



RADIO TEST REPORT

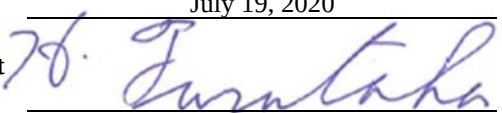
Test Report No. : 13438454H-A-R1

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 C: 2020
Test Result : Complied (Refer to SECTION 3.2)

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3. This sample tested is in compliance with the limits of the above regulation.
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6. This test report covers Radio technical requirements. It does not cover administrative issues such as Manual or non-Radio 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-A. 13438454H-A is replaced with this report.

Date of test: July 19, 2020

Representative test engineer:


Hiroyuki Furutaka

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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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.: 13438454H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13438454H-A	September 11, 2020	-	-
1	13438454H-A-R1	October 19, 2020	P.7	Correction of the Worst margin for Electric Field Strength of Fundamental Emission test in Clause 3.2 From 18.0 dB to 18.5 dB
1	13438454H-A-R1	October 19, 2020	P.10	Addition of the following the sentences in clause 4.2; *This EUT has two modes which transponder key is inserted or not. The worst case was confirmed with and without transponder key at pre-check, as a result, the test with transponder key was the worst case. Therefore, the test with transponder key was performed only.
1	13438454H-A-R1	October 19, 2020	P.10	Correction of shield for Cable No.2 in cable list of Clause 4.2; From Shielded to Unshielded
1	13438454H-A-R1	October 19, 2020	P.14	Correction of Radiated Emission below 30 MHz test data. (Fundamental DC 12.0 V) < PK > From LOSS: -73.6, Gain: 32.1, To LOSS: -74.0, Gain: 32.3 < PK with Duty Factor > From LOSS: -73.6, Gain: 32.1, Result: 7.7, Margin 18.0 To LOSS: -74.0, Gain: 32.3, Result: 7.1 Margin 18.5 < Result of the fundamental emission at 3 m without Distance factor > From LOSS: 6.4, Gain: 32.1, Result: 87.7 To LOSS: 6.0, Gain: 32.3, Result: 87.1

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation	MCS	Modulation and Coding Scheme
AC	Alternating Current	MRA	Mutual Recognition Arrangement
AFH	Adaptive Frequency Hopping	N/A	Not Applicable
AM	Amplitude Modulation	NIST	National Institute of Standards and Technology
Amp, AMP	Amplifier	NS	No signal detect.
ANSI	American National Standards Institute	NSA	Normalized Site Attenuation
Ant, ANT	Antenna	NVLAP	National Voluntary Laboratory Accreditation Program
AP	Access Point	OBW	Occupied Band Width
ASK	Amplitude Shift Keying	OFDM	Orthogonal Frequency Division Multiplexing
Atten., ATT	Attenuator	P/M	Power meter
AV	Average	PCB	Printed Circuit Board
BPSK	Binary Phase-Shift Keying	PER	Packet Error Rate
BR	Bluetooth Basic Rate	PHY	Physical Layer
BT	Bluetooth	PK	Peak
BT LE	Bluetooth Low Energy	PN	Pseudo random Noise
BW	BandWidth	PRBS	Pseudo-Random Bit Sequence
Cal Int	Calibration Interval	PSD	Power Spectral Density
CCK	Complementary Code Keying	QAM	Quadrature Amplitude Modulation
Ch., CH	Channel	QP	Quasi-Peak
CISPR	Comite International Special des Perturbations Radioelectriques	QPSK	Quadri-Phase Shift Keying
CW	Continuous Wave	RBW	Resolution Band Width
DBPSK	Differential BPSK	RDS	Radio Data System
DC	Direct Current	RE	Radio Equipment
D-factor	Distance factor	RF	Radio Frequency
DFS	Dynamic Frequency Selection	RMS	Root Mean Square
DQPSK	Differential QPSK	RSS	Radio Standards Specifications
DSSS	Direct Sequence Spread Spectrum	Rx	Receiving
EDR	Enhanced Data Rate	SA, S/A	Spectrum Analyzer
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power	SG	Signal Generator
EMC	ElectroMagnetic Compatibility	SVSWR	Site-Voltage Standing Wave Ratio
EMI	ElectroMagnetic Interference	TR	Test Receiver
EN	European Norm	Tx	Transmitting
ERP, e.r.p.	Effective Radiated Power	VBW	Video BandWidth
EU	European Union	Vert.	Vertical
EUT	Equipment Under Test	WLAN	Wireless LAN
Fac.	Factor		
FCC	Federal Communications Commission		
FHSS	Frequency Hopping Spread Spectrum		
FM	Frequency Modulation		
Freq.	Frequency		
FSK	Frequency Shift Keying		
GFSK	Gaussian Frequency-Shift Keying		
GNSS	Global Navigation Satellite System		
GPS	Global Positioning System		
Hori.	Horizontal		
ICES	Interference-Causing Equipment Standard		
IEC	International Electrotechnical Commission		
IEEE	Institute of Electrical and Electronics Engineers		
IF	Intermediate Frequency		
ILAC	International Laboratory Accreditation Conference		
ISED	Innovation, Science and Economic Development Canada		
ISO	International Organization for Standardization		
JAB	Japan Accreditation Board		
LAN	Local Area Network		
LIMS	Laboratory Information Management System		

