




# EMI TEST REPORT


**Test Report No. : 32GE0121-HO-01-A-R2**

**Applicant** : OMRON Automotive Electronics Co. Ltd.  
**Type of Equipment** : Receiver Antenna  
**Model No.** : GHR-M002  
**FCC ID** : OUCGHR-M002  
**Test regulation** : FCC Part 15 Subpart B: 2012  
RSS-Gen Issue 3: 2010 +A1: January 2012  
**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 report is a revised version of 32GE0121-HO-01-A-R1. 32GE0121-HO-01-A-R1 is replaced with this report.

**Date of test:** May 2, 2012

**Representative test engineer:**   
Shinya Watanabe  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**   
Takahiro Hatakeda  
Leader of WiSE Japan,  
UL Verification Service

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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 : Receiver Antenna  
Model No. : GHR-M002  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC 5.0V  
Receipt Date of Sample : April 18, 2012  
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

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**UL Japan, Inc.**

**Head Office EMC Lab.**

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## 2.2 Product Description

Model No: GHR-M002 (referred to as the EUT in this report) is the Receiver Antenna.  
The clock frequency of EUT is 16MHz(CPU) or 8MHz or 10.178125MHz.

Feature of EUT : Lock and unlock doors (gate/trunk) by receiving RF signal output by the operation of the registered transmitter (remote transmitter, hereafter referred to as T/M).  
Immobilizer function for antitheft and remote engine starter function to start up/stop an engine by pressing a button of a separate transmitter (remote control engine starter) is also installed.

Operating Voltage (Inner) : DC5.0V\*  
\*The stable voltage (DC5.0V) is provided to RF part regardless of input voltage fluctuation (Car Battery).

### Immobilizer part (LF Transmitting part)

Equipment Type : Transceiver  
Frequency of Operation : 125kHz  
Type of Modulation : AM  
Antenna Type : Coil Antenna  
Method of Frequency Generation : Ceramic Resonator (125kHz =8MHz /64)

### UHF part (RF Receiving part)

Equipment Type : Receiver  
Type of Receiver : Super Heterodyne  
Receiving Frequency : 315MHz  
Oscillator Frequency : 10.178125MHz (Crystal)  
Local Oscillator Frequency : 325.7MHz (10.178125MHz \* 32)  
Intermediate Frequency : 10.7MHz  
Antenna Type : S type Antenna (Built-in)  
Method of Frequency Generation : Crystal

### FCC15.111(b) / RSS-Gen 4.10

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: 2012, final revised on March 30, 2012 and effective April 30, 2012

Title : FCC 47CFR Part15 Radio Frequency Device  
Subpart B Unintentional Radiators

: RSS-Gen Issue 3: 2010 +A1: January 2012  
General Requirements and Information for the Certification of Radio Apparatus

### **3.2 Procedures and results**

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2003 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4			
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	21.1dB 30.600MHz, QP, Horizontal / Vertical	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			
*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.

Test room (semi- anechoic chamber)	Radiated emission						
	(3m*)(+dB)			(1m*)(+dB)		(0.5m*)(+dB)	
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.2dB	5.0dB	5.1dB	4.7dB	5.7dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	4.8dB	5.6dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	4.8dB	5.6dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	4.8dB	5.6dB	5.1dB	4.2dB

\*3m/1m/0.5m = Measurement distance

#### Radiated emission test (3m)

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

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### 3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. \*NVLAP Lab. code: 200572-0  
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Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	FCC Registration Number	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	313583	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	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	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	134570	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	4.75 x 5.4 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	-	-	8.0 x 4.5 x 2.8m	2.0 x 2.0m	-
No.10 measurement room	-	-	2.6 x 2.8 x 2.5m	2.4 x 2.4m	-
No.11 measurement room	-	-	3.1 x 3.4 x 3.0m	2.4 x 3.4m	-

\* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

### 3.6 Data of EMI, Test instruments, and Test set up

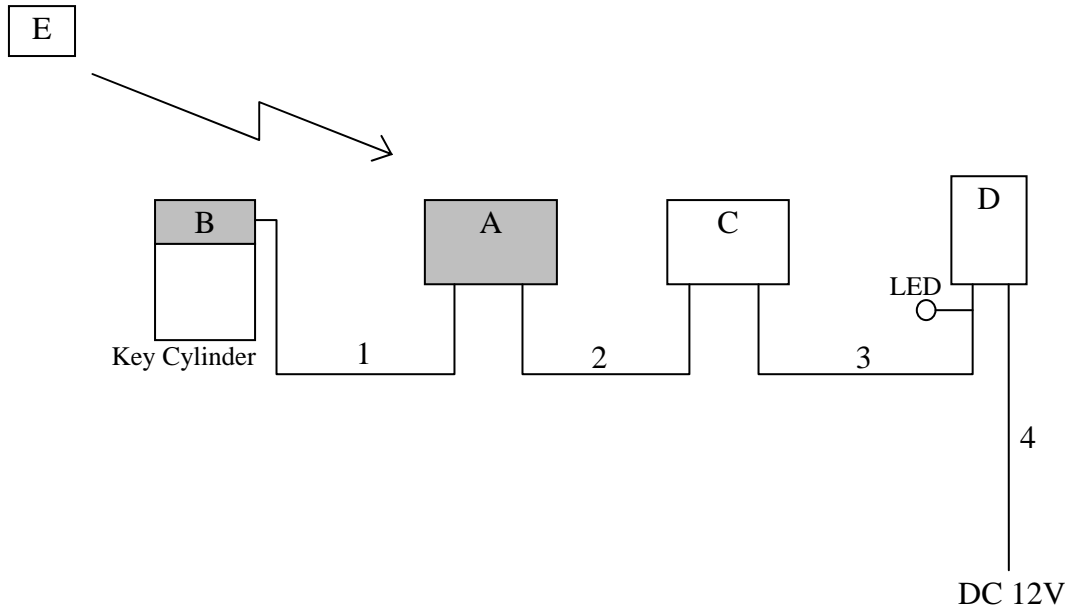
Refer to APPENDIX.

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

### 4.1 Operating modes

Mode	Remarks
Receiving mode	* Test was performed with checking the EUT receiving state by LED lighting.

### 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	Receiver Antenna	GHR-M002	002	OMRON Automotive Electronics Co. Ltd.	EUT
B	Coil Antenna	-	001	-	EUT
C	ECU	G8D-640M-ECU	75250310000803	OMRON Automotive Electronics Co. Ltd.	-
D	Simulator	-	001	OMRON Automotive Electronics Co. Ltd.	-
E	Key	-	001	OMRON Automotive Electronics Co. Ltd.	-

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	1.5	Unshielded	Unshielded	Dedicated
2	Signal Cable	1.5	Unshielded	Unshielded	-
3	Signal Cable	1.5	Unshielded	Unshielded	-
4	DC Cable	1.5	Unshielded	Unshielded	-

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

Test place : See data  
Temperature : See data  
Humidity : See data

### **5.2 Test configuration**

EUT was placed on a urethane platform of nominal size, 1.0m by 1.5m, raised 0.8m above the conducting ground plane. The EUT was set on the center 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 : 30MHz-300MHz (Biconical antenna) / 300MHz-1000MHz (Logperiodic antenna)  
1000MHz -2000MHz (Horn antenna)  
Test distance : 3m  
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 4m 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
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 3MHz AV *1): RBW:1MHz/VBW:10Hz

\*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- 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



**APPENDIX 1: Data of EMI test**

**Radiated Emission**

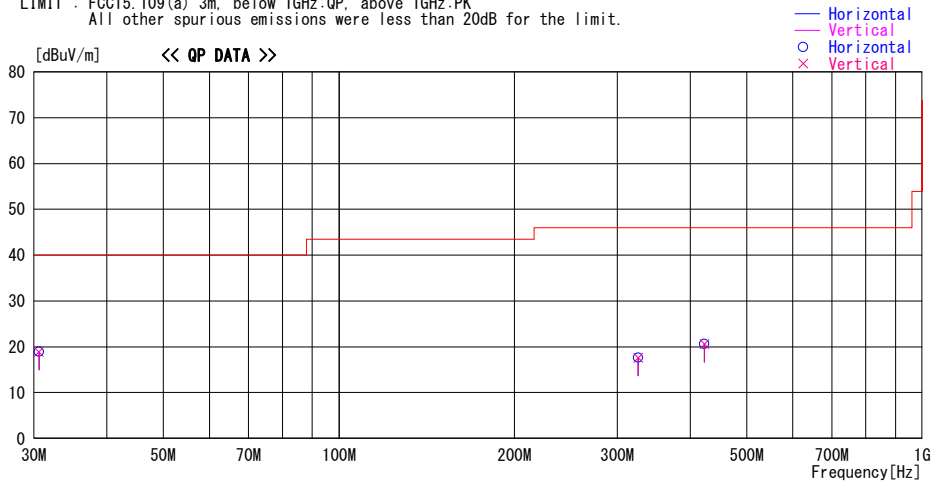
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2012/05/02

