



# RADIO TEST REPORT

Test Report No. : 32GE0120-HO-01-A-R3

**Applicant** : OMRON Automotive Electronics Co. Ltd.  
**Type of Equipment** : Keyless operation system  
**Model No.** : GGM-M003  
**FCC ID** : OUCGGM-M003  
**Test regulation** : FCC Part 15 Subpart C: 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 above regulation.
4. The test results in this 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 report is a revised version of 32GE0120-HO-01-A-R2. 32GE0120-HO-01-A-R2 is replaced with this report.

**Date of test:** April 29 and 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



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. \*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap>

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**Head Office EMC Lab.**

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<b>CONTENTS</b>	<b>PAGE</b>
<b>SECTION 1: Customer information .....</b>	<b>3</b>
<b>SECTION 2: Equipment under test (E.U.T.).....</b>	<b>3</b>
<b>SECTION 3: Test specification, procedures &amp; results .....</b>	<b>5</b>
<b>SECTION 4: Operation of E.U.T. during testing .....</b>	<b>8</b>
<b>SECTION 5: Radiated emission (Fundamental and Spurious Emission).....</b>	<b>10</b>
<b>SECTION 6: -26dB Bandwidth.....</b>	<b>12</b>
<b>SECTION 7: 99% Occupied Bandwidth.....</b>	<b>12</b>
<b>APPENDIX 1: Data of EMI test.....</b>	<b>13</b>
<b>Radiated Emission below 30MHz (Fundamental and Spurious Emission) .....</b>	<b>13</b>
<b>Radiated Emission above 30MHz (Spurious Emission).....</b>	<b>14</b>
<b>-26dB Bandwidth.....</b>	<b>15</b>
<b>99% Occupied Bandwidth.....</b>	<b>16</b>
<b>APPENDIX 2: Test instruments .....</b>	<b>17</b>
<b>APPENDIX 3: Photographs of test setup .....</b>	<b>18</b>
<b>Radiated Emission.....</b>	<b>18</b>
<b>Worst Case Position .....</b>	<b>19</b>

## **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 : Keyless Operation System  
Model No. : GGM-M003  
Serial No. : Refer to Section 4, Clause 4.2  
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

### **2.2 Product Description**

Model No: GGM-M003 (referred to as the EUT in this report) is the Keyless Operation System.  
KOS consists of KOS ECU, LF ANT, and FOB BOX.

Keyless operation system is a system to lock/unlock (door entry function) a door /trunk by pressing Lock/Unlock SW on each door with holding the registered keyless operation key (hereafter referred to as FOB) and start up an engine (engine starter function) without using an existing mechanical key. These operations can be done without pulling FOB from a pocket or bag.

The keyless entry function to lock/unlock doors by pressing a button on FOB, 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) are installed.

### **General Specification**

Operating Voltage : DC8 to 16V  
Operating Temperature : -40 deg. C. - +85 deg. C

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KOS has the following radio functions: Immobilizer system and Smart System (LF Transmitting/RF Receiving).

**Immobilizer system function** \*1)

Equipment Type : Transceiver  
Frequency of Operation : 125kHz  
Type of Modulation : BPLM  
Mode of Operation : Simplex  
Antenna Type : Coil Antenna  
Method of Frequency Generation : Ceramic Resonator  
Operating Voltage (inner) : DC5V (The stable voltage: DC5V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

**Smart System: LF Transmitting function** \*2)

Equipment Type : Transmitter  
Frequency of Operation : 125kHz  
Type of Modulation : ASK  
Mode of Operation : Simplex  
Antenna Type : Ferrite Antenna  
Method of Frequency Generation : Crystal and CPU timer  
Operating Voltage (inner) : DC8V (The stable voltage: DC8V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

\*KOS has 5 or 6 LF antennas depending on the vehicles on which the EUT is mounted, and all the antennas are same in specification. Each antenna does not transmit at the same time. ECU controls the power for each antenna.

**Smart System: RF Receiving function** \*3)

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  
Method of Frequency Generation : Crystal  
Operating Voltage (inner) : DC5V (The stable voltage: DC5V is provided to RF part regardless of input voltage fluctuation (Car Battery).)

\*1) This test report applies for Immobilizer system function.

\*2) LF Transmitting function is applied for other test report. (Test Report No.: 32GE0120-HO-01-B)

\*3) RF Receiving function is applied for other test report. (Test Report No.: 32GE0120-HO-01-E)

\* Immobilizer system function and LF Transmitting function do not transmit 125kHz at the same time.

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## **SECTION 3: Test specification, procedures & results**

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2012, final revised on July 23, 2012 and effective August 22, 2012

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

\* The revision on July 23, 2012 does not affect the test specification applied to the EUT.