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

Telephone : +81 596 24 8999

Facsimile : +81 596 24 8124

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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 RIKI 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).

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

SECTION 3: Test specification, procedures & results

3.1 Test Specification

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

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.209 Radiated emission limits; general requirements.

* The revision does not affect the test result conducted before its effective date.

* Also the EUT complies with FCC Part 15 Subpart B.

3.2 Procedures and results

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results	Remarks
Conducted Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 8.8	<FCC> Section 15.207 <ISED> RSS-Gen 8.8	-	N/A	N/A	N/A	*1)
Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.12	<FCC> Section 15.209 <ISED> RSS-210 7.2 RSS-Gen 8.9	Radiated	N/A	18.5 dB 125 kHz 0 deg. Peak with Duty factor	Complied a)	-
Electric Field Strength of Spurious Emission	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> RSS-Gen 6.5, 6.6, 6.13	<FCC> Section 15.209 <ISED> RSS-210 7.3 RSS-Gen 8.9	Radiated	N/A	13.3 dB 32.564 MHz, Vertical, QP	Complied a)	-
-26 dB Bandwidth	<FCC> ANSI C63.10:2013 6 Standard test methods <ISED> -	<FCC> Reference data <ISED> -	Radiated	N/A	N/A	Complied b)	-

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

*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 -26 dB Bandwidth and 99 % Occupied Bandwidth)

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.

FCC Part 15.31 (e)

The battery voltage (DC 12V) is provided to the EUT. Input voltage to RF part doesn't go through the regulator. So the test was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage (DC 12 V) and the variation of the input power does not affect the test result, therefore the EUT complies with the requirement.

FCC Part 15.203 Antenna requirement

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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

Telephone : +81 596 24 8999

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3.3 Addition to standard

Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
99 % Occupied Band Width	RSS-Gen 6.7	-	Radiated	N/A	N/A	-

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.

