



# RADIO TEST REPORT


Test Report No. : 10116173H-A-R2

**Applicant** : OMRON Automotive Electronics Co. Ltd.  
**Type of Equipment** : ECU  
**Model No.** : GGM-M007  
**FCC ID** : OUCGGM-M007  
**Test regulation** : FCC Part 15 Subpart C: 2013  
**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 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 10116173H-A-R1. 10116173H-A-R1 is replaced with this report.

**Date of test:** December 4 to 27, 2013

**Representative test engineer:**

  
Masatoshi Nishiguchi  
Engineer of WiSE Japan,  
UL Verification Service

**Approved by:**

  
Masanori Nishiyama  
Manager 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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## **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 : ECU  
Model No. : GGM-M007  
Serial No. : Refer to Section 4, Clause 4.2  
Rating : DC12.0V  
Receipt Date of Sample : November 28, 2013  
Country of Mass-production : China  
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-M007 (referred to as the EUT in this report) is the ECU.

KOS consists of LF antenna for transmission, UHF receiver, Base station (transmitting and receiving device for communication with a transponder), and FOB slot with coil antenna for transmission and reception.

KOS is a system to lock/unlock a door/trunk by pressing Lock/Unlock switch on each door (door entry function), and start up the engine without using an existing mechanical key (engine starter function), while holding the registered keyless operation key (hereafter referred to as FOB) in 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 the engine by pressing a button of a separate transmitter (remote control engine starter) , TPMS function which monitors the air pressure of a tire are also installed.

### **General Specification**

Clock frequency : 16.00MHz (CPU)  
Battery : Car Battery (DC 12V)  
Operating Voltage : DC 12V  
Operating Temperature : -40 deg. C to +85 deg. C

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

### **Immobilizer system function**

Equipment Type : Transceiver  
Frequency of Operation : 125kHz  
Type of Modulation : BPLM  
Mode of Operation : Simplex  
Antenna Type : Coil Antenna  
Method of Frequency Generation : Ceramic

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**Smart System: LF Transmitting function**

Equipment Type : Transmitter  
Frequency of Operation : 125kHz  
Mode of Operation : Simplex  
Antenna Type : Ferrite Antenna  
Method of Frequency Generation : CPU Timer

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

Type of Receiver : Super Heterodyne  
Receiving Frequency : 315MHz  
Oscillator Frequency : 21.948717MHz  
Local Oscillator Frequency : 314.726MHz  
Intermediate Frequency : 274kHz  
Antenna Type : S type antenna  
Method of Frequency Generation : Crystal  
Receiving Bandwidth : 200kHz

\* RF Receiving function was tested according to FCC Part 15 Subpart B standard.  
Please see UL Japan, Inc. Test Report No. 10116173H-C.

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

### **3.1 Test Specification**

Test Specification : FCC Part 15 Subpart C: 2013, final revised on September 30, 2013 and effective October 30, 2013

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

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

The EUT is a battery-operated device and test was performed with the full-charged battery. Therefore, this EUT complies with the requirement.

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

It is impossible for end users to replace the antenna, because the antenna is mounted inside of the vehicle. Therefore, the equipment complies with the antenna requirement of Section 15.203.

### **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	8.1dB 0.12500MHz 0 deg., PK with Duty factor (AS Antenna)	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	12.8dB 189.999MHz, QP, Vertical (T/G Antenna)	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.

\*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.

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### 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.

### 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	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	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	-	-	8.8 x 4.6 x 2.8m	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.



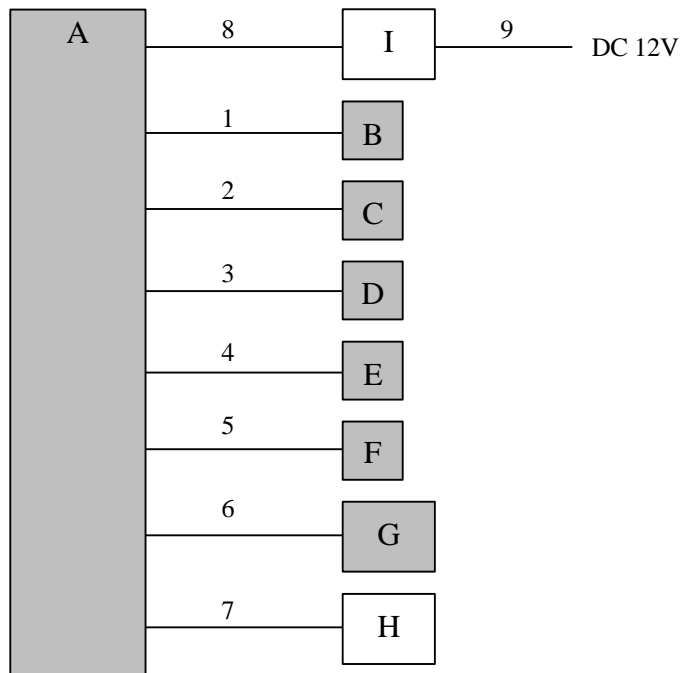
## **SECTION 4: Operation of E.U.T. during testing**

### **4.1 Operating Modes**

The mode is used: Transmitting mode (Tx) 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.

