



## EMI TEST REPORT

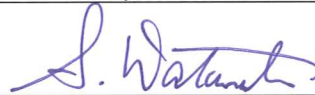
Test Report No. : 32GE0120-HO-01-E-R3

**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 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 32GE0120-HO-01-E-R2. 32GE0120-HO-01-E-R2 is replaced with this report.

**Date of test:** May 2 and 25, 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 : 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. ECU controls the power for each antenna. The test was performed with maximum power and minimum power which were settable. The end-user cannot set the power setting value since it is defined each vehicle.

**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) Immobilizer system function is applied for other test report. (Test Report No.: 32GE0120-HO-01-A(FCC)/32GE0120-HO-01-C(IC))

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

\*3) This test report applies for RF Receiving function.

**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: 2012, final revised on July 23, 2012 and effective August 22, 2012

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

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

Test Specification/Title : 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<br>7. AC powerline<br>conducted emission<br>measurements | FCC:Part 15 Subpart B<br>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<br>8. Radiated<br>emission measurements                  | FCC: Part 15 Subpart B<br>15.109(a) | N/A       | 12.1dB<br>33.246MHz,<br>Vertical, QP | 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<br>(semi-<br>anechoic<br>chamber) | Radiated emission |                  |                 |                |                 |                   |                   |
|---|-------------------|------------------|-----------------|----------------|-----------------|-------------------|-------------------|
|   | (3m*)(+dB)        |                  |                 |                | (1m*)(+dB)      |                   | (0.5m*)(+dB)      |
|   | 9kHz<br>-30MHz    | 30MHz<br>-300MHz | 300MHz<br>-1GHz | 1GHz<br>-10GHz | 10GHz<br>-18GHz | 18GHz<br>-26.5GHz | 26.5GHz<br>-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

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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.

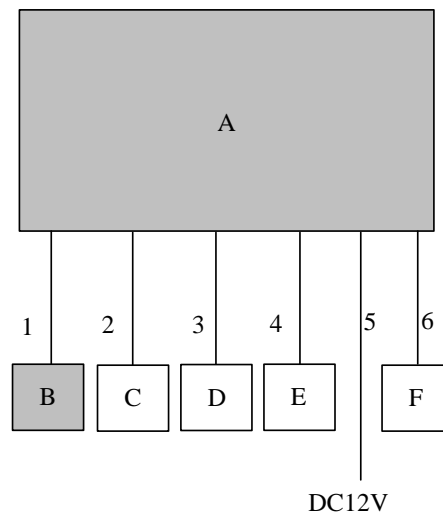
## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating modes**

| Test mode         | Remarks |
|-------------------|---------|
| RF Receiving mode | 315MHz  |

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**

### **5.1 Operating environment**

Test place : No.2 and 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, 1.0m by 1.5m, raised 0.8m 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 : 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<br>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 three axes of EUT to see the position of maximum noise, and the test was made at representative position since no difference was found among each position.