Report No. : 32GE0121-HO-01  
Power : DC 12.0V  
Temp. / Humi. : 21deg. C / 63%  
Engineer : Shinya Watanabe

Mode / Remarks : Receiving mode

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	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]
			Factor [dB/m]	Gain [dB]						
30.600	22.9	QP	17.8	-21.8	18.9	96	318	Hori.	40.0	21.1
30.600	22.9	QP	17.8	-21.8	18.9	346	100	Vert.	40.0	21.1
325.700	21.2	QP	15.2	-18.8	17.6	16	100	Hori.	46.0	28.4
325.700	21.2	QP	15.2	-18.8	17.6	345	100	Vert.	46.0	28.4
423.200	21.9	QP	17.6	-18.9	20.6	16	100	Hori.	46.0	25.4
423.200	21.9	QP	17.6	-18.9	20.6	345	100	Vert.	46.0	25.4

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - 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.

## Radiated Emission

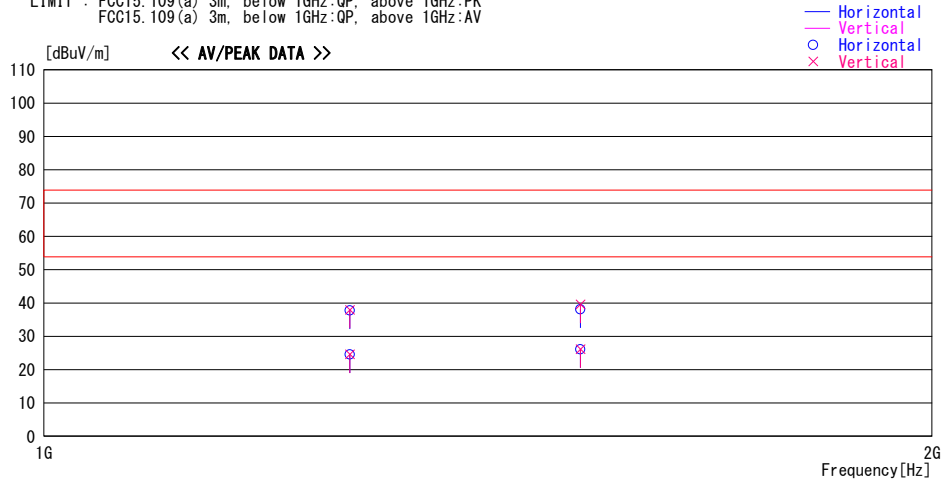
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2012/05/02

Report No. : 32GE0121-HO-01  
Power : DC 12.0V  
Temp. / Humi. : 21deg.C / 63%  
Engineer : Shinya Watanabe

Mode / Remarks : 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	46.1	PK	25.7	-34.1	37.7	359	100	Hori.	73.9	36.2	
1269.660	46.4	PK	25.7	-34.1	38.0	359	100	Vert.	73.9	35.9	NS
1269.660	33.0	AV	25.7	-34.1	24.6	359	100	Hori.	53.9	29.3	NS
1269.660	33.0	AV	25.7	-34.1	24.6	359	100	Vert.	53.9	29.3	NS
1519.997	45.4	PK	26.3	-33.6	38.1	359	100	Hori.	73.9	35.8	NS
1519.997	46.9	PK	26.3	-33.6	39.6	359	100	Vert.	73.9	34.3	NS
1519.997	33.5	AV	26.3	-33.6	26.2	359	100	Hori.	53.9	27.7	NS
1519.997	33.5	AV	26.3	-33.6	26.2	359	100	Vert.	53.9	27.7	NS

CHART: WITH FACTOR ANT TYPE: -30MHz: LOOP, 30-300MHz: BICONICAL, 300MHz-1000MHz: LOGPERIODIC, 1000MHz-: HORN  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - 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.

## **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	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2012/02/16 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2011/11/23 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2012/02/22 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 12
MPA-10	Pre Amplifier	Agilent	8449B	3008A02142	RE	2012/01/25 * 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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