#### **FCC 15.31(e)**

The EUT provides the stable voltage (DC8V for LF Transmitter, DC5V for Immobilizer) constantly to RF part regardless of input voltage. Therefore, the EUT complies with the requirement.

#### **FCC Part 15.203 Antenna requirement**

It is impossible for end users to replace the Immobilizer antenna, because it is mounted inside of the vehicle and users cannot access it. Therefore, the equipment complies with the antenna requirement of Section 15.203.

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### 3.2 Procedures and results

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	Conducted Emission	<FCC> ANSI C63.4:2003 7. AC powerline conducted emission measurements <IC> RSS-Gen 7.2.4	<FCC> Section 15.207 <IC> RSS-Gen 7.2.4	-	N/A *1)	N/A	N/A
2	Electric Field Strength of Fundamental Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.8, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	25.6dB 0.12500Hz 0 deg. AV	Complied
3	Electric Field Strength of Spurious Emission	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> RSS-Gen 4.9, 4.11	<FCC> Section 15.209 <IC> RSS-210 2.5.1 RSS-Gen 7.2.5	Radiated	N/A	10.6dB 33.288MHz, Vertical, QP	Complied
4	-26dB Bandwidth	<FCC> ANSI C63.4:2003 13. Measurement of intentional radiators <IC> -	<FCC> Reference data <IC> -	Radiated	N/A	N/A	N/A

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.

### 3.3 Addition to standard

No.	Item	Test Procedure	Specification	Remarks	Deviation	Worst margin	Results
1	99% Occupied Band Width	RSS-Gen 4.6.1	RSS-Gen 4.6.1	Radiated	N/A	N/A	N/A

Other than above, no addition, exclusion nor deviation has been made from the standard.

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### 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.

### 3.5 Test Location

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	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.

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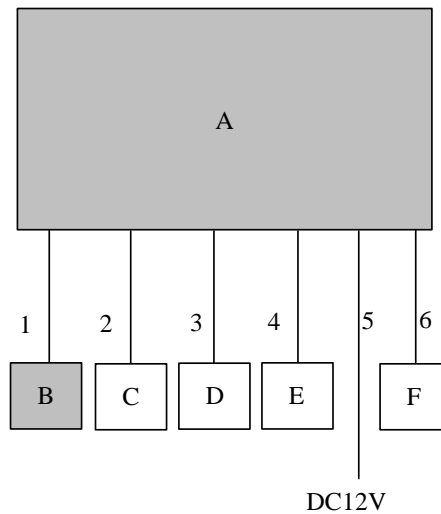
## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Modes**

Test mode	Remarks
Transmitting mode	125kHz

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

### **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	KOS ECU	GGM-M003 *1)	001	OMRON Automotive Electronics Co. Ltd.	EUT
B	KEYLESS OPERATION KEY BOX	C8Z-F116M *1)	00076	OMRON Automotive Electronics Co. Ltd.	EUT
C	LF ANT	G8D-841M-ANT	1-244	OMRON Automotive Electronics Co. Ltd.	-
D	LF ANT	G8D-841M-ANT	1-245	OMRON Automotive Electronics Co. Ltd.	-
E	DAMMY ECU	-	-	OMRON Automotive Electronics Co. Ltd.	-
F	JIG	-	-	OMRON Automotive Electronics Co. Ltd.	-

\*1) Keyless Operation System is composed with these Items and the system model number is GGM-M003.

**List of cables used**

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal Cable	1.6	Unshielded	Unshielded	Dedicated
2	Antenna Cable	1.7	Unshielded	Unshielded	Dedicated
3	Antenna Cable	1.7	Unshielded	Unshielded	Dedicated
4	Signal Cable	1.6	Unshielded	Unshielded	-
5	DC Cable	2.5	Unshielded	Unshielded	-
6	Signal Cable	1.3	Unshielded	Unshielded	-

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**SECTION 5: Radiated emission (Fundamental and Spurious Emission)**

**Test Procedure**

The Radiated Electric Field Strength intensity has been measured on No 4 semi anechoic chamber with a ground plane and at a distance of 3m.

Frequency : From 9kHz to 30MHz at distance 3m

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: 0deg., 45deg., 90deg., 135 deg. and 180deg.) and horizontal polarization.

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

Frequency : From 30MHz to 1GHz at distance 3m

The measuring antenna height 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.

Measurements were performed with a QP, PK, and AV detector.

AV detector was used since carrier and harmonics transmit with no interval (not pulse emission).

The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz).

