



EMI TEST REPORT


Test Report No. : 10116173H-C-R1

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : ECU
Model No. : GGM-M007
FCC ID : OUCGGM-M007
Test regulation : **FCC Part 15 Subpart B: 2013**
RSS-Gen Issue 3: 2010 +A1: January 2012
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 the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This report is a revised version of 10116173H-C. 10116173H-C is replaced with this report.

Date of test: December 17, 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/mar1/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).

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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

* Immobilizer system function was tested according to FCC Part 15 Subpart C standard.
Please see UL Japan, Inc. Test Report No. 10116173H-A-R1 and 10116173H-B-R1.

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

* LF Transmitting function was tested according to FCC Part 15 Subpart C standard.
Please see UL Japan, Inc. Test Report No. 10116173H-A-R1 and 10116173H-B-R1.

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

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: 2013, final revised on September 30, 2013 and effective October 30, 2013

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

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 7. AC powerline conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 7.2.4	IC: RSS-Gen 7.2.4			
Radiated emission	FCC: ANSI C63.4: 2003 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	18.6dB 944.178MHz, QP Horizontal/Vertical	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

3.3 Addition to standard

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	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	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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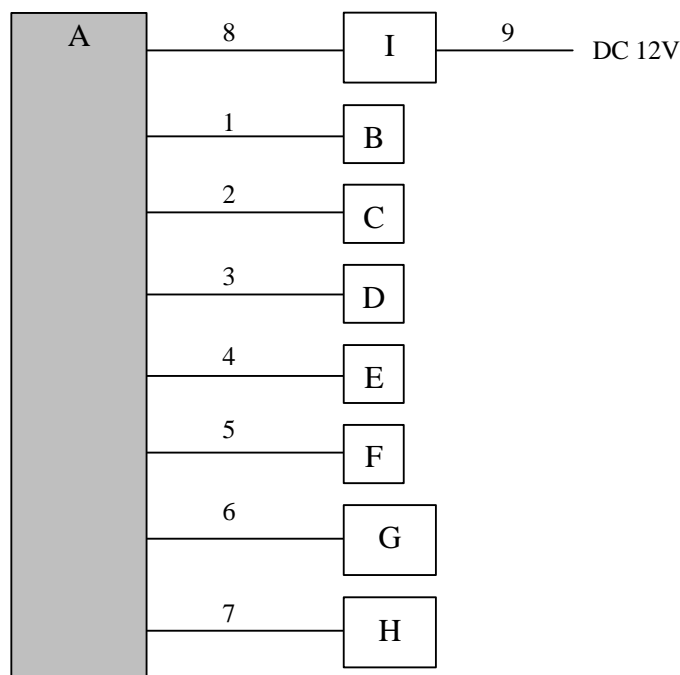
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Test Mode	Remarks
Receiving mode	315MHz.

*The test signal level was confirmed to be sufficient to stabilize the local oscillator of the EUT.

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.	-
C	LF antenna as "As"	G8D-841M-ANT	K999033	OMRON Automotive Electronics Co. Ltd.	-
D	LF antenna as "InF"	G8D-841M-ANT	K999043	OMRON Automotive Electronics Co. Ltd.	-
E	LF antenna as "InR"	G8D-841M-ANT	K999023	OMRON Automotive Electronics Co. Ltd.	-
F	LF antenna as "T/G"	G8D-841M-ANT	K999013	OMRON Automotive Electronics Co. Ltd.	-
G	KEYLESS OPERATION KEY BOX	C8Z-F116M	090915	OMRON Automotive Electronics Co. Ltd.	-
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

5.1 Operating environment

Test place : No.3 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a wooden 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 *1)
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 3MHz AV *2): RBW:1MHz/VBW:10Hz

*1) The Spectrum Analyzer was used in 3dB resolution bandwidth.

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

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

6.5 Test result

Summary of the test results: Pass

Date: December 17, 2013

Test engineer: Masatoshi Nishiguchi

UL Japan, Inc.

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APPENDIX 1: Data of EMI test

Radiated Emission
Below 1GHz

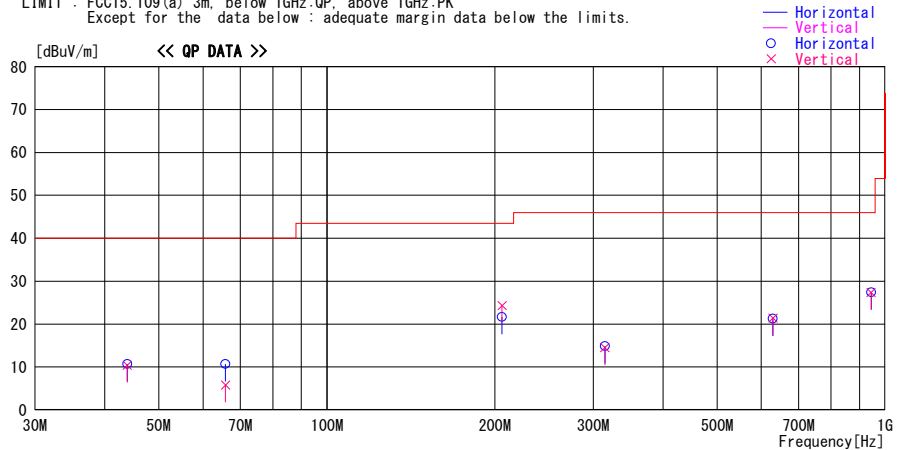
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
Date : 2013/12/17