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**Description of EUT and Support equipment**

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	ECU	GGM-M007	00040	OMRON Automotive Electronics Co. Ltd.	EUT
B	LF antenna as "Dr"	G8D-841M-ANT	K999061	OMRON Automotive Electronics Co. Ltd.	EUT
C	LF antenna as "As"	G8D-841M-ANT	K999033	OMRON Automotive Electronics Co. Ltd.	EUT
D	LF antenna as "InF"	G8D-841M-ANT	K999043	OMRON Automotive Electronics Co. Ltd.	EUT
E	LF antenna as "InR"	G8D-841M-ANT	K999023	OMRON Automotive Electronics Co. Ltd.	EUT
F	LF antenna as "T/G"	G8D-841M-ANT	K999013	OMRON Automotive Electronics Co. Ltd.	EUT
G	KEYLESS OPERATION KEY BOX	C8Z-F116M	090915	OMRON Automotive Electronics Co. Ltd.	EUT
H	ENGINE START SWITCH	C8N-B100M	186226	OMRON Automotive Electronics Co. Ltd.	-
I	Switch Board	-	-	OMRON Automotive Electronics Co. Ltd.	-

**List of cables used**

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna Cable	1.7	Unshielded	Unshielded	-
2	Signal Cable	1.7	Unshielded	Unshielded	-
3	Signal Cable	1.7	Unshielded	Unshielded	-
4	Signal Cable	1.7	Unshielded	Unshielded	-
5	Signal Cable	1.7	Unshielded	Unshielded	-
6	Signal Cable	1.7	Unshielded	Unshielded	-
7	Signal Cable	1.7	Unshielded	Unshielded	-
8	Signal Cable	1.7	Unshielded	Unshielded	-
9	DC Cable	2.0	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 1 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 for vertical polarization (antenna angle: 0deg., 45deg., 90deg., 135 deg., and 180 deg) and horizontal polarization were confirmed at pre check..

As a result, the test was performed with the worst 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 PK with Duty factor detector.

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 *1)	200Hz *1)	9kHz *1)	9kHz *2)	120kHz

\*1) Distance Factor:  $40 \times \log(3m/300m) = -80dB$

\*2) Distance Factor:  $40 \times \log(3m/30m) = -40dB$

- The carrier level was 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 mechanical key is inserted or not. The worst case was confirmed with and without mechanical key, as a result, the test without mechanical key was the worst case. Therefore the test without mechanical key was performed only.

**Test data** : **APPENDIX 1**

**Test result** : **Pass**

Date: December 4, 2013  
December 8, 2013

Test engineer: Masatoshi Nishiguchi  
Shinya Watanabe

**UL Japan, Inc.**

**Head Office EMC Lab.**

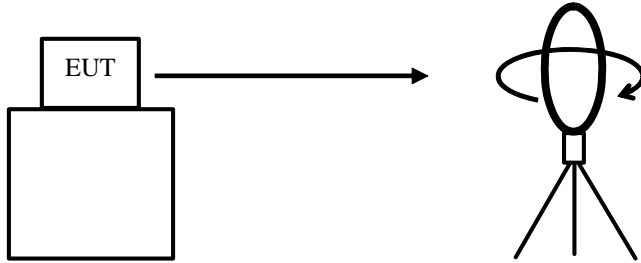
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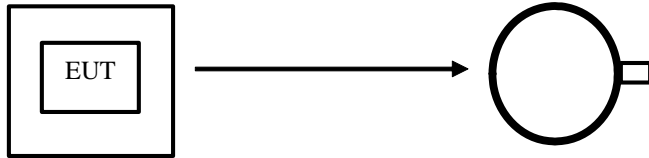
**Figure 1: Direction of the Loop Antenna**

*Side View (Vertical)*



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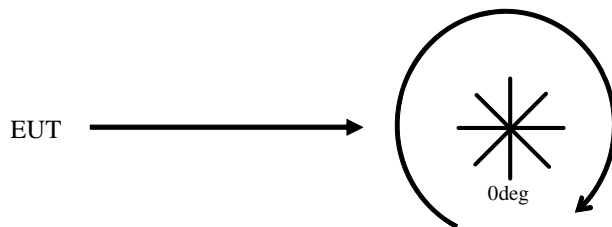
*Top View (Horizontal)*



Antenna was not rotated.

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*Top View (Vertical)*



Front side: 0 deg.  
Forward direction: clockwise

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

### **Test Procedure**

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

#### **[LF Antenna]**

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	3kHz	Auto	Peak	Max Hold	Spectrum Analyzer

#### **[Immobilizer]**

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	10kHz	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 (Single)	Sample	Max Hold	Spectrum Analyzer

Test data : APPENDIX 1

Test result : Pass

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**APPENDIX 1: Data of EMI test**

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

LF antenna as "Dr"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "Dr"

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.3	20.0	-73.9	32.1	-	17.3	45.6	28.3	Fundamental
0	0.25000	PK	60.9	19.9	-73.9	32.1	-	-25.2	39.6	64.8	
0	0.37500	PK	55.5	19.8	-73.9	32.1	-	-30.7	36.1	66.8	
0	0.50000	QP	33.2	19.8	-33.8	32.2	-	-13.0	33.6	46.6	
0	0.62500	QP	45.3	19.8	-33.8	32.1	-	-0.8	31.7	32.5	
0	0.75000	QP	32.2	19.8	-33.8	32.1	-	-13.9	30.1	44.0	
0	0.87500	QP	40.1	19.8	-33.8	32.1	-	-6.0	28.7	34.7	
0	1.00000	QP	31.6	19.8	-33.8	32.0	-	-14.4	27.6	42.0	
0	1.12500	QP	36.8	19.8	-33.8	32.0	-	-9.2	26.5	35.7	
0	1.25000	QP	31.4	19.8	-33.8	32.0	-	-14.6	25.6	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.3	20.0	-73.9	32.1	0.0	17.3	25.6	8.3	Fundamental
0	0.25000	PK	60.9	19.9	-73.9	32.1	0.0	-25.2	19.6	44.8	
0	0.37500	PK	55.5	19.8	-73.9	32.1	0.0	-30.7	16.1	46.8	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.3	20.0	6.1	32.1	-	97.3	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

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

LF antenna as "As"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "As"