Other than above, 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 following 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	9 kHz to 30 MHz	3.3 dB
10 m		3.2 dB
3 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		5.0 dB
	200 MHz to 1000 MHz (Horizontal)	5.2 dB
		6.3 dB
10 m	30 MHz to 200 MHz (Horizontal)	4.8 dB
		4.8 dB
	200 MHz to 1000 MHz (Horizontal)	5.0 dB
		5.0 dB

Antenna Terminal test

Test Item	Uncertainty (+/-)
-26 dB Bandwidth / 99 % Occupied Bandwidth	0.96 %

3.5 Test Location

UL Japan, Inc. Ise EMC Lab.
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Telephone: +81 596 24 8999, Facsimile: +81 596 24 8124
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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 × 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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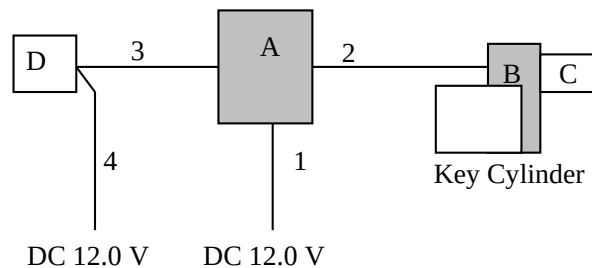
SECTION 4: Operation of EUT during testing

4.1 Operating Modes

Test mode	Remarks
1) Tx 125 kHz Immobilizer Antenna	-
* EUT was set by the software as follows; Software: 200213_RadioTest_TypeA.s (Date: February 13, 2020, Storage location: EUT memory) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

Justification : The system was configured in typical fashion (as a user would normally use it) for testing.

4.2 Configuration and peripherals



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

*The input voltage (DC 12 V) passes through Item No. A without affecting it and is supplied to the Coil antenna (Item No. B) without any drop in voltage.

*This EUT has two modes which transponder key is inserted or not. The worst case was confirmed with and without transponder key at pre-check, as a result, the test with transponder key was the worst case. Therefore, the test with transponder key was performed only.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Body ECU	DH19R-2	No.295	DENSO CORPORATION	EUT
B	Coil Antenna	DH19R-2	X0300304	TOKAI RIKI CO.,LTD.	EUT
C	Transponder	-	295	TOKAI RIKI CO.,LTD.	-
D	Evaluation Bench	-	No.26	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	3.0	Unshielded	Unshielded	-
2	DC and Antenna Cable	3.0	Unshielded	Unshielded	-
3	Signal Cable	3.0	Unshielded	Unshielded	-
4	DC Cable	3.0	Unshielded	Unshielded	-

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

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 Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

Frequency : From 9 kHz to 30 MHz

The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for vertical polarization (antenna angle: 0 deg., 45 deg., 90 deg., and 135 deg.) and horizontal polarization.

*Refer to Figure 1 about Direction of the Loop Antenna.

Frequency: From 30 MHz to 1 GHz

The measuring antenna height 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.

The test was made with the detector (RBW / VBW) in the following table.

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

Test Antennas are used as below;

Frequency	Below 30 MHz	30 MHz to 200 MHz	200 MHz to 1 GHz
Antenna Type	Loop	Biconical	Logperiodic

Frequency	From 9 kHz to 90 kHz and From 110 kHz to 150 kHz	From 90 kHz to 110 kHz	From 150 kHz to 490 kHz	From 490 kHz to 30 MHz	From 30 MHz to 1 GHz
Instrument used	Test Receiver				
Detector	PK / AV	QP	PK / AV	QP	QP
IF Bandwidth	200 Hz	200 Hz	9 kHz	9 kHz	120 kHz
Test Distance	3 m *1)	3 m *1)	3 m *1)	3 m *2)	3 m

*1) Distance Factor: $40 \times \log(3 \text{ m} / 300 \text{ m}) = -80 \text{ dB}$

*2) Distance Factor: $40 \times \log(3 \text{ m} / 30 \text{ m}) = -40 \text{ dB}$

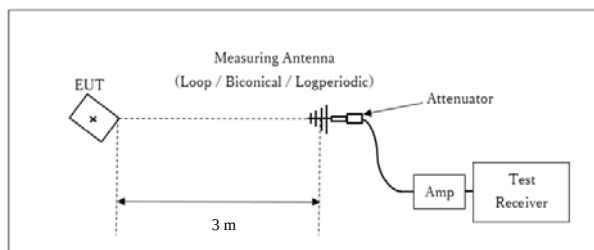
Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open field test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

These tests were performed in semi anechoic chamber. Therefore the measured level of emissions may be higher than if measurements were made without a ground plane.