### **5.5 Test result**

Summary of the test results: Pass

**APPENDIX 1: Data of EMI test**

**Radiated Emission**

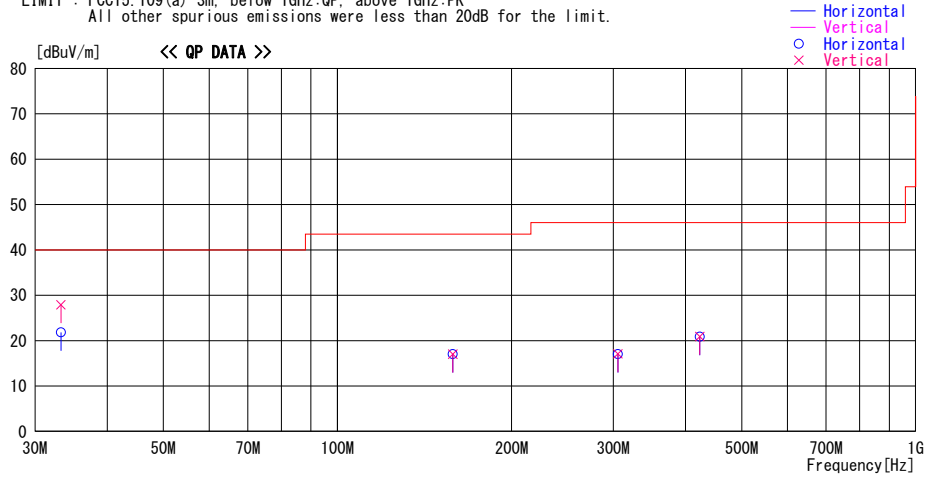
**DATA OF RADIATED EMISSION TEST**

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

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

Mode / Remarks : RF 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<br>[MHz] | Reading<br>[dBuV] | DET | Antenna          |                     | Level<br>[dBuV/m] | Angle<br>[Deg] | Height<br>[cm] | Polar. | Limit<br>[dBuV/m] | Margin<br>[dB] | Comment |
|--------------------|-------------------|-----|------------------|---------------------|-------------------|----------------|----------------|--------|-------------------|----------------|---------|
|                    |                   |     | Factor<br>[dB/m] | Loss & Gain<br>[dB] |                   |                |                |        |                   |                |         |
| 33.246             | 26.7              | QP  | 16.8             | -21.7               | 21.8              | 0              | 301            | Hori.  | 40.0              | 18.2           |         |
| 33.246             | 32.8              | QP  | 16.8             | -21.7               | 27.9              | 0              | 100            | Vert.  | 40.0              | 12.1           |         |
| 158.236            | 21.9              | QP  | 15.3             | -20.2               | 17.0              | 0              | 100            | Hori.  | 43.5              | 26.5           | NS      |
| 158.236            | 21.9              | QP  | 15.3             | -20.2               | 17.0              | 0              | 100            | Vert.  | 43.5              | 26.5           | NS      |
| 305.600            | 21.2              | QP  | 14.6             | -18.8               | 17.0              | 0              | 100            | Hori.  | 46.0              | 29.0           | NS      |
| 305.600            | 21.3              | QP  | 14.6             | -18.8               | 17.1              | 0              | 100            | Vert.  | 46.0              | 28.9           | NS      |
| 423.220            | 22.1              | QP  | 17.6             | -18.9               | 20.8              | 0              | 100            | Hori.  | 46.0              | 25.2           | NS      |
| 423.220            | 22.2              | QP  | 17.6             | -18.9               | 20.9              | 0              | 100            | Vert.  | 46.0              | 25.1           | 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.

**Radiated Emission**

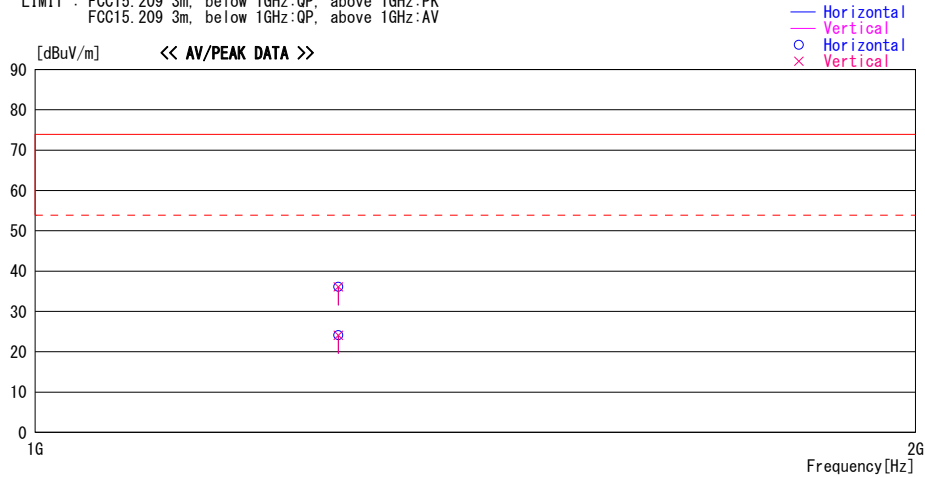
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No. 4 Semi Anechoic Chamber  
Date : 2012/05/25

Report No. : 32GE0120-HO-01  
Power : DC 12.0V  
Temp. / Humi. : 23deg. C / 56% RH  
Engineer : Motoya Imura

Mode / Remarks : RF Receiving mode

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK  
FCC15.209 3m, below 1GHz:QP, above 1GHz:AV



| Frequency<br>[MHz] | Reading<br>[dBuV] | DET | Antenna          |                       | Level<br>[dBuV/m] | Angle<br>[Deg] | Height<br>[cm] | Polar. | Limit    |      | Comment |
|--------------------|-------------------|-----|------------------|-----------------------|-------------------|----------------|----------------|--------|----------|------|---------|
|                    |                   |     | Factor<br>[dB/m] | Loss&<br>Gain<br>[dB] |                   |                |                |        | [dBuV/m] | [dB] |         |
| 1269.660           | 43.6              | PK  | 24.7             | -32.2                 | 36.1              | 0              | 100            | Hori.  | 73.9     | 37.8 | NS      |
| 1269.660           | 43.6              | PK  | 24.7             | -32.2                 | 36.1              | 0              | 100            | Vert.  | 73.9     | 37.8 | NS      |
| 1269.660           | 31.6              | AV  | 24.7             | -32.2                 | 24.1              | 0              | 100            | Hori.  | 53.9     | 29.8 | NS      |
| 1269.660           | 31.6              | AV  | 24.7             | -32.2                 | 24.1              | 0              | 100            | Vert.  | 53.9     | 29.8 | 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<br>* 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                       |
| 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                       |
| MAEC-04     | Semi Anechoic Chamber(NSA) | TDK              | Semi Anechoic Chamber 3m | DA-10005    | RE        | 2012/02/29 * 12                       |
| MOS-15      | Thermo-Hygrometer          | Custom           | CTH-180                  | -           | RE        | 2012/02/06 * 12                       |
| MJM-07      | Measure                    | PROMART          | SEN1955                  | -           | RE        | -                                     |
| MSA-05      | Spectrum Analyzer          | Advantest        | R3273                    | 160400285   | RE        | 2011/11/23 * 12                       |
| MHA-21      | Horn Antenna 1-18GHz       | Schwarzbeck      | BBHA9120D                | 9120D-557   | RE        | 2011/08/11 * 12                       |
| MCC-114     | Microwave Cable 1G-26.5GHz | Suhner           | SUCOFLEX104              | 290212/4    | RE        |                                       |
| MPA-11      | MicroWave System Amplifier | Agilent          | 83017A                   | MY39500779  | RE        | 2012/03/29 * 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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