Report No. : 10116173H
Temp./Humi. : 21deg. C / 30% RH
Engineer : Masatoshi Nishiguchi

Mode / Remarks : Rx 315MHz WorstAxis(Hori:X , Vert:Y)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
314.726	22.2	QP	14.7	-22.0	14.9	359	100	Hori.	46.0	31.1	NS
314.726	21.8	QP	14.7	-22.0	14.5	359	100	Vert.	46.0	31.5	NS
629.452	21.9	QP	19.7	-20.2	21.4	359	100	Vert.	46.0	24.6	NS
629.452	21.8	QP	19.7	-20.2	21.3	348	200	Hori.	46.0	24.7	
944.178	21.3	QP	23.3	-17.2	27.4	359	200	Vert.	46.0	18.6	NS
944.178	21.3	QP	23.3	-17.2	27.4	143	100	Hori.	46.0	18.6	
43.897	22.6	QP	13.0	-24.9	10.7	359	313	Hori.	40.0	29.3	
43.897	22.3	QP	13.0	-24.9	10.4	0	100	Vert.	40.0	29.6	NS
65.846	28.2	QP	7.1	-24.6	10.7	359	331	Hori.	40.0	29.3	
65.846	23.3	QP	7.1	-24.6	5.8	0	100	Vert.	40.0	34.2	NS
205.949	28.0	QP	16.7	-23.0	21.7	43	216	Hori.	43.5	21.8	
205.998	30.6	QP	16.7	-23.0	24.3	183	100	Vert.	43.5	19.2	

* NS: No signal detected

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
 Above 1GHz

DATA OF RADIATED EMISSION TEST

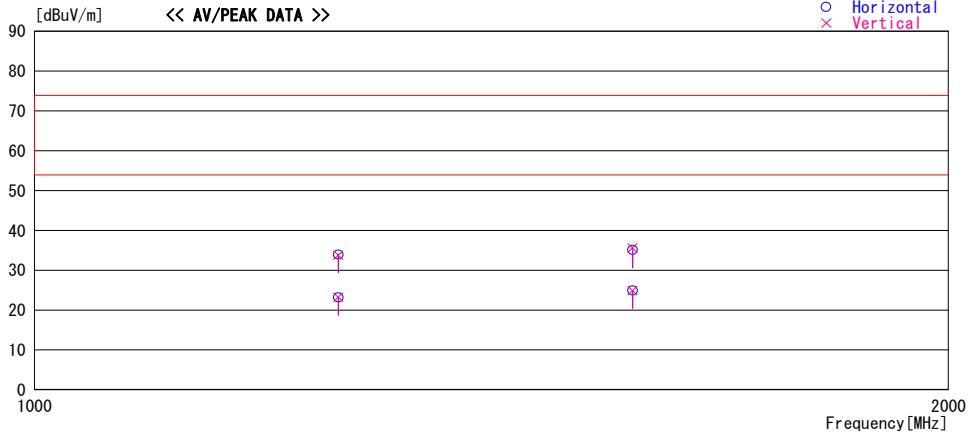
UL Japan, Inc. Head Office EMC Lab. No.3 Semi Anechoic Chamber
 Date : 2013/12/17

Report No. : 10116173H
 Temp./Humi. : 21deg. C / 30% RH
 Engineer : Masatoshi Nishiguchi

Mode / Remarks : Rx 315MHz WorstAxis(Hori:X , Vert:Y)

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

— Horizontal
 — Vertical
 ○ Horizontal
 × Vertical



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain					[dBuV/m]	[dB]	
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1258.904	41.4	PK	24.8	-32.3	33.9	0	100	Hori.	73.9	40.0	NS
1258.904	41.3	PK	24.8	-32.3	33.8	0	100	Vert.	73.9	40.1	NS
1258.904	30.7	AV	24.8	-32.3	23.2	0	100	Vert.	53.9	30.7	NS
1258.904	30.7	AV	24.8	-32.3	23.2	0	100	Hori.	53.9	30.7	NS
1573.630	40.5	PK	25.9	-31.3	35.1	0	100	Hori.	73.9	38.8	NS
1573.630	30.3	AV	25.9	-31.3	24.9	0	100	Vert.	53.9	29.0	NS
1573.630	41.0	PK	25.9	-31.3	35.6	0	100	Vert.	73.9	38.3	NS
1573.630	30.3	AV	25.9	-31.3	24.9	0	100	Hori.	53.9	29.0	NS

* NS: No signal detected

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.

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	-	RE	2013/02/26 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2013/11/08 * 12
MTR-08	Test Receiver	Rohde & Schwarz	ESCI	100767	RE	2013/08/20 * 12
MBA-03	Biconical Antenna	Schwarzbeck	BBHA9106	1915	RE	2013/10/13 * 12
MLA-03	Logperiodic Antenna	Schwarzbeck	USLP9143	174	RE	2013/10/13 * 12
MCC-51	Coaxial cable	UL Japan	-	-	RE	2013/07/23 * 12
MAT-70	Attenuator(6dB)	Agilent	8491A-006	MY52460153	RE	2013/04/05 * 12
MPA-13	Pre Amplifier	SONOMA INSTRUMENT	310	260834	RE	2013/03/12 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2013/05/17 * 12
MCC-133	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336164/4(1m) / 340640(5m)	RE	2013/09/27 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2013/03/12 * 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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