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.5	20.0	-73.9	32.1	-	17.5	45.6	28.1	Fundamental
0	0.25000	PK	61.5	19.9	-73.9	32.1	-	-24.6	39.6	64.2	
0	0.37500	PK	52.6	19.8	-73.9	32.1	-	-33.6	36.1	69.7	
0	0.50000	QP	34.3	19.8	-33.8	32.2	-	-11.9	33.6	45.5	
0	0.62500	QP	45.7	19.8	-33.8	32.1	-	-0.4	31.7	32.1	
0	0.75000	QP	32.2	19.8	-33.8	32.1	-	-13.9	30.1	44.0	
0	0.87500	QP	40.2	19.8	-33.8	32.1	-	-5.9	28.7	34.6	
0	1.00000	QP	31.6	19.8	-33.8	32.0	-	-14.4	27.6	42.0	
0	1.12500	QP	37.1	19.8	-33.8	32.0	-	-8.9	26.5	35.4	
0	1.25000	QP	31.4	19.8	-33.8	32.0	-	-14.6	25.6	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.5	20.0	-73.9	32.1	0.0	17.5	25.6	8.1	Fundamental
0	0.25000	PK	61.5	19.9	-73.9	32.1	0.0	-24.6	19.6	44.2	
0	0.37500	PK	52.6	19.8	-73.9	32.1	0.0	-33.6	16.1	49.7	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.5	20.0	6.1	32.1	-	97.5	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

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**Radiated Emission below 30MHz (Fundamental and Spurious Emission)**  
LF antenna as "InF"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "InF"

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	-73.9	32.1	-	17.4	45.6	28.2	Fundamental
0	0.25000	PK	61.8	19.9	-73.9	32.1	-	-24.3	39.6	63.9	
0	0.37500	PK	56.0	19.8	-73.9	32.1	-	-30.2	36.1	66.3	
0	0.50000	QP	33.5	19.8	-33.8	32.2	-	-12.7	33.6	46.3	
0	0.62500	QP	45.6	19.8	-33.8	32.1	-	-0.5	31.7	32.2	
0	0.75000	QP	32.2	19.8	-33.8	32.1	-	-13.9	30.1	44.0	
0	0.87500	QP	40.2	19.8	-33.8	32.1	-	-5.9	28.7	34.6	
0	1.00000	QP	31.7	19.8	-33.8	32.0	-	-14.3	27.6	41.9	
0	1.12500	QP	37.1	19.8	-33.8	32.0	-	-8.9	26.5	35.4	
0	1.25000	QP	31.4	19.8	-33.8	32.0	-	-14.6	25.6	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	-73.9	32.1	0.0	17.4	25.6	8.2	Fundamental
0	0.25000	PK	61.8	19.9	-73.9	32.1	0.0	-24.3	19.6	43.9	
0	0.37500	PK	56.0	19.8	-73.9	32.1	0.0	-30.2	16.1	46.3	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	103.4	20.0	6.1	32.1	-	97.4	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

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**Radiated Emission below 30MHz (Fundamental and Spurious Emission)**  
LF antenna as "InR"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "InR"

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	102.6	20.0	-73.9	32.1	-	16.6	45.6	29.0	Fundamental
0	0.25000	PK	60.9	19.9	-73.9	32.1	-	-25.2	39.6	64.8	
0	0.37500	PK	52.3	19.8	-73.9	32.1	-	-33.9	36.1	70.0	
0	0.50000	QP	33.9	19.8	-33.8	32.2	-	-12.3	33.6	45.9	
0	0.62500	QP	40.3	19.8	-33.8	32.1	-	-5.8	31.7	37.5	
0	0.75000	QP	32.7	19.8	-33.8	32.1	-	-13.4	30.1	43.5	
0	0.87500	QP	36.3	19.8	-33.8	32.1	-	-9.8	28.7	38.5	
0	1.00000	QP	31.9	19.8	-33.8	32.0	-	-14.1	27.6	41.7	
0	1.12500	QP	34.2	19.8	-33.8	32.0	-	-11.8	26.5	38.3	
0	1.25000	QP	31.4	19.8	-33.8	32.0	-	-14.6	25.6	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	102.6	20.0	-73.9	32.1	0.0	16.6	25.6	9.0	Fundamental
0	0.25000	PK	60.9	19.9	-73.9	32.1	0.0	-25.2	19.6	44.8	
0	0.37500	PK	52.3	19.8	-73.9	32.1	0.0	-33.9	16.1	50.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	102.6	20.0	6.1	32.1	-	96.6	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

**Radiated Emission below 30MHz (Fundamental and Spurious Emission)**  
LF antenna as "T/G"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "T/G"

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	99.1	20.0	-73.9	32.1	-	13.1	45.6	32.5	Fundamental
0	0.25000	PK	58.0	19.9	-73.9	32.1	-	-28.1	39.6	67.7	
0	0.37500	PK	50.4	19.8	-73.9	32.1	-	-35.8	36.1	71.9	
0	0.50000	QP	34.0	19.8	-33.8	32.2	-	-12.2	33.6	45.8	
0	0.62500	QP	38.4	19.8	-33.8	32.1	-	-7.7	31.7	39.4	
0	0.75000	QP	32.3	19.8	-33.8	32.1	-	-13.8	30.1	43.9	
0	0.87500	QP	35.1	19.8	-33.8	32.1	-	-11.0	28.7	39.7	
0	1.00000	QP	31.7	19.8	-33.8	32.0	-	-14.3	27.6	41.9	
0	1.12500	QP	33.2	19.8	-33.8	32.0	-	-12.8	26.5	39.3	
0	1.25000	QP	31.4	19.8	-33.8	32.0	-	-14.6	25.6	40.2	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	99.1	20.0	-73.9	32.1	0.0	13.1	25.6	12.5	Fundamental
0	0.25000	PK	58.0	19.9	-73.9	32.1	0.0	-28.1	19.6	47.7	
0	0.37500	PK	50.4	19.8	-73.9	32.1	0.0	-35.8	16.1	51.9	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	99.1	20.0	6.1	32.1	-	93.1	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

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

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/04/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz , Immobilizer

