



EMI TEST REPORT

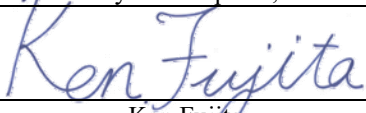
Test Report No. : 12737031H-B-R2

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Immobilizer and Alarm system
Model No. : K72R0
FCC ID : OUCK72R0
Test regulation : FCC Part 15 Subpart B: 2018
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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
6. The all test items in this test report are conducted by UL Japan, Inc. Ise EMC Lab.
7. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
8. The information provided from the customer for this report is identified in SECTION 1.
9. This report is a revised version of 12737031H-B-R1. 12737031H-B-R1 is replaced with this report.

Date of test: February 21 to April 4, 2019

Representative test engineer:


Ken Fujita
Engineer
Consumer Technology Division

Approved by:


Shinichi Miyazono
Engineer
Consumer Technology Division



This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
http://japan.ul.com/resources/emc_accredited/

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

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Facsimile : +81 596 24 8124

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SECTION 1: Customer information

Company Name	:	OMRON Automotive Electronics Co. Ltd.
Address	:	6368 NENJOZAKA OKUSA KOMAKI AICHI, 485-0802 JAPAN
Telephone Number	:	+81-568-78-6159
Facsimile Number	:	+81-568-78-7659
Contact Person	:	Takashi Betsui

The information provided from the customer is as follows;

- Applicant, Type of Equipment, Model No. on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. 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 (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Immobilizer and Alarm system
Model No.	:	K72R0
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC 12.0 V
Receipt Date of Sample	:	February 19, 2019
Country of Mass-production	:	Japan and India
Condition of EUT	:	Production prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model No: K72R0 (referred to as the EUT in this report) is the Immobilizer and Alarm system.

Radio Specification

[Transmitter part] *1)

Radio Type	:	Transceiver
Frequency of Operation	:	125 kHz
Modulation	:	ASK
Antenna type	:	External Antenna
Clock frequency (Maximum)	:	8 MHz (CPU)

[Receiver part]

Equipment Type	:	Receiver
Frequency of Operation	:	433.92 MHz
Local clock frequency	:	21.948717 MHz (Crystal)
Modulation	:	FSK
Antenna Type	:	Pattern Antenna

*1) The test of transmitter part was performed separately from this test report, and the conformability is confirmed.

FCC15.111(b)

The receiving antenna (of this EUT) is installed inside the EUT and cannot be removed (permanently attached). Therefore, Radiated emission test was performed.

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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 March 12, 2018 and effective April 11, 2018

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 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A	N/A	N/A	*1)
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8				
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	0.4 dB 38.648 MHz, Vertical, QP	Complied# a)	-
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.2				
*Note: UL Japan, Inc’s EMI Work Procedure 13-EM-W0420.						
*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.						
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.

3.4 Uncertainty

EMI

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 $k = 2$.

Polarity	Radiated emission (Below 1 GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 MHz to 200 MHz	200 MHz to 1000 MHz	30 MHz to 200 MHz	200 MHz to 1000 MHz
Horizontal	4.8 dB	5.2 dB	4.8 dB	5.0 dB
Vertical	5.0 dB	6.3 dB	4.9 dB	5.0 dB

Radiated emission (Above 1 GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 GHz to 6 GHz	6 GHz to 18 GHz	10 GHz to 26.5 GHz	26.5 GHz to 40 GHz	1 GHz to 18 GHz
5.0 dB	5.3 dB	5.8 dB	5.8 dB	5.2 dB

* Measurement distance

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Facsimile : +81 596 24 8124

3.5 Test Location

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
NVLAP Lab. code: 200572-0 / FCC Test Firm Registration Number: 199967

Test site	IC Registration Number	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	2973C-1	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	2973C-2	7.5 x 5.8 x 5.2	4.0 x 4.0	-	3 m
No.3 semi-anechoic chamber	2973C-3	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	2973C-4	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.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 E.U.T. during testing