	From 9kHz to 90kHz and From 110kHz to 150kHz	From 90kHz to 110kHz	From 150kHz to 490kHz	From 490kHz to 30MHz	From 30MHz to 1GHz
Detector Type	PK/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

\*This EUT is to be installed in vehicles. The antenna of EUT is installed in Key cylinder, and the body of EUT is installed in the front part of vehicles. In the set-up configuration for the tests, the antenna and the body of EUT were set on three positions of X, Y, and Z axis respectively.

- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.

With the position, the noise levels of all the frequencies were measured.

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

\* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)

[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])

[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

**Test data** : APPENDIX 1  
**Test result** : Pass

Date: April 29 and May 2, 2012

Test engineer: Shinya Watanabe

**UL Japan, Inc.**

**Head Office EMC Lab.**

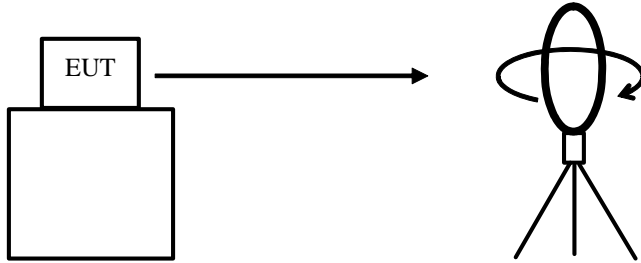
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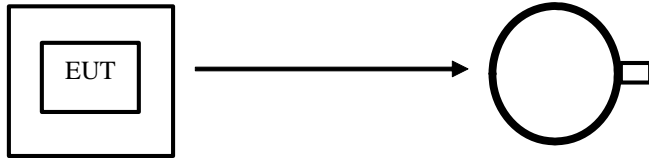
Facsimile : +81 596 24 8124

**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



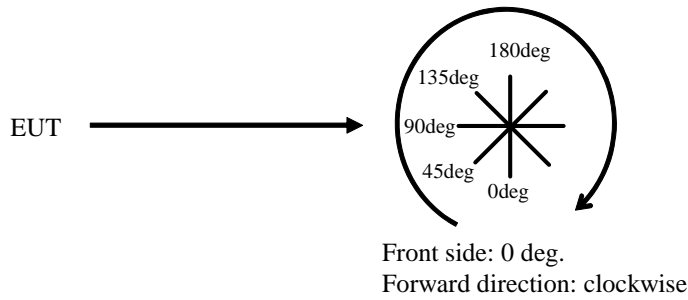
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



## **SECTION 6: -26dB Bandwidth**

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	200kHz	2kHz	6.2kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1  
Test result : Pass

## **SECTION 7: 99% Occupied Bandwidth**

### **Test Procedure**

The measurement was performed in the antenna height to gain the maximum of Electric field strength.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
99% Occupied Bandwidth	Enough width to display 20dB Bandwidth	1 % of Span	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%.

Test data : APPENDIX 1  
Test result : Pass

**APPENDIX 1: Data of EMI test**

**Radiated Emission below 30MHz (Fundamental and Spurious Emission)**

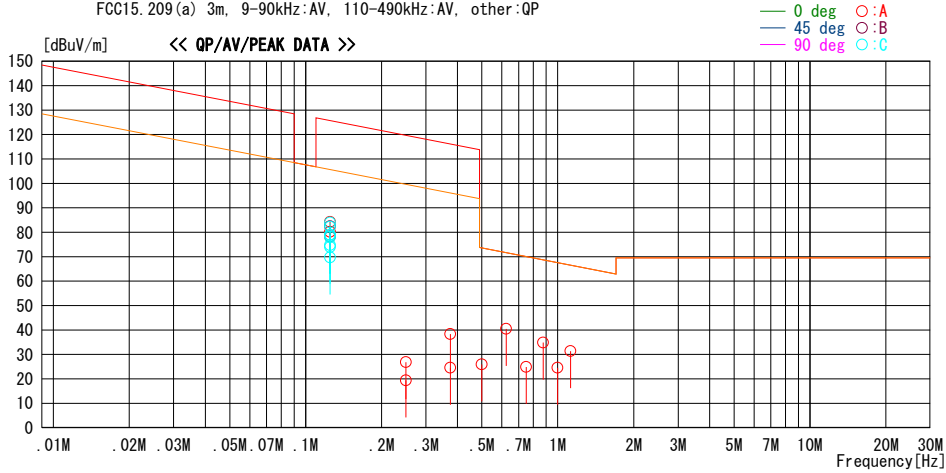
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Date : 2012/04/29

Report No. : 32GE0120-HO-01  
Power : DC 12.0V  
Temp./ Humi. : 24deg. C. / 48%RH  
Engineer : Shinya Watanabe