**PK or QP**

Ant Deg [deg] or Polarity [Hori/Vert]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	91.2	20.0	-74.0	32.1	-	5.1	45.6	40.5	Fundamental
0	0.25000	PK	71.3	19.9	-73.9	32.1	-	-14.8	39.6	54.4	
0	0.37500	PK	57.7	19.8	-73.9	32.1	-	-28.5	36.1	64.6	
0	0.50000	QP	34.0	19.8	-33.9	32.2	-	-12.3	33.6	45.9	
0	0.62500	QP	46.2	19.8	-33.8	32.1	-	0.1	31.7	31.6	
0	0.75000	QP	40.5	19.8	-33.8	32.1	-	-5.6	30.1	35.7	
0	0.87500	QP	41.0	19.8	-33.8	32.1	-	-5.1	28.7	33.8	
0	1.00000	QP	32.9	19.8	-33.8	32.0	-	-13.1	27.6	40.7	
0	1.12500	QP	37.9	19.8	-33.8	32.0	-	-8.1	26.5	34.6	
0	1.25000	QP	34.5	19.8	-33.7	32.0	-	-11.4	25.6	37.0	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier)

**PK with Duty factor**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	91.2	20.0	-74.0	32.1	0.0	5.1	25.6	20.5	Fundamental
0	0.25000	PK	71.3	19.9	-73.9	32.1	0.0	-14.8	19.6	34.4	
0	0.37500	PK	57.7	19.8	-73.9	32.1	0.0	-28.5	16.1	44.6	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter+D.Factor) - Gain(Amplifier) + Duty factor \*

\* Since the peak emission result satisfied the average limit, duty factor was omitted.

**Result of the fundamental emission at 3m without Distance factor**

**PK or QP**

Ant Deg [deg]	Frequency [MHz]	Detector	Reading [dBuV]	Ant Factor [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
0	0.12500	PK	91.2	20.0	6.0	32.1	-	85.1	-	-	Fundamental

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amplifier)

\* All spurious emissions lower than this result.

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## Radiated Emission above 30MHz (Spurious Emission)

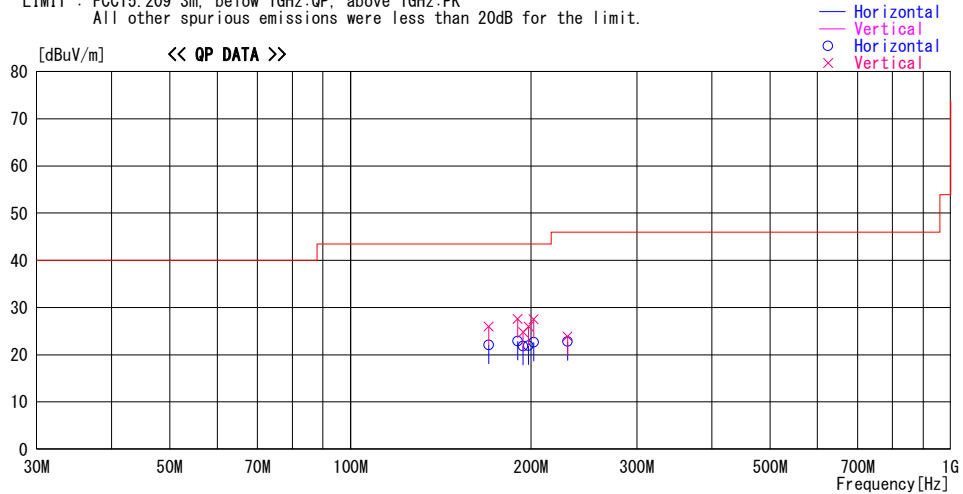
### DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Date : 2013/12/27

Report No. : 10116173H  
 Temp./Humi. : 24deg. C / 33% RH  
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 125kHz LF antenna as "Dr" Worst Axis

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]							
169.998	26.4	QP	15.7	-20.0	22.1	145	171	Hori.	43.5	21.4	
169.998	30.3	QP	15.7	-20.0	26.0	310	100	Vert.	43.5	17.5	
189.998	26.5	QP	16.2	-19.8	22.9	55	172	Hori.	43.5	20.6	
189.998	31.2	QP	16.2	-19.8	27.6	45	100	Vert.	43.5	15.9	
193.998	25.2	QP	16.3	-19.7	21.8	60	133	Hori.	43.5	21.7	
193.998	28.2	QP	16.3	-19.7	24.8	39	100	Vert.	43.5	18.7	
197.998	25.2	QP	16.4	-19.7	21.9	71	155	Hori.	43.5	21.6	
197.998	29.3	QP	16.4	-19.7	26.0	0	100	Vert.	43.5	17.5	
201.998	25.7	QP	16.5	-19.6	22.6	45	172	Hori.	43.5	20.9	
201.998	30.6	QP	16.5	-19.6	27.5	0	100	Vert.	43.5	16.0	
229.988	25.3	QP	16.8	-19.3	22.8	130	123	Hori.	46.0	23.2	
229.988	26.4	QP	16.8	-19.3	23.9	36	100	Vert.	46.0	22.1	

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.

**Radiated Emission above 30MHz (Spurious Emission)**  
LF antenna as "As"

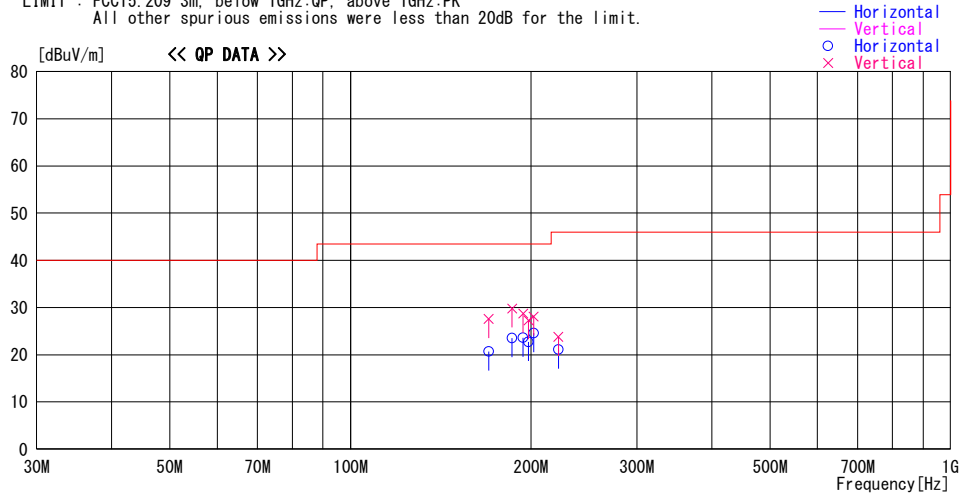
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2013/12/27