However test results were confirmed to pass against standard limit.

[Test Setup]

Below 1 GHz



* : Center of turn table

Test Distance: 3 m

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- The carrier level and 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 the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

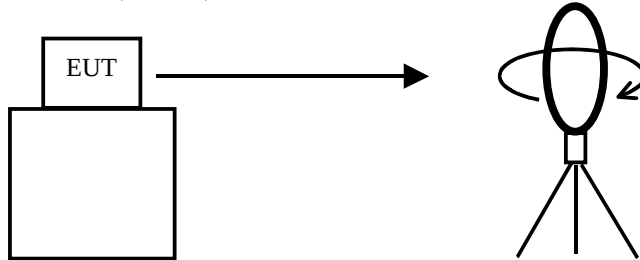
Measurement range : 9 kHz - 1 GHz
Test data : APPENDIX 1
Test result : Pass

Date: July 19, 2020

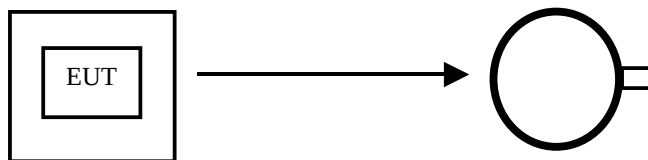
Test engineer: Hiroyuki Furutaka

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

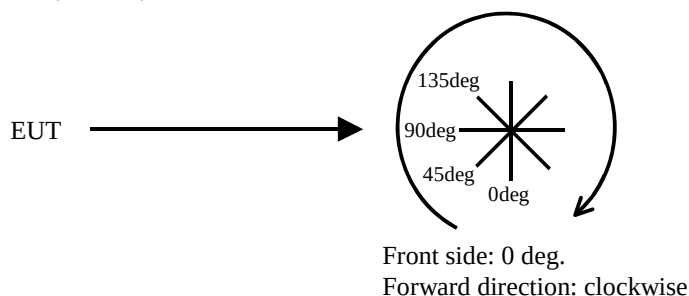


Top View (Horizontal)



Antenna was not rotated.

Top View (Vertical)



SECTION 6: -26 dB Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26 dB Bandwidth	100 kHz	1 kHz	3 kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1
Test result : Pass

SECTION 7: 99 % Occupied Bandwidth

Test Procedure

The test was measured with a spectrum analyzer using a test fixture.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99 % Occupied Bandwidth	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak *1)	Max Hold *1)	Spectrum Analyzer

*1) The measurement was performed with Peak detector, Max Hold since the duty cycle was not 100 %.
Peak hold was applied as Worst-case measurement.

Test data : APPENDIX 1
Test result : Pass

APPENDIX 1: Test data

Radiated Emission below 30 MHz (Fundamental and Spurious Emission)

Report No. 13261923H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 19, 2020
Temperature / Humidity 22 deg. C / 65 % RH
Engineer Hiroyuki Furutaka
Mode Mode 1

