



EMI TEST REPORT

Test Report No. : 11840085H-B-R1

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : UNIT ASSY
Model No. : GHR-H015-R
FCC ID : OUCGHR-H015R
Test regulation : FCC Part 15 Subpart B: 2017
Test Result : Complied

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 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)
7. This report is a revised version of 11840085H-B.

Date of test: July 4, 2017

Representative test engineer:


Ken Fujita
Engineer
Consumer Technology Division

Approved by:


Motoya Imura
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

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.
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11840085H-B

[illegible]

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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

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

2.1 Identification of E.U.T.

Type of Equipment : UNIT ASSY
Model No. : GHR-H015-R
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12 V
Receipt Date of Sample : May 30, 2017
Country of Mass-production : Japan
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: GHR-H015-R (referred to as the EUT in this report) is the UNIT ASSY.

General Specification

Clock frequencies in the system : 8 MHz, 10 MHz (CPU)
21.948717 MHz (Crystal)

Radio Specification

[Transmitter part]*

Radio Type : Transmitter
Frequency of Operation : 125 kHz
Modulation : FSK
Method of Frequency Generation : Crystal resonator
Antenna type : Inverted L antenna

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

[Receiver part]

Radio Type : Receiver
Frequency of Operation : 433.92 MHz
Method of Frequency Generation : Crystal

UNIT ASSY (model: GHR-H015-R) consists of the following parts:

- BCM (included UHF Receiver)
- LF ANT (Front)
- LF ANT (Rear)

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 June 14, 2017 and effective July 14, 2017

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	25.1 dB 42.265 MHz Vertical, 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 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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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* 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.

SECTION 4: Operation of E.U.T. during testing

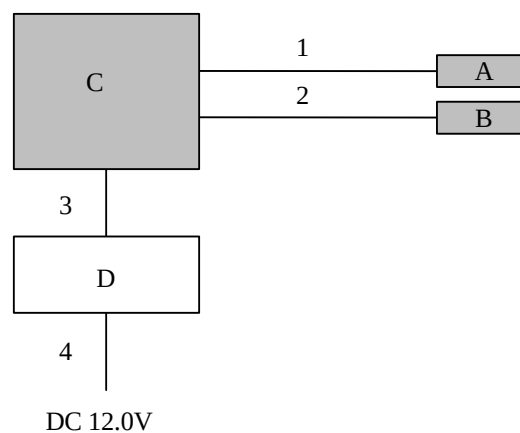
4.1 Operating modes

Mode	Remarks
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.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	LF Antenna (Rear)	CGF-H003-0010	No.1	OMRON Automotive Electronics Co. Ltd.	EUT
B	LF Antenna (Front)	CGF-H001-0010	No.1	OMRON Automotive Electronics Co. Ltd.	EUT
C	ECU	GHR-H015-R01	No.20	OMRON Automotive Electronics Co. Ltd.	EUT
D	ECU Simulator	-	No.9	OMRON Automotive Electronics Co. Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	0.70	Unshielded	Unshielded	-
2	Antenna Cable	0.55	Unshielded	Unshielded	-
3	Signal Cable	0.60	Unshielded	Unshielded	-
4	DC Cable	2.00	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

6.2 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.

6.3 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

6.4 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.

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: $20 \times \log (3.75 \text{ m} / 3 \text{ m}) = 1.94 \text{ dB}$

- 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.

6.5 Test result

Summary of the test results: Pass

Date: July 4, 2017

Test engineer: Ken Fujita

APPENDIX 1: Test data

Radiated Emission

DATA OF RADIATED EMISSION TEST

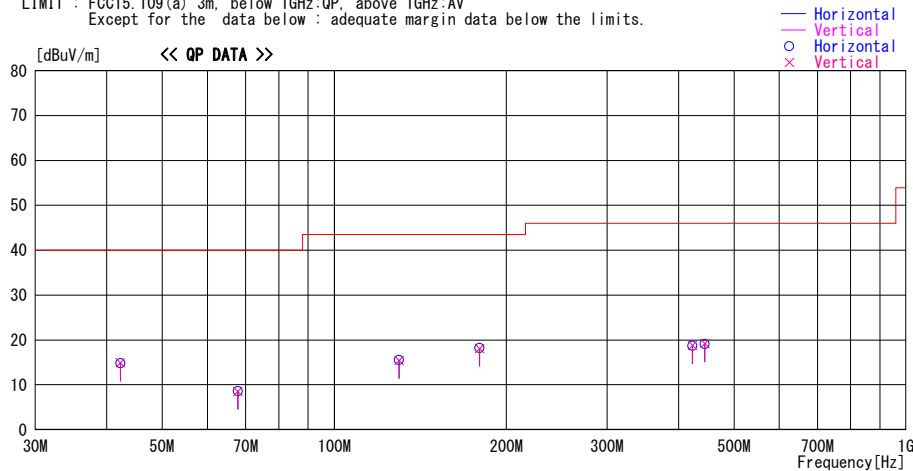
UL Japan, Inc. Ise EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2017/07/04