Report No. : 10116173H  
Temp./Humi. : 24deg. C / 33% RH  
Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 125kHz LF antenna as "As" Worst Axis

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]							
169.998	31.9	QP	15.7	-20.0	27.6	78	100	Vert.	43.5	15.9	
169.998	25.0	QP	15.7	-20.0	20.7	129	177	Hori.	43.5	22.8	
185.999	33.4	QP	16.2	-19.8	29.8	70	100	Vert.	43.5	13.7	
185.999	27.1	QP	16.2	-19.8	23.5	39	174	Hori.	43.5	20.0	
193.998	27.0	QP	16.3	-19.7	23.6	53	153	Hori.	43.5	19.9	
193.998	32.1	QP	16.3	-19.7	28.7	15	100	Vert.	43.5	14.8	
197.998	26.0	QP	16.4	-19.7	22.7	142	170	Hori.	43.5	20.8	
197.998	30.6	QP	16.4	-19.7	27.3	7	100	Vert.	43.5	16.2	
201.998	27.7	QP	16.5	-19.6	24.6	138	180	Hori.	43.5	18.9	
201.998	31.2	QP	16.5	-19.6	28.1	0	100	Vert.	43.5	15.4	
221.998	23.8	QP	16.7	-19.4	21.1	144	152	Hori.	46.0	24.9	
221.998	26.5	QP	16.7	-19.4	23.8	40	100	Vert.	46.0	22.2	

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.

**Radiated Emission above 30MHz (Spurious Emission)**  
LF antenna as "InF"

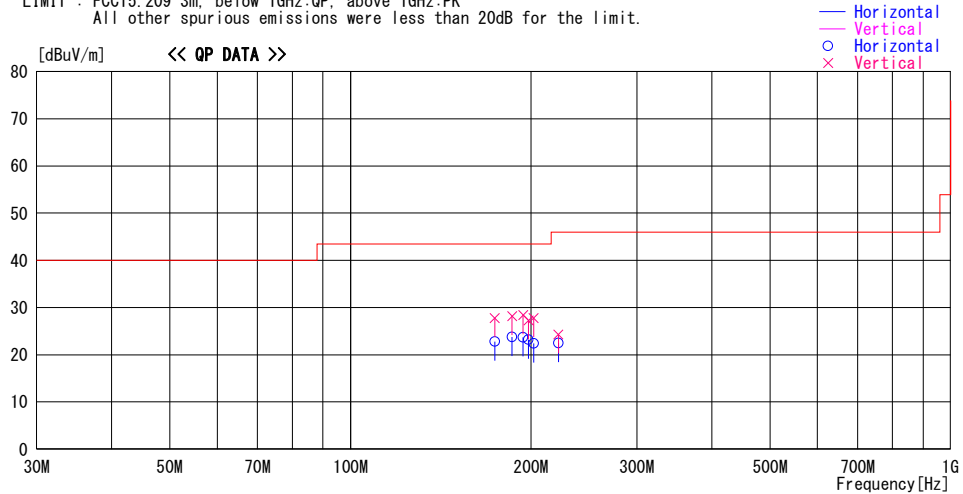
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2013/12/27

Report No. : 10116173H  
Temp./Humi. : 24deg. C / 33% RH  
Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 125kHz LF antenna as "InF" Worst Axis

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]							
173.998	32.0	QP	15.8	-20.0	27.8	260	100	Vert.	43.5	15.7	
173.998	27.0	QP	15.8	-20.0	22.8	50	170	Hori.	43.5	20.7	
185.999	31.8	QP	16.2	-19.8	28.2	150	100	Vert.	43.5	15.3	
185.999	27.4	QP	16.2	-19.8	23.8	49	174	Hori.	43.5	19.7	
193.998	27.1	QP	16.3	-19.7	23.7	49	158	Hori.	43.5	19.8	
193.998	31.8	QP	16.3	-19.7	28.4	15	100	Vert.	43.5	15.1	
197.998	26.5	QP	16.4	-19.7	23.2	145	169	Hori.	43.5	20.3	
197.998	30.6	QP	16.4	-19.7	27.3	5	100	Vert.	43.5	16.2	
201.998	25.5	QP	16.5	-19.6	22.4	138	205	Hori.	43.5	21.1	
201.998	30.9	QP	16.5	-19.6	27.8	0	100	Vert.	43.5	15.7	
221.998	25.2	QP	16.7	-19.4	22.5	149	155	Hori.	46.0	23.5	
221.998	27.0	QP	16.7	-19.4	24.3	0	100	Vert.	46.0	21.7	

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.

