BA		
9	115.000	21.20	10.56	8.34	32.12	7.98	43.50	35.52	Vert.	100	0	BA		
10	200.001	20.80	11.37	9.22	32.01	9.38	43.50	34.12	Vert.	100	0	LA		
11	405.000	20.70	15.93	10.80	31.99	15.44	46.00	30.56	Vert.	100	0	LA		
12	433.395	27.90	16.26	10.99	31.99	23.16	46.00	22.84	Vert.	100	0	LA		

#### 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.

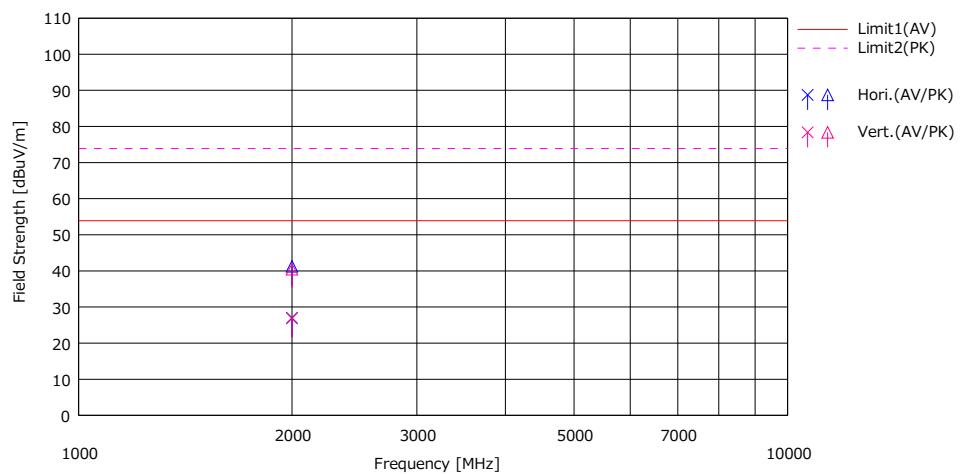
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## Radiated Emission

Report No. 13377198H  
 Test place Ise EMC Lab.  
 Semi Anechoic Chamber No.3  
 Date August 19, 2020  
 Temperature / Humidity 25 deg. C / 58 % RH  
 Engineer Yuta Moriya  
 (Above 1 GHz)  
 Mode Mode 1

Limit : FCC\_Part 15 Subpart B(15.109)\_Class B



Nb.	Freq. [MHz]	Reading		Ant.Fac	Loss	Gain	Result		Limit		Margin		Pola.	Height [cm]	Angle [deg]	Ant. Type	Comment
		(AV) [dBuV]	(PK) [dBuV]				(AV) [dB]	(PK) [dB]	(AV) [dBuV/m]	(PK) [dBuV/m]	(AV) [dBuV/m]	(PK) [dBuV/m]					
1	2000.000	28.80	43.10	26.29	4.77	32.88	26.98	41.28	53.90	73.90	26.92	32.42	Hori.	100	0	H20	
2	2000.000	28.70	42.30	26.29	4.77	32.88	26.88	40.48	53.90	73.90	27.02	33.42	Vert.	100	0	H20	

### CHART: WITH FACTOR

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

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

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

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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
RE	MTR-10	141951	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	03/10/2020	12
RE	MAT-95	142314	Attenuator	Pasternack	PE7390-6	D/C 1504	06/17/2020	12
RE	MCC-51	141323	Coaxial cable	UL Japan	-	-	07/06/2020	12
RE	MCC-231	177964	Microwave Cable	Junkosha INC.	MMX221	1901S329(1m)/ 1902S579(5m)	03/02/2020	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/10/2020	12
RE	MPA-11	141580	MicroWave System Amplifier	Keysight Technologies Inc	83017A	MY39500779	03/24/2020	12
RE	MAEC-03	142008	AC3_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	05/22/2020	24
RE	MAEC-03-SVSWR	142013	AC3_Semi Anechoic Chamber(SVSWR)	TDK	Semi Anechoic Chamber 3m	DA-10005	04/08/2019	24
RE	MOS-13	141554	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	1301	01/07/2020	12
RE	COTS-ME MI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MJM-16	142183	Measure	KOMELON	KMC-36	-	-	-
RE	MMM-08	141532	DIGITAL HiTESTER	Hioki	3805	51201197	01/06/2020	12
RE	YBA-03	197990	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHBB 9124 + BBA 9106	01365	05/17/2020	12
RE	LA-17	160924	Logperiodic Antenna	Schwarzbeck Mess - Elektronik	VUSLP9111B	225	11/29/2019	12
RE	MHA-20	141507	Horn Antenna 1-18GHz	Schwarzbeck Mess - Elektronik	BBHA9120D	258	09/26/2019	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.**

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