Mode / Remarks : Transmitting 125KHz Worst Axis

LIMIT : FCC15.209(a) 3m, 9-90kHz:PK, 110-490kHz:PK, other:QP  
FCC15.209(a) 3m, 9-90kHz:AV, 110-490kHz:AV, other:QP



Freq. [MHz]	Reading [dBuV]	DET	Ant. Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]	Table	Comment
										[deg]	
0.12500	90.6	PEAK	19.9	6.0	32.2	84.3	125.7	41.4	0	A	180
0.12500	88.8	PEAK	19.9	6.0	32.2	82.5	125.7	43.2	45	B	156
0.12500	85.3	PEAK	19.9	6.0	32.2	79.0	125.7	46.7	90	C	104
0.12500	88.6	PEAK	19.9	6.0	32.2	82.3	125.7	43.4	135	C	201
0.12500	90.2	PEAK	19.9	6.0	32.2	83.9	125.7	41.8	180	C	180
0.12500	80.2	PEAK	19.9	6.0	32.2	73.9	125.7	51.8	0	C	183 Ho1
0.12500	86.4	AV	19.9	6.0	32.2	80.1	105.7	25.6	0	A	180
0.12500	84.5	AV	19.9	6.0	32.2	78.2	105.7	27.5	45	B	180
0.12500	81.0	AV	19.9	6.0	32.2	74.7	105.7	31.0	90	C	180
0.12500	84.3	AV	19.9	6.0	32.2	78.0	105.7	27.7	135	C	180
0.12500	85.3	AV	19.9	6.0	32.2	79.0	105.7	26.7	180	C	180
0.12500	76.0	AV	19.9	6.0	32.2	69.7	105.7	36.0	0	C	183 Ho1
0.25000	33.2	PEAK	19.7	6.1	32.2	26.8	119.7	92.9	0	A	173
0.25000	25.8	AV	19.7	6.1	32.2	19.4	99.7	80.3	0	A	173
0.37500	44.8	PEAK	19.7	6.1	32.2	38.4	116.1	77.7	0	A	171
0.37500	31.0	AV	19.7	6.1	32.2	24.6	96.1	71.5	0	A	171
0.50000	32.6	QP	19.6	6.1	32.3	26.0	73.6	47.6	0	A	2
0.62500	46.9	QP	19.6	6.1	32.2	40.4	71.7	31.3	0	A	180
0.75000	31.4	QP	19.6	6.1	32.2	24.9	70.1	45.2	0	A	0
0.87500	41.5	QP	19.5	6.1	32.2	34.9	68.7	33.8	0	A	180
1.00000	31.0	QP	19.5	6.2	32.2	24.5	67.6	43.1	0	A	0
1.12500	37.9	QP	19.5	6.2	32.2	31.4	66.5	35.1	0	A	180

CHART: WITH FACTOR, ANT TYPE: LOOP, Except for the data below: adequate margin data below the limits.  
CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE + ATTEN.) - GAIN (AMP.)

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

## Radiated Emission above 30MHz (Spurious Emission)

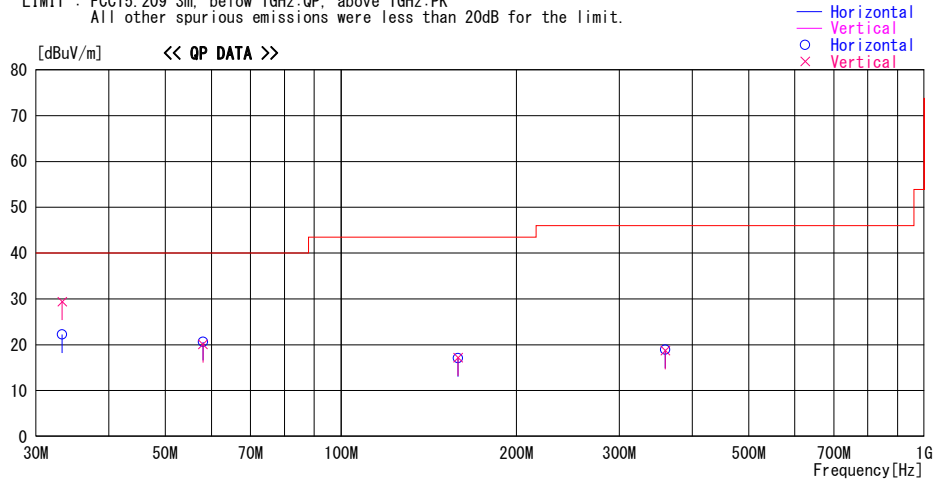
### DATA OF RADIATED EMISSION TEST

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

Report No. : 32GE0120-H0-01  
 Power : DC 12.0V  
 Temp. / Humi. : 21deg.C / 63%  
 Engineer : Shinya Watanabe