PK or QP

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.1250	PK	93.4	19.9	-74.0	32.3	-	7.1	45.6	38.5	Fundamental (DC 10.2 V)
0deg	0.1250	PK	93.4	19.9	-74.0	32.3	-	7.1	45.6	38.5	Fundamental (DC 12.0 V)
0deg	0.1250	PK	93.4	19.9	-74.0	32.3	-	7.1	45.6	38.5	Fundamental (DC 13.8 V)
0deg	0.2500	PK	47.7	19.9	-74.0	32.3	-	-38.7	39.6	78.3	
0deg	0.3750	PK	56.6	19.9	-73.9	32.3	-	-29.8	36.1	65.9	
0deg	0.5000	QP	33.6	19.8	-33.9	32.2	-	-12.8	33.6	46.4	
0deg	0.6250	QP	45.4	19.8	-33.9	32.2	-	-1.0	31.7	32.7	
0deg	0.7500	QP	31.7	19.8	-33.9	32.2	-	-14.6	30.1	44.7	
0deg	0.8750	QP	40.3	19.8	-33.9	32.2	-	-6.0	28.7	34.7	
0deg	1.0000	QP	31.2	19.8	-33.8	32.2	-	-15.1	27.6	42.7	
0deg	1.1250	QP	37.1	19.8	-33.8	32.2	-	-9.2	26.5	35.7	
0deg	1.2500	QP	31.2	19.8	-33.8	32.2	-	-15.1	25.6	40.7	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier)

PK with Duty factor

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	93.4	19.9	-74.0	32.3	0.0	7.1	25.6	18.5	DC 10.2 V
0deg	0.12500	PK	93.4	19.9	-74.0	32.3	0.0	7.1	25.6	18.5	DC 12.0 V
0deg	0.12500	PK	93.4	19.9	-74.0	32.3	0.0	7.1	25.6	18.5	DC 13.8 V
0deg	0.25000	PK	47.7	19.9	-74.0	32.3	0.0	-38.7	19.6	58.3	
0deg	0.37500	PK	56.6	19.9	-73.9	32.3	0.0	-29.8	16.1	45.9	

Result = Reading + Ant Factor + Loss (Cable + Attenuator + Filter + D.Factor) - Gain(Amplifier) + Duty factor *

* Since the peak emission result satisfied the average limit, duty factor was omitted.

Result of the fundamental emission at 3 m without Distance factor

PK or QP

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0deg	0.12500	PK	93.4	19.9	6.0	32.3	-	87.1	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

*It was confirmed that there was no difference by the input voltage in the spurious emission.

* Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

Radiated Emission above 30 MHz (Spurious Emission)

Report No. 13261923H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 19, 2020
Temperature / Humidity 22 deg. C / 65 % RH
Engineer Hiroyuki Furutaka
Mode Mode 1

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	32.564	QP	30.1	17.3	7.4	38.8	16.0	40.0	24.1	
Hori.	44.049	QP	29.0	13.1	7.6	38.8	10.9	40.0	29.1	
Hori.	52.050	QP	28.5	10.2	7.8	38.8	7.7	40.0	32.4	
Hori.	92.081	QP	34.6	8.6	8.4	38.9	12.8	43.5	30.8	
Hori.	96.095	QP	32.4	9.3	8.5	38.9	11.3	43.5	32.2	
Hori.	249.604	QP	28.4	11.5	10.2	38.9	11.3	46.0	34.7	
Vert.	32.564	QP	40.9	17.3	7.4	38.8	26.8	40.0	13.3	
Vert.	44.049	QP	38.3	13.1	7.6	38.8	20.2	40.0	19.8	
Vert.	52.050	QP	38.4	10.2	7.8	38.8	17.6	40.0	22.5	
Vert.	92.081	QP	41.0	8.6	8.4	38.9	19.2	43.5	24.4	
Vert.	96.095	QP	38.1	9.3	8.5	38.9	17.0	43.5	26.5	
Vert.	249.604	QP	28.5	11.5	10.2	38.9	11.4	46.0	34.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator) - Gain(Amplifier)

*Other frequency noises omitted in this report were not seen or had enough margin (more than 20 dB).

*The test result is rounded off to one or two decimal places, so some differences might be observed.

*It was confirmed that there was no difference by the input voltage in the spurious emission.

UL Japan, Inc.

Ise EMC Lab.