**Radiated Emission above 30MHz (Spurious Emission)**  
 LF antenna as "InR"

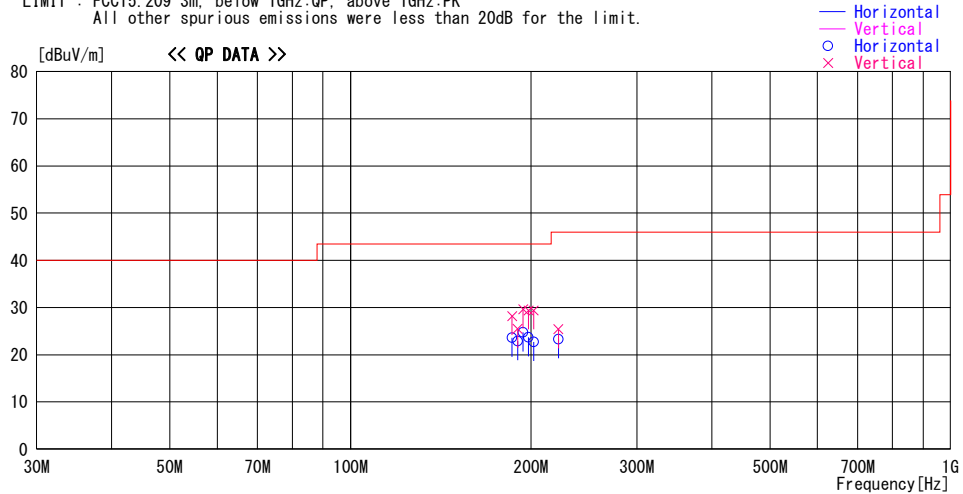
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
 Date : 2013/12/27

Report No. : 10116173H  
 Temp./Humi. : 24deg. C / 33% RH  
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 125kHz LF antenna as "InR" Worst Axis

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]							
185.999	27.2	QP	16.2	-19.8	23.6	50	170	Hori.	43.5	19.9	
185.999	31.8	QP	16.2	-19.8	28.2	152	100	Vert.	43.5	15.3	
189.999	26.5	QP	16.2	-19.8	22.9	51	172	Hori.	43.5	20.6	
189.999	29.1	QP	16.2	-19.8	25.5	153	100	Vert.	43.5	18.0	
193.998	28.1	QP	16.3	-19.7	24.7	50	158	Hori.	43.5	18.8	
193.998	33.0	QP	16.3	-19.7	29.6	20	100	Vert.	43.5	13.9	
197.998	27.0	QP	16.4	-19.7	23.7	147	170	Hori.	43.5	19.8	
197.998	32.7	QP	16.4	-19.7	29.4	9	100	Vert.	43.5	14.1	
201.998	25.8	QP	16.5	-19.6	22.7	139	200	Hori.	43.5	20.8	
201.998	32.5	QP	16.5	-19.6	29.4	0	100	Vert.	43.5	14.1	
221.998	26.0	QP	16.7	-19.4	23.3	152	152	Hori.	46.0	22.7	
221.998	28.1	QP	16.7	-19.4	25.4	0	100	Vert.	46.0	20.6	

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.

**Radiated Emission above 30MHz (Spurious Emission)**  
LF antenna as "T/G"

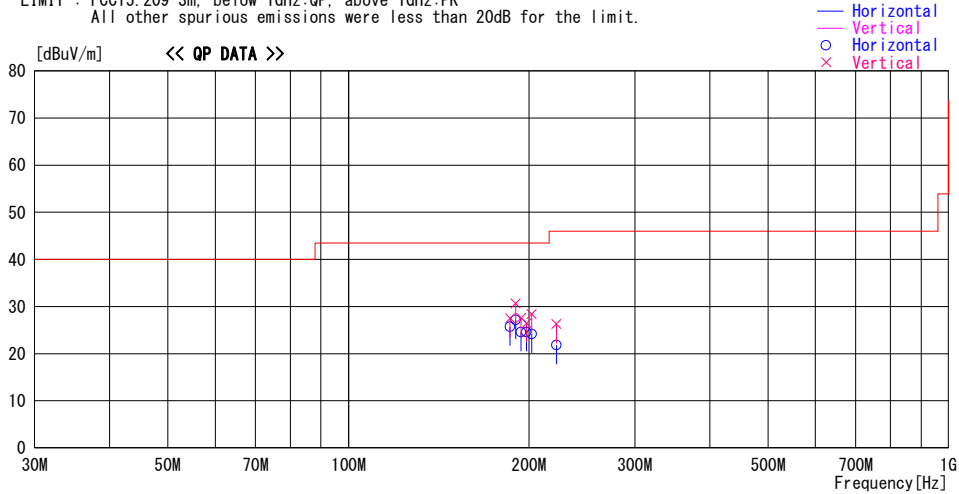
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2013/12/27

Report No. : 10116173H  
Temp./Humi. : 24deg. C / 33% RH  
Engineer : Masatoshi Nishiguchi

Mode / Remarks : Tx 125kHz LF antenna as "T/G" Worst Axis

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	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
185.999	29.3	QP	16.2	-19.8	25.7	50	177	Hori.	43.5	17.8	
185.999	31.1	QP	16.2	-19.8	27.5	153	100	Vert.	43.5	16.0	
189.999	30.8	QP	16.2	-19.8	27.2	50	175	Hori.	43.5	16.3	
189.999	34.3	QP	16.2	-19.8	30.7	152	100	Vert.	43.5	12.8	
193.998	28.0	QP	16.3	-19.7	24.6	44	161	Hori.	43.5	18.9	
193.998	31.0	QP	16.3	-19.7	27.6	19	100	Vert.	43.5	15.9	
197.998	27.9	QP	16.4	-19.7	24.6	142	173	Hori.	43.5	18.9	
197.998	29.8	QP	16.4	-19.7	26.5	11	100	Vert.	43.5	17.0	
201.998	27.3	QP	16.5	-19.6	24.2	137	202	Hori.	43.5	19.3	
201.998	31.5	QP	16.5	-19.6	28.4	0	100	Vert.	43.5	15.1	
221.998	24.5	QP	16.7	-19.4	21.8	152	151	Hori.	46.0	24.2	
221.998	29.0	QP	16.7	-19.4	26.3	0	100	Vert.	46.0	19.7	

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.