Mode / Remarks : Transmitting

LIMIT : FCC15.209 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 [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Loss& Gain [dB]							
33.288	27.1	QP	16.8	-21.7	22.2	0	281	Hori.	40.0	17.8	
33.288	34.3	QP	16.8	-21.7	29.4	0	100	Vert.	40.0	10.6	
58.025	33.3	QP	8.9	-21.5	20.7	185	385	Hori.	40.0	19.4	
58.025	32.7	QP	8.9	-21.5	20.1	276	100	Vert.	40.0	19.9	
158.777	22.0	QP	15.3	-20.2	17.1	0	100	Hori.	43.5	26.4	NS
158.777	22.1	QP	15.3	-20.2	17.2	0	100	Vert.	43.5	26.3	NS
359.870	21.4	QP	16.3	-18.8	18.9	158	100	Hori.	46.0	27.1	NS
359.870	21.2	QP	16.3	-18.8	18.7	325	100	Vert.	46.0	27.3	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)

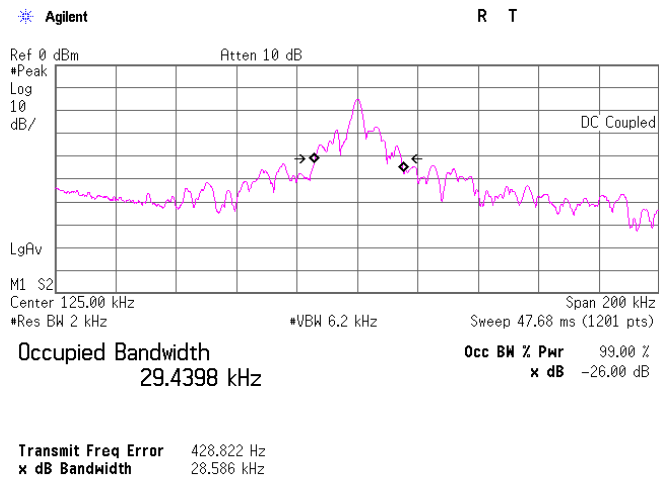
\*The test result is rounded off to one or two decimal places, so some differences might be observed.

## -26dB Bandwidth

UL Japan, Inc.  
 Head Office EMC Lab. No.4 Semi Anechoic Chamber

REPORT NO : 32GE0120-HO-01  
 REGULATION : Reference data  
 TEST DISTANCE : 3m  
 DATE : 4/29/2012  
 TEMPERATURE : 24 deg. C  
 HUMIDITY : 48 % RH  
 Engineer : Shinya Watanabe

FREQ	-26dB Bandwidth
[kHz]	[kHz]
125.0	28.586

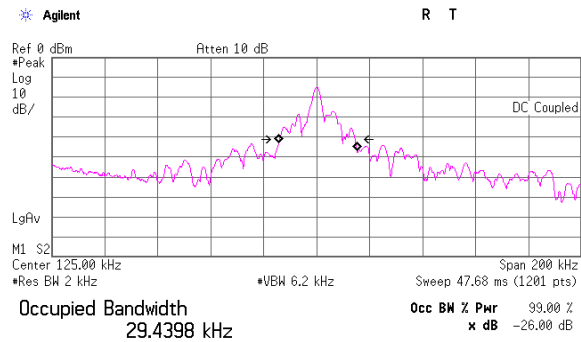


## 99% Occupied Bandwidth

UL Japan, Inc.  
 Head Office EMC Lab. No.4 Semi Anechoic Chamber

REPORT NO : 32GE0120-HO-01  
 REGULATION : Reference data  
 TEST DISTANCE : 3m  
 DATE : 4/29/2012  
 TEMPERATURE : 24 deg. C  
 HUMIDITY : 48 % RH  
 Engineer : Shinya Watanabe

FREQ	99% Occupied Bandwidth
[kHz]	[kHz]
125.0	29.440



Transmit Freq Error 428.822 Hz  
 x dB Bandwidth 28.586 kHz



## **APPENDIX 2: Test instruments**

### **EMI test equipment**

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2012/02/29 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2012/04/05 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	RE	2011/07/04 * 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-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MRENT-95	Spectrum Analyzer	Agilent	E4440A	MY46185823	RE	2011/06/30 * 12
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	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 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

**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**

**UL Japan, Inc.**

**Head Office EMC Lab.**

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