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

Telephone : +81 596 24 8999

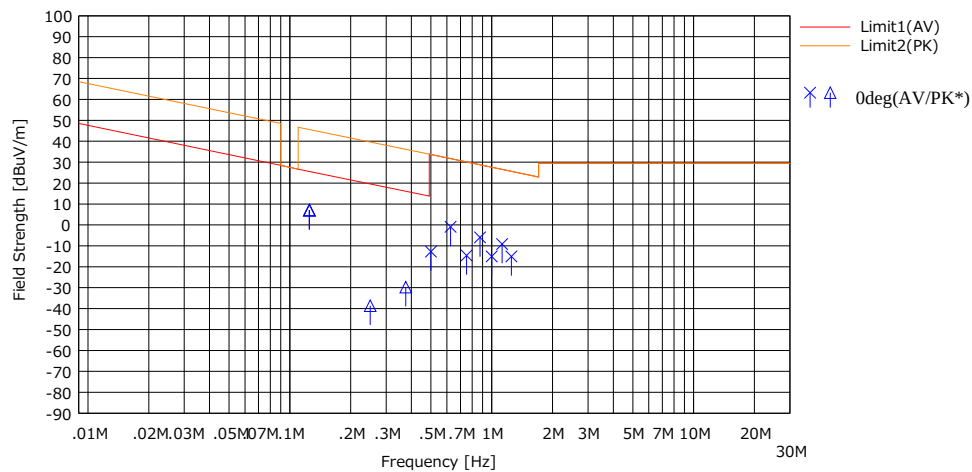
Facsimile : +81 596 24 8124

Radiated Emission Plot data, Worst case

Report No. 13261923H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 19, 2020
Temperature / Humidity 22 deg. C / 65 % RH
Engineer Hiroyuki Furutaka
Mode Mode 1

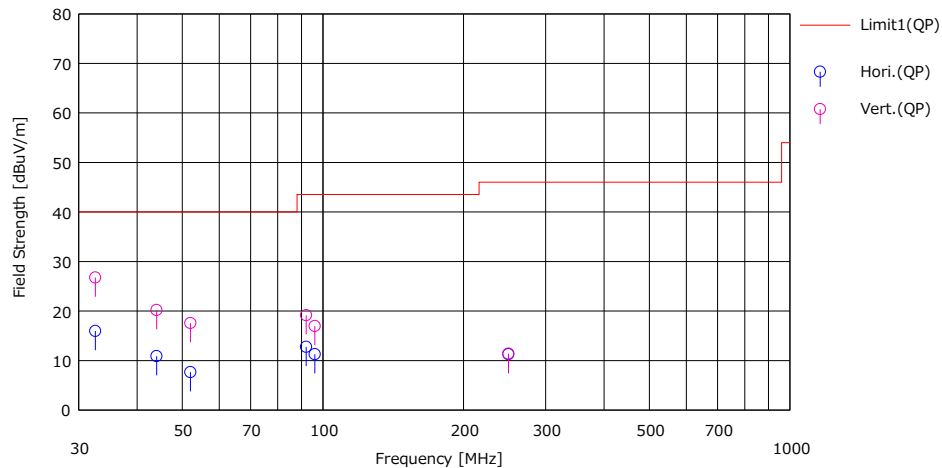
(below 30MHz)

Limit : FCC15.209(a), 9-90kHz:PK, 110-490kHz:PK, other:QP



* Data above 490 kHz were measured using a QP detector.

(above 30MHz)