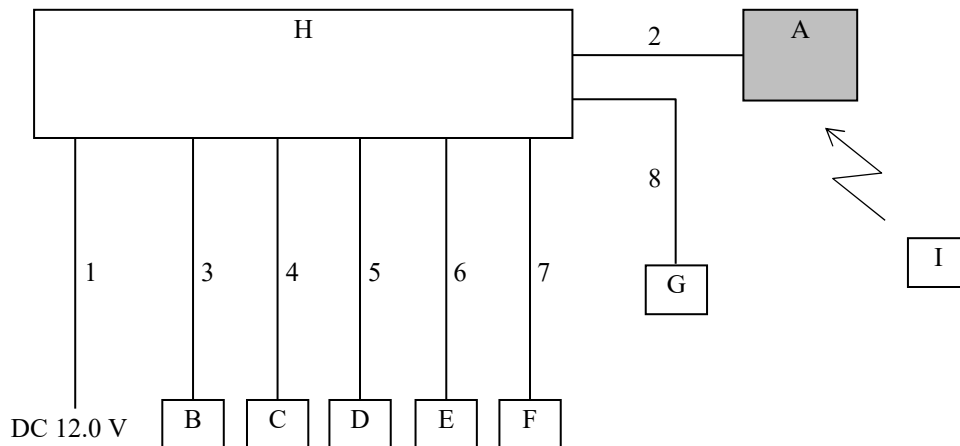
4.1 Operating modes

Mode	Remarks
1. Receiving mode	-

*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.

*Item No. A is included in Receiver Antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Immobilizer and Alarm system	K72R0	001	OMRON Automotive Electronics Co. Ltd.	EUT
B	LF Antenna-1 (Type B)	CGF-S002-J0B	01	OMRON Automotive Electronics Co. Ltd.	-
C	LF Antenna-1 (Type B)	CGF-S002-J0B	02	OMRON Automotive Electronics Co. Ltd.	-
D	LF Antenna-2 (Type 1)	CGF-S002-D01	03	OMRON Automotive Electronics Co. Ltd.	-
E	LF Antenna-3 (Type 3)	CGF-S002-D03	04	OMRON Automotive Electronics Co. Ltd.	-
F	LF Antenna-4 (Type 2-2)	CGF-S002-N22	05	OMRON Automotive Electronics Co. Ltd.	-
G	Push Start Switch	P55R0	2919H1	OMRON Automotive Electronics Co. Ltd.	-
H	Switch BOX	RV494	001	OMRON Automotive Electronics Co. Ltd.	-
I	FOB	R55R3	001	OMRON Automotive Electronics Co. Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.0	Unshielded	Unshielded	-
2	Signal & DC Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable	2.4	Unshielded	Unshielded	-
4	Antenna Cable	2.4	Unshielded	Unshielded	-
5	Antenna Cable	2.4	Unshielded	Unshielded	-
6	Antenna Cable	2.4	Unshielded	Unshielded	-
7	Antenna Cable	2.4	Unshielded	Unshielded	-
8	Signal & DC Cable	2.0	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.4 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2. Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The EUT was set on the 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 - 3000 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, or the Spectrum Analyzer.

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

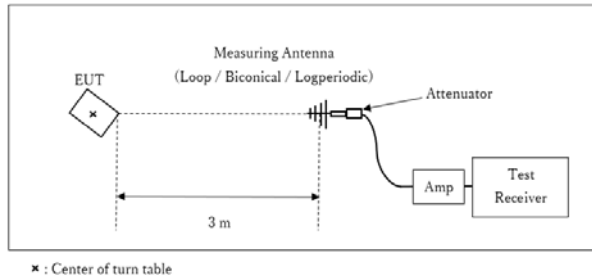
Frequency	Below 1GHz	Above 1GHz *1)
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120 kHz	PK: BW 1 MHz, CISPR AV: BW 1 MHz

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

Distance Factor: $20 \times \log (3.6 \text{ m} / 3 \text{ m}) = 1.59 \text{ dB}$

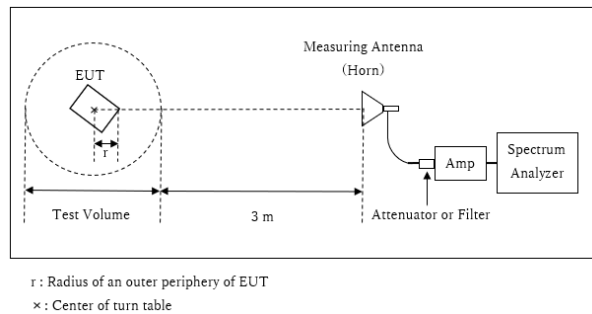
Figure 2: Test Setup

Below 1 GHz



Test Distance: 3 m

1 GHz - 3 GHz



Distance Factor: $20 \times \log(3.6 \text{ m}^*/3.0 \text{ m}) = 1.59 \text{ dB}$

* Test Distance: $(3 + \text{Test Volume} / 2) - r = 3.6 \text{ m}$

Test Volume: 3 m

(Test Volume has been calibrated based on CISPR 16-1-4.)

r = 0.9 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 the position that has the maximum noise.

