



RADIO TEST REPORT

Test Report No. : 32GE0121-HO-01-B-R1

Applicant : OMRON Automotive Electronics Co. Ltd.
Type of Equipment : Receiver Antenna
Model No. : GHR-M002
FCC ID : OUCGHR-M002
Test regulation : FCC Part 15 Subpart C: 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 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 32GE0121-HO-01-B. 32GE0121-HO-01-B is replaced with this report.

Date of test: May 1 and 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

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CONTENTS	PAGE
SECTION 1: Customer information	3
SECTION 2: Equipment under test (E.U.T.).....	3
SECTION 3: Test specification, procedures & results	4
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated emission (Fundamental and Spurious Emission).....	8
SECTION 6: -26dB Bandwidth.....	10
SECTION 7: 99% Occupied Bandwidth.....	10
APPENDIX 1: Data of EMI test.....	11
Radiated Emission below 30MHz (Fundamental and Spurious Emission)	11
Radiated Emission above 30MHz (Spurious Emission).....	12
-26dB Bandwidth.....	13
99% Occupied Bandwidth.....	14
APPENDIX 2: Test instruments	15
APPENDIX 3: Photographs of test setup	16
Radiated Emission.....	16
Worst Case Position	17

SECTION 1: Customer information

Company Name : OMRON Automotive Electronics Co. Ltd.
Address : 6368 NENJOZAKA OKUSA KOMAKI AICHI 485-0802 JAPAN
Telephone Number : +81-568-78-6159
Facsimile Number : +81-568-78-7659
Contact Person : Masashi Matsuda

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Receiver Antenna
Model No. : GHR-M002
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 5.0V
Receipt Date of Sample : April 18, 2012
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product Description

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

Feature of EUT : Lock and unlock doors (gate/trunk) by receiving RF signal output by the operation of the registered transmitter (remote transmitter, hereafter referred to as T/M).
Immobilizer function for antitheft and remote engine starter function to start up/stop an engine by pressing a button of a separate transmitter (remote control engine starter) is also installed.
Operating Voltage (Inner) : DC5.0V*
*The stable voltage (DC5.0V) is provided to RF part regardless of input voltage fluctuation (Car Battery).

Immobilizer part (LF Transmitting part)

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

UHF part (RF Receiving part)

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

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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 March 30, 2012 and effective April 30, 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

FCC 15.31 (e)

This EUT provides stable voltage (DC5.0V) constantly to RF Part regardless of input voltage. Therefore, this 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	24.4dB 0.12500MHz 180 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	11.5dB 40.750MHz, 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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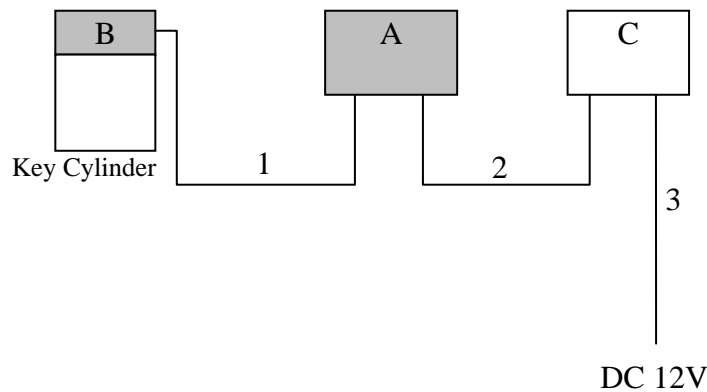
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

Test mode	Remarks
Transmitting mode (Tx)	125kHz Modulated on (Mod on)

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	Receiver Antenna	GHR-M002	001	OMRON Automotive Electronics Co. Ltd.	EUT
B	Coil Antenna	-	001	-	EUT
C	ECU	G8D-640M-ECU	75250310000503	OMRON Automotive Electronics Co. Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	1.5	Unshielded	Unshielded	Dedicated
2	Signal Cable	1.5	Unshielded	Unshielded	-
3	DC Cable	1.5	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 2 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 180 deg.) 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.

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 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.