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

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

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Facsimile : +81 596 24 8124

-26 dB Bandwidth and 99 % Occupied Bandwidth

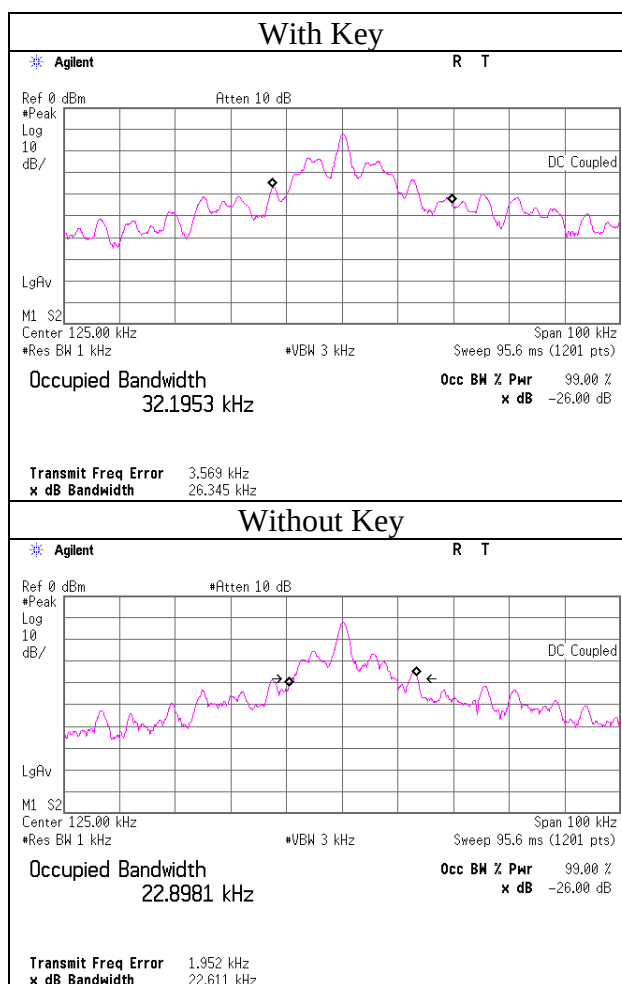
Report No. 13261923H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.1
Date July 19, 2020
Temperature / Humidity 22 deg. C / 65 % RH
Engineer Hiroyuki Furutaka
Mode Mode 1

With Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
26.345	32.1953

Without Key

-26 dB Bandwidth [kHz]	99 % Occupied Bandwidth [kHz]
22.611	22.8981



*It was confirmed that there was no difference by the input voltage.

APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	MAEC-01	141998	AC1_Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	06/08/2020	24
RE	MOS-27	141566	Thermo-Hygrometer	CUSTOM. Inc	CTH-201	A08Q26	01/07/2020	12
RE	MMM-03	141530	Digital Tester	Fluke Corporation	FLUKE 26-3	78030621	08/20/2019	12
RE	MJM-25	142226	Measure	KOMELON	KMC-36	-	-	-
RE	COTS-MEMI-02	178648	EMI measurement program	TSJ (Techno Science Japan)	TEPTO-DV	-	-	-
RE	MCC-03	141215	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W/3D-2W/ RG400u/ RFM-E421(SW)	-/01068 (Switcher)	06/25/2020	12
RE	MLPA-01	141254	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	10/04/2019	12
RE	MCC-143	141413	Coaxial Cable	UL Japan	-	-	06/18/2020	12
RE	MPA-13	141582	Pre Amplifier	SONOMA INSTRUMENT	310	260834	02/10/2020	12
RE	MAT-08	141213	Attenuator(6dB)	Weinschel Corp	2	BK7971	11/14/2019	12
RE	KBA-05	141198	Biconical Antenna	Schwarzbeck Mess - Elektronik	VHA9103+BBA9106	2513	04/22/2020	12
RE	MCC-02	141350	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	06/25/2020	12
RE	MTR-09	141950	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	06/03/2020	12
RE	MLA-20	141264	Logperiodic Antenna(200-1000MHz)	Schwarzbeck Mess - Elektronik	VUSLP9111B	9111B-189	04/22/2020	12
RE	MPA-19	141585	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	02/10/2020	12
RE	MRENT-130	141855	Spectrum Analyzer	Keysight Technologies Inc	E4440A	MY46187750	11/19/2019	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: Spurious emission

UL Japan, Inc.

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Facsimile : +81 596 24 8124