



EMI TEST REPORT

Test Report No. : 12164506H

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Immobilizer and Alarm system
Model No. : K56RQ
Test regulation : FCC Part 15 Subpart B: 2018
FCC ID : OUCK56RQ
Test Result : Complied

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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 NVLAP, NIST, or any agency of the Federal Government.
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)

Date of test: February 7, 2018

Representative test engineer:

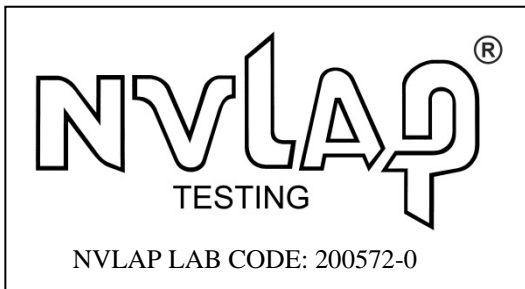
Hiroyuki Furutaka
Engineer

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/

UL Japan, Inc.

Ise EMC Lab.

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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 : Masashi Matsuda

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Immobilizer and Alarm system
Model No. : K56RQ
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : February 2, 2018
Rating : DC 12.0 V
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: K56RQ (referred to as the EUT in this report) is the Immobilizer and Alarm system.

General Specification

Clock frequency in the system : 8MHz (CPU)

Radio Specification

Frequency of operation : 433.92 MHz
Local Oscillator Frequency : 21.948717MHz
Type of modulation : FSK
Antenna Type : Pattern Antenna
Operating Temperature : -40 deg. C to 85 deg. C

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 January 2, 2018 and effective February 1, 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
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	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	20.0 dB 846.440 MHz Horizontal, QP	Complied
	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.

3.3 Addition to standard

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

3.4 Uncertainty

EMI

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	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	5.2 dB	6.3 dB	5.0 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
5.2 dB	5.5 dB	5.5 dB	5.4 dB	5.5 dB

* Measurement distance

Radiated emission test (3 m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

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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	N/A	-	-
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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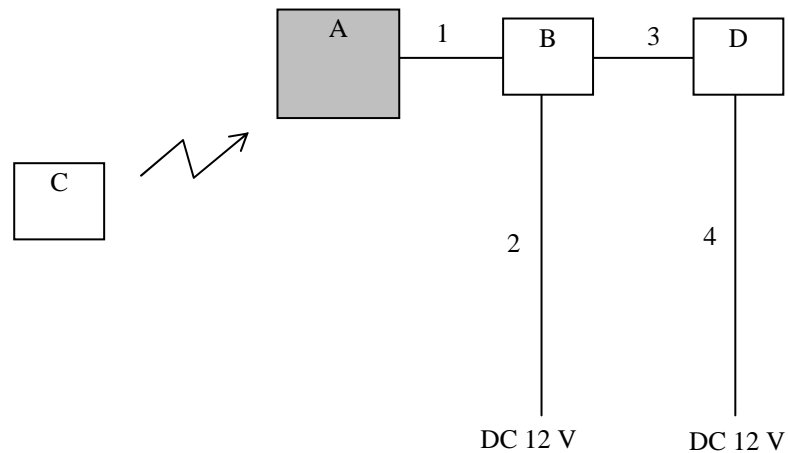
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Mode	Remarks
Receiving mode (Rx) 433.92 MHz	-

* It was confirmed by using LED of Jig 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 includes Receiver Antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Receiver	K56RQ	023	OMRON Automotive Electronics Co. Ltd.	EUT
B	Switch Box	-	17	OMRON Automotive Electronics Co. Ltd.	-
C	Transmitter	T55R2	41	OMRON Automotive Electronics Co. Ltd.	-
D	Immobilizer	I55R0	007	OMRON Automotive Electronics Co. Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC and Signal Cable	2.0	Unshielded	Unshielded	-
2	DC Cable	3.0	Unshielded	Unshielded	-
3	Signal Cable	2.0	Unshielded	Unshielded	-
4	DC Cable	3.0	Unshielded	Unshielded	-

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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 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 - 2000 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: $20 \times \log(3.5 \text{ m} / 3 \text{ m}) = 1.33 \text{ dB}$

- 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 7, 2018

Test engineer: Hiroyuki Furutaka

UL Japan, Inc.

Ise EMC Lab.

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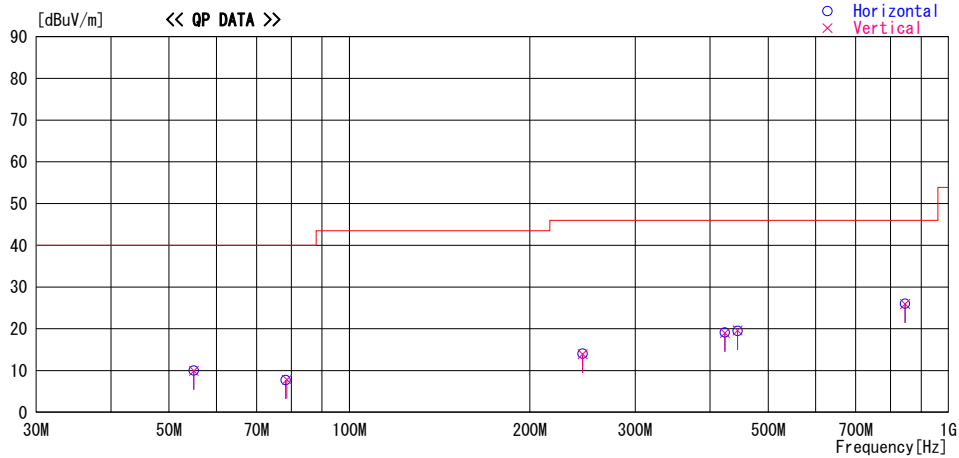
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APPENDIX 1: Test data