**Radiated Emission above 30MHz (Spurious Emission)**  
**Immobilizer**

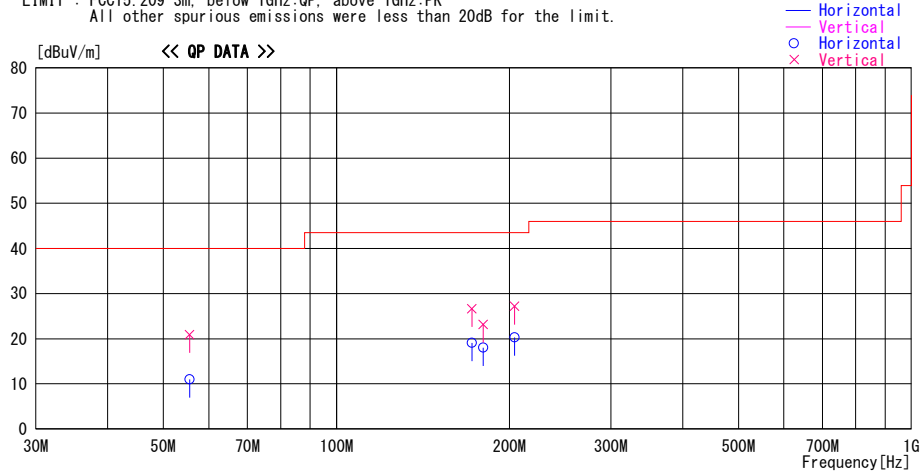
**DATA OF RADIATED EMISSION TEST**

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Date : 2013/12/08

Report No. : 10116173H  
Temp./Humi. : 24deg. C / 33% RH  
Engineer : Shinya Watanabe

Mode / Remarks : Tx 125kHz Immobilizer Worst Axis

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	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
55.515	23.6	QP	8.9	-21.5	11.0	0	100	Hori.	40.0	29.0	
55.515	33.5	QP	8.9	-21.5	20.9	261	100	Vert.	40.0	19.1	
172.020	23.3	QP	15.8	-20.0	19.1	301	100	Hori.	43.5	24.4	
172.020	30.9	QP	15.8	-20.0	26.7	89	100	Vert.	43.5	16.8	
180.000	22.0	QP	16.0	-20.0	18.0	0	100	Hori.	43.5	25.5	
180.000	27.2	QP	16.0	-20.0	23.2	242	100	Vert.	43.5	20.3	
204.005	23.4	QP	16.5	-19.6	20.3	194	137	Hori.	43.5	23.2	
204.005	30.3	QP	16.5	-19.6	27.2	10	100	Vert.	43.5	16.3	

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.

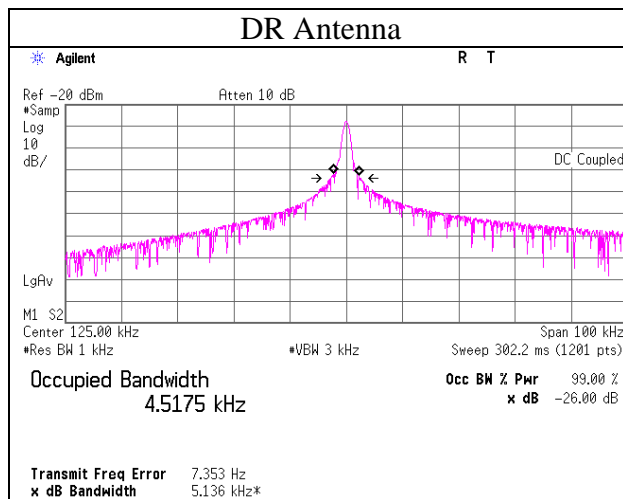
**-26dB Bandwidth and 99% Occupied Bandwidth**

LF antenna as "Dr"

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. 10116173H  
Date 12/26/2013  
Temperature/ Humidity 23 deg. C / 32% RH  
Engineer Masatoshi Nishiguchi  
Mode Tx 125kHz, LF antenna as "Dr"

-26dB Bandwidth [kHz]
5.136

99% Occupied Bandwidth [kHz]
4.5175



**UL Japan, Inc.**

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Telephone : +81 596 24 8999

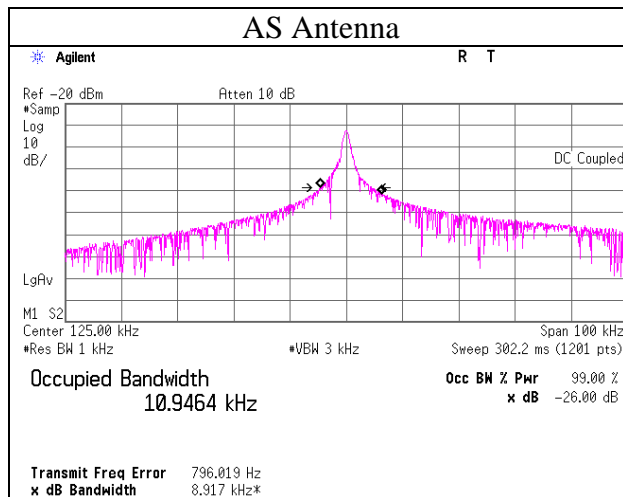
Facsimile : +81 596 24 8124

**-26dB Bandwidth and 99% Occupied Bandwidth**  
LF antenna as "As"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "As"

-26dB Bandwidth [kHz]
8.917

99% Occupied Bandwidth [kHz]
10.9464

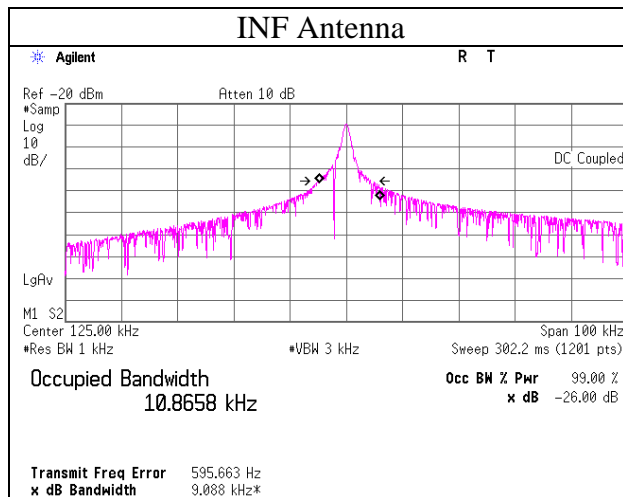


**-26dB Bandwidth and 99% Occupied Bandwidth**  
LF antenna as "InF"

Test place : Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/26/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, LF antenna as "InF"