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: February 21, 2019
February 27, 2019
April 4, 2019

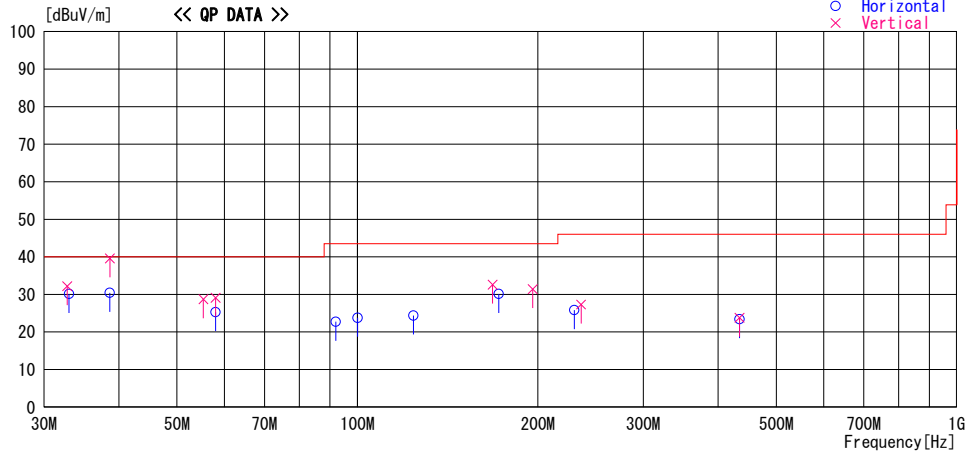
Test engineer: Tomoki Matsui
Ken Fujita
Ken Fujita

APPENDIX 1: Test data

Radiated Emission

Report No. 12737031H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 21, 2019 April 4, 2019
Temperature / Humidity 21 deg. C / 31% RH 23 deg. C / 33% RH
Engineer Tomoki Matsui Ken Fujita
(Below 1GHz) (Below 1GHz)
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency [MHz]	Reading [dBuV]	DET	Antenna		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit		Margin	Comment
			Factor [dB/m]	Loss& Gain [dB]					[dBuV/m]	[dB]		
32.788	38.6	QP	17.3	-23.7	32.2	135	100	Vert.	40.0	7.8		
33.016	36.6	QP	17.2	-23.7	30.1	0	268	Hori.	40.0	9.9		
38.618	39.0	QP	15.1	-23.7	30.4	359	240	Hori.	40.0	9.6		
38.648	48.2	QP	15.1	-23.7	39.6	214	100	Vert.	40.0	0.4		
55.360	42.9	QP	9.2	-23.4	28.7	260	100	Vert.	40.0	11.3		
58.019	40.2	QP	8.4	-23.3	25.3	0	400	Hori.	40.0	14.7		
58.021	44.0	QP	8.4	-23.3	29.1	260	100	Vert.	40.0	10.9		
92.048	36.9	QP	8.7	-22.9	22.7	0	289	Hori.	43.5	20.8		
100.056	36.4	QP	10.2	-22.8	23.8	0	289	Hori.	43.5	19.7		
124.066	33.7	QP	13.1	-22.4	24.4	151	190	Hori.	43.5	19.1		
168.092	38.7	QP	15.7	-21.8	32.6	155	100	Vert.	43.5	10.9		
172.090	36.1	QP	15.8	-21.8	30.1	231	190	Hori.	43.5	13.4		
196.104	36.7	QP	16.3	-21.6	31.4	180	100	Vert.	43.5	12.1		
230.129	35.6	QP	11.2	-21.0	25.8	301	140	Hori.	46.0	20.2		
236.134	37.0	QP	11.3	-21.0	27.3	167	100	Vert.	46.0	18.7		
434.194	27.6	QP	16.1	-20.3	23.4	221	134	Hori.	46.0	22.6		
434.194	28.0	QP	16.1	-20.3	23.8	321	100	Vert.	46.0	22.2		

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 & GAIN (CABLE + ATT - GAIN(AMP))

*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.