* 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: May 1 and 2, 2012

Test engineer: Shinya Watanabe

UL Japan, Inc.

Head Office EMC Lab.

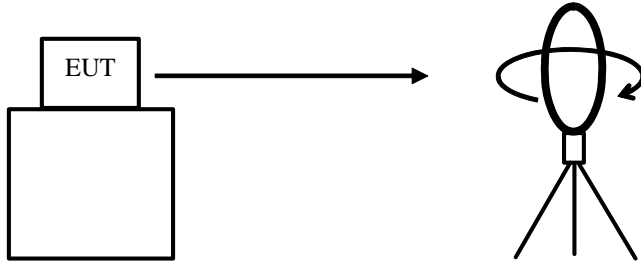
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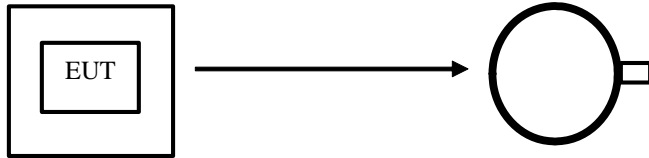
Facsimile : +81 596 24 8124

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

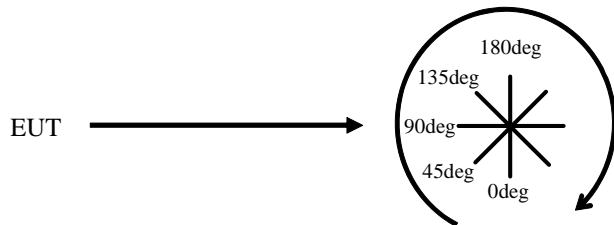


Top View (Horizontal)



Antenna was not rotated.

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.

Test	Span	RBW	VBW	Sweep	Detector	Trace	Instrument used
-26dB Bandwidth	100kHz	1kHz	3kHz	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

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APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

DATA OF RADIATED EMISSION TEST

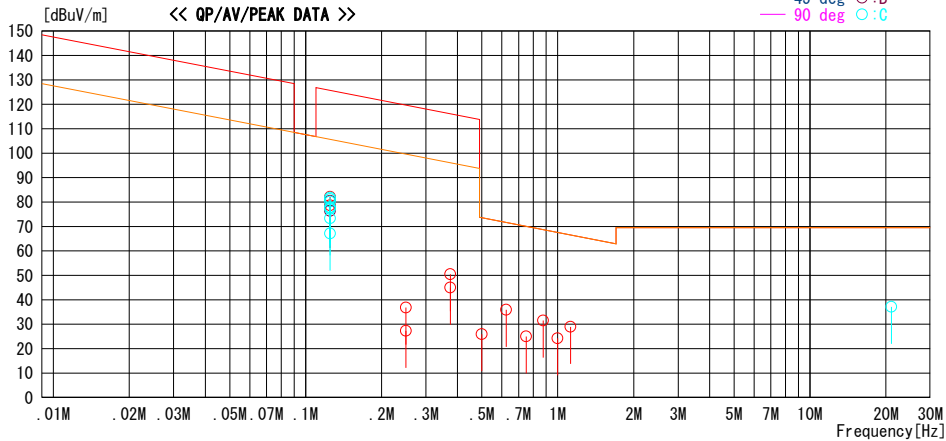
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2012/05/01

Report No. : 32GE0121-HO-01
Power : DC 12.0V
Temp./ Humi. : 24deg. C. / 61%RH
Engineer : Shinya Watanabe