Report No. : 11840085H

Temp./Humi. : 22deg. C / 68% RH
Engineer : Ken Fujita

Mode / Remarks : Rx_433.92MHz_Below 1GHz

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	Margin	Comment
			Factor [dB/m]	Gain [dB]					[dBuV/m]	[dB]	
42.265	22.8	QP	13.3	-21.3	14.8	0	100	Hori.	40.0	25.2	
42.265	22.9	QP	13.3	-21.3	14.9	0	100	Vert.	40.0	25.1	
67.816	22.9	QP	6.7	-21.0	8.6	0	100	Hori.	40.0	31.4	
67.816	22.8	QP	6.7	-21.0	8.5	0	100	Vert.	40.0	31.5	
129.820	21.9	QP	13.7	-20.1	15.5	359	100	Hori.	43.5	28.0	
129.820	21.8	QP	13.7	-20.1	15.4	319	100	Vert.	43.5	28.1	
179.560	21.4	QP	16.2	-19.5	18.1	319	100	Vert.	43.5	25.4	
179.560	21.5	QP	16.2	-19.5	18.2	359	100	Hori.	43.5	25.3	
423.220	21.0	QP	16.2	-18.5	18.7	0	100	Hori.	46.0	27.3	
423.220	21.1	QP	16.2	-18.5	18.8	359	100	Vert.	46.0	27.2	
444.620	21.1	QP	16.6	-18.6	19.1	0	100	Hori.	46.0	26.9	
444.620	21.2	QP	16.6	-18.6	19.2	359	100	Vert.	46.0	26.8	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:-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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Radiated Emission

DATA OF RADIATED EMISSION TEST

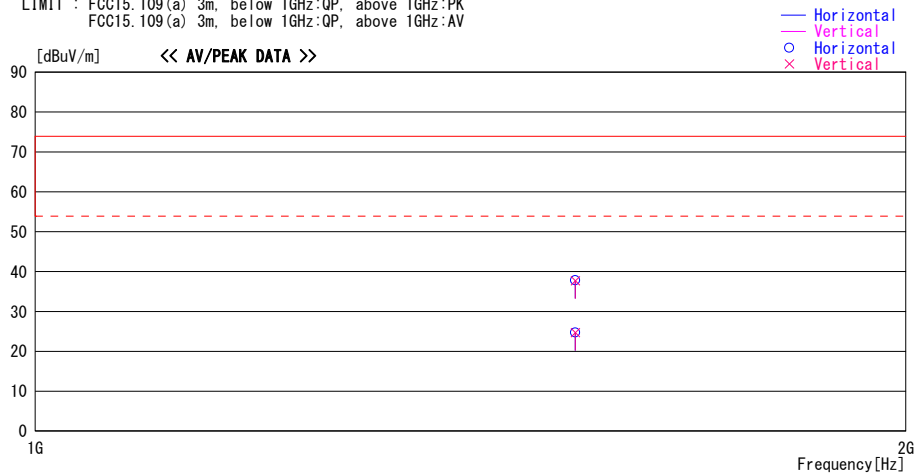
UL Japan, Inc. Ise EMC Lab. No.2 Semi Anechoic Chamber
Date : 2017/07/04

Report No. : 11840085H

Temp./Humi. : 22deg. C / 68% RH
Engineer : Ken Fujita

Mode / Remarks : Rx_433.92MHz_above 1GHz

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



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1537.080	43.9	PK	25.9	-32.0	37.8	0	100	Hori.	73.9	36.1	
1537.080	43.8	PK	25.9	-32.0	37.7	0	100	Vert.	73.9	36.2	
1537.080	30.8	AV	25.9	-32.0	24.7	0	100	Hori.	53.9	29.2	
1537.080	30.8	AV	25.9	-32.0	24.7	0	100	Vert.	53.9	29.2	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:-: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.

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	2016/08/02 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2016/12/13 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MBA-08	Biconical Antenna	Schwarzbeck	VHA9103B	08031	RE	2016/09/29 * 12
MLA-21	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-190	RE	2017/01/05 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2017/02/24 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2016/11/28 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2016/09/13 * 12
MMM-01	Digital Tester	Fluke	FLUKE 26-3	78030611	RE	2016/08/23 * 12
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2017/01/12 * 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	2016/08/29 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2017/01/16 * 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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