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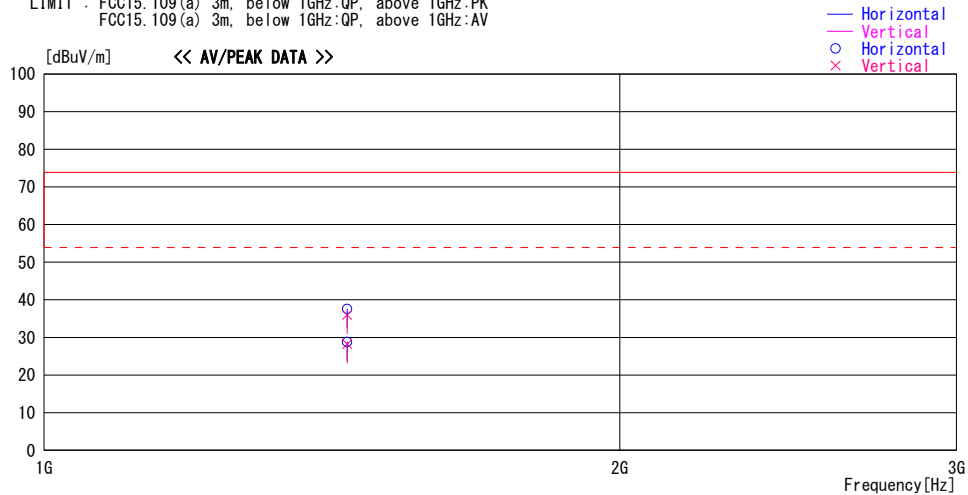
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Radiated Emission

Report No. 12737031H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.4
Date February 27, 2019
Temperature / Humidity 21 deg. C / 42% RH
Engineer Ken Fujita
(Above 1GHz)
Mode Mode 1

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
1440.231	42.8	PK	25.4	-30.6	37.6	0	100	Hori.	73.9	36.3	
1440.231	34.0	AV	25.4	-30.6	28.8	0	100	Hori.	53.9	25.1	
1440.231	41.2	PK	25.4	-30.6	36.0	0	100	Vert.	73.9	37.9	
1440.231	33.4	AV	25.4	-30.6	28.2	0	100	Vert.	53.9	25.7	

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 & GAIN (CABLE - GAIN(AMP) + D-factor)

*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.

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APPENDIX 2: Test instruments

Test Instruments

Test Item	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Calibration Due Date	Cal Int
RE	148898	Attenuator	KEYSIGHT	8491A	MY52462282	10/3/2018	10/31/2019	12
RE	141152	EMI measurement program	TSJ	TEPTO-DV	-	-	-	-
RE	141581	MicroWave System Amplifier	AGILENT	83017A	650	10/4/2018	10/31/2019	12
RE	141412	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1405S146(5m)	6/14/2018	6/30/2019	12
RE	141508	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	6/8/2018	6/30/2019	12
RE	141884	Spectrum Analyzer	AGILENT	E4448A	MY44020357	3/13/2019	3/31/2020	12
RE	141545	DIGITAL HiTESTER	HIOKI	3805	51201148	1/29/2019	1/31/2020	12
RE	141583	Pre Amplifier	SONOMA INSTRUMENT	310	260833	2/8/2019	2/29/2020	12
RE	141397	Coaxial Cable	UL Japan	-	-	6/13/2018	6/30/2019	12
RE	141267	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	3/21/2019	3/31/2020	12
RE	141425	Biconical Antenna	Schwarzbeck	BBA9106	1302	6/1/2018	6/30/2019	12
RE	141949	Test Receiver	Rohde & Schwarz	ESCI	100767	8/6/2018	8/31/2019	12
RE	142227	Measure	KOMELON	KMC-36	-	-	-	-
RE	142011	AC4 Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	6/28/2018	6/30/2020	24
RE	141562	Thermo-Hygrometer	CUSTOM	CTH-201	0010	1/11/2019	1/31/2020	12

*Hyphens for Last Calibration Date, Calibration Due 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.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item:

RE: Radiated emission

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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