-26dB Bandwidth [kHz]
9.088

99% Occupied Bandwidth [kHz]
10.8658

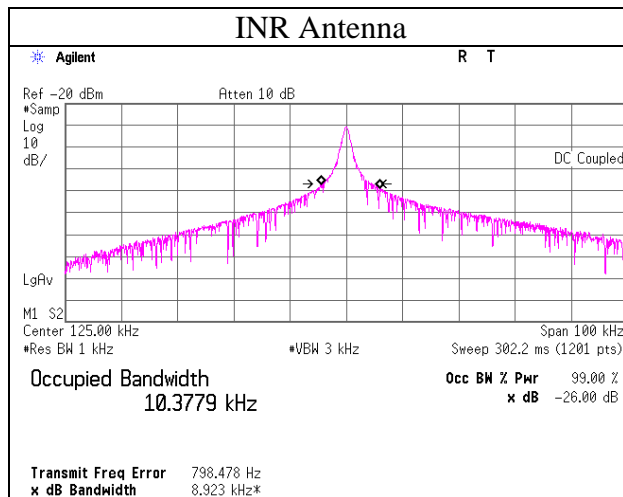


**-26dB Bandwidth and 99% Occupied Bandwidth**  
LF antenna as "InR"

Test place Head Office EMC Lab. No.4 Semi Anechoic Chamber  
Order No. 10116173H  
Date 12/26/2013  
Temperature/ Humidity 23 deg. C / 32% RH  
Engineer Masatoshi Nishiguchi  
Mode Tx 125kHz, LF antenna as "InR"

-26dB Bandwidth [kHz]
8.923

99% Occupied Bandwidth [kHz]
10.3779

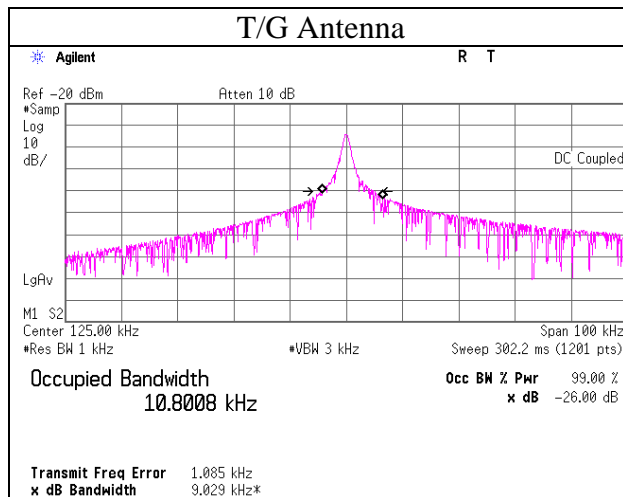


**-26dB Bandwidth and 99% Occupied Bandwidth**  
 LF antenna as "T/G"

Test place	Head Office EMC Lab. No.4 Semi Anechoic Chamber
Order No.	10116173H
Date	12/26/2013
Temperature/ Humidity	23 deg. C / 32% RH
Engineer	Masatoshi Nishiguchi
Mode	Tx 125kHz, LF antenna as "T/G"

-26dB Bandwidth
[kHz]
9.029

99% Occupied Bandwidth
[kHz]
10.8008

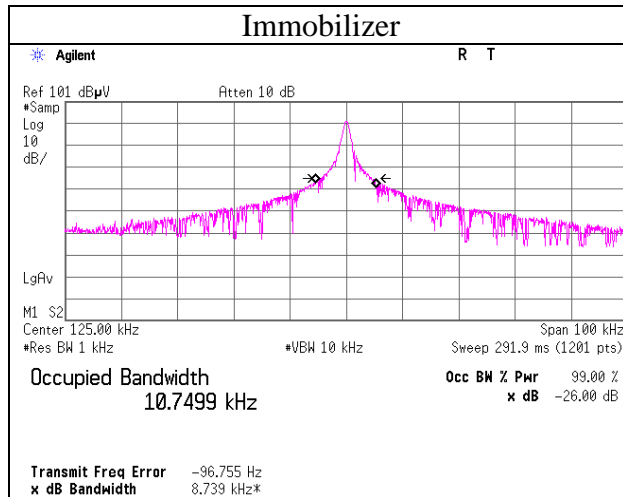


**-26dB Bandwidth and 99% Occupied Bandwidth**  
Immobilizer

Test place : Head Office EMC Lab. No.2 Semi Anechoic Chamber  
Order No. : 10116173H  
Date : 12/04/2013  
Temperature/ Humidity : 23 deg. C / 32% RH  
Engineer : Masatoshi Nishiguchi  
Mode : Tx 125kHz, Immobilizer

-26dB Bandwidth [kHz]
8.739

99% Occupied Bandwidth [kHz]
10.7499



## **APPENDIX 2: Test instruments**

### **EMI test equipment**

<b>Control No.</b>	<b>Instrument</b>	<b>Manufacturer</b>	<b>Model No</b>	<b>Serial No</b>	<b>Test Item</b>	<b>Calibration Date * Interval(month)</b>
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2013/06/30 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2013/02/26 * 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	2013/11/15 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2013/06/11 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2013/10/30 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2013/02/06 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2013/07/22 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2013/03/12 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2013/10/13 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2013/10/13 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2013/11/26 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2013/02/06 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2013/09/12 * 12
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2013/11/12 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141(5m)/421-010(1m)/sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	RE	2013/07/23 * 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: Spurious emission**

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