Radiated Emission

Report No. 12164506H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 7, 2018
Temperature / Humidity 23 deg. C / 41 % RH
Engineer Hiroyuki Furutaka
(Below 1 GHz)
Mode Receiving mode

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
55.000	24.3	QP	9.1	-23.4	10.0	0	100	Hori.	40.0	30.0	
55.000	24.2	QP	9.1	-23.4	9.9	0	100	Vert.	40.0	30.1	
78.280	24.2	QP	6.6	-23.1	7.7	0	100	Hori.	40.0	32.3	
78.620	24.3	QP	6.6	-23.1	7.8	0	100	Vert.	40.0	32.2	
245.000	23.2	QP	11.7	-20.9	14.0	0	100	Hori.	46.0	32.0	
245.000	23.1	QP	11.7	-20.9	13.9	0	100	Vert.	46.0	32.1	
423.220	23.3	QP	16.1	-20.4	19.0	0	100	Vert.	46.0	27.0	
423.220	23.4	QP	16.1	-20.4	19.1	0	100	Hori.	46.0	26.9	
444.620	23.4	QP	16.6	-20.4	19.6	0	100	Vert.	46.0	26.4	
444.620	23.3	QP	16.6	-20.4	19.5	0	100	Hori.	46.0	26.5	
846.440	22.1	QP	21.3	-17.4	26.0	0	100	Hori.	46.0	20.0	
846.440	22.0	QP	21.3	-17.4	25.9	0	100	Vert.	46.0	20.1	

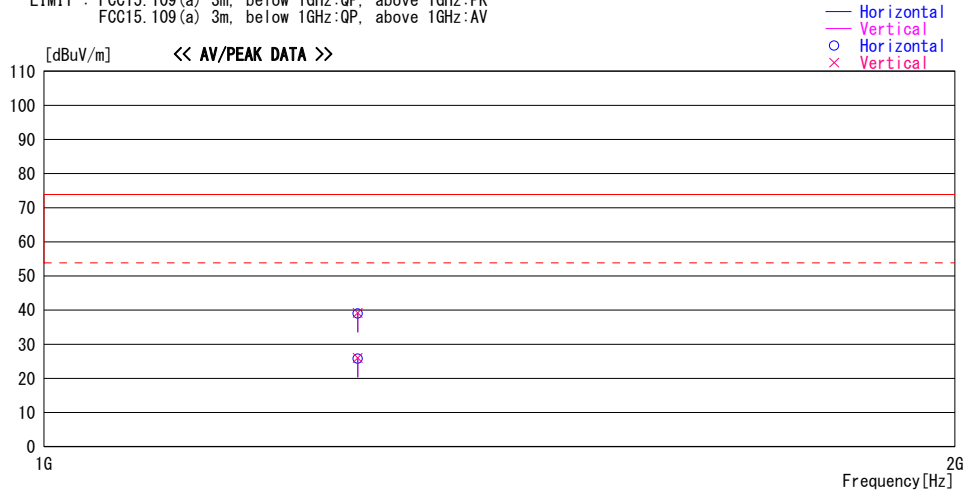
CHART: WITH FACTOR

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))

Radiated Emission

Report No. 12164506H
Test place Ise EMC Lab.
Semi Anechoic Chamber No.2
Date February 7, 2018
Temperature / Humidity 23 deg. C / 41 % RH
Engineer Hiroyuki Furutaka
(Above 1 GHz)
Mode Receiving mode

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		Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss & Gain [dB]							
1269.660	46.3	PK	24.8	-32.1	39.0	0	100	Hori.	73.9	34.9	
1269.660	46.5	PK	24.8	-32.1	39.2	0	100	Vert.	73.9	34.7	
1269.660	33.1	AV	24.8	-32.1	25.8	0	100	Hori.	53.9	28.1	
1269.660	33.3	AV	24.8	-32.1	26.0	0	100	Vert.	53.9	27.9	

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)

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2017/08/31 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2017/12/21 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2017/11/07 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2017/08/21 * 12
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2017/09/13 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/12/10 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2017/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2017/11/14 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2017/09/27 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2017/08/07 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2017/02/24 * 12
MCC-216	Microwave Cable	Junkosha	MWX221	1604S253(1 m) / 1608S087(5 m)	RE	2017/08/04 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2018/01/23 * 12
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2018/01/30 * 12

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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