Mode / Remarks : Transmitting 125KHz WorstAxis

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

— 0 deg ○:A
— 45 deg ○:B
— 90 deg ○:C



Freq.	Reading	DET	Ant. Fac	Loss	Gain	Result	Limit	Margin	Antenna	Table	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[deg]	[deg]	
0.12500	88.4	PEAK	19.9	6.0	32.2	82.1	125.7	43.6	0	A	3
0.12500	86.7	PEAK	19.9	6.0	32.2	80.4	125.7	45.3	45	B	328
0.12500	84.2	PEAK	19.9	6.0	32.2	77.9	125.7	47.8	90	C	275
0.12500	86.5	PEAK	19.9	6.0	32.2	80.2	125.7	45.5	135	C	224
0.12500	88.1	PEAK	19.9	6.0	32.2	81.8	125.7	43.9	180	C	179
0.12500	79.6	PEAK	19.9	6.0	32.2	73.3	125.7	52.4	0	C	186 Hol
0.12500	85.0	AV	19.9	6.0	32.2	78.7	105.7	27.0	0	A	3
0.12500	82.7	AV	19.9	6.0	32.2	76.4	105.7	29.3	45	B	328
0.12500	84.0	AV	19.9	6.0	32.2	77.7	105.7	28.0	90	C	275
0.12500	83.4	AV	19.9	6.0	32.2	77.1	105.7	28.6	135	C	224
0.12500	87.6	AV	19.9	6.0	32.2	81.3	105.7	24.4	180	C	179
0.12500	73.5	AV	19.9	6.0	32.2	67.2	105.7	38.5	0	C	186 Hol
0.25000	43.3	PEAK	19.7	6.1	32.2	36.9	119.7	82.8	0	A	0
0.25000	33.7	AV	19.7	6.1	32.2	27.3	99.7	72.4	0	A	0
0.37500	56.9	PEAK	19.7	6.1	32.2	50.5	116.1	65.6	0	A	179
0.37500	51.4	AV	19.7	6.1	32.2	45.0	96.1	51.1	0	A	179
0.50000	32.5	QP	19.6	6.1	32.3	25.9	73.6	47.7	0	A	3
0.62500	42.3	QP	19.6	6.2	32.2	35.9	71.7	35.8	0	A	170
0.75000	31.4	QP	19.6	6.2	32.2	25.0	70.1	45.1	0	A	0
0.87500	38.0	QP	19.5	6.2	32.2	31.5	68.7	37.2	0	A	182
1.00000	30.8	QP	19.5	6.2	32.2	24.3	67.6	43.3	0	A	0
1.12500	35.5	QP	19.5	6.2	32.2	29.0	66.5	37.5	0	A	179
21.00300	42.6	QP	19.5	7.3	32.2	37.2	69.5	32.3	90	C	249

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)

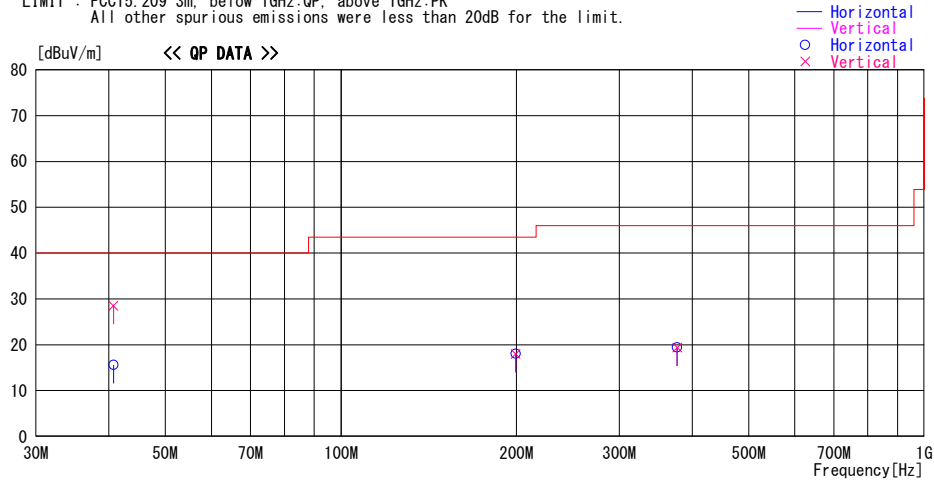
DATA OF RADIATED EMISSION TEST

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

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

Mode / Remarks : Transmitting 125kHz WorstAxis

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]							
40.750	23.3	QP	14.0	-21.7	15.6	0	100	Hori.	40.0	24.4	NS
40.750	36.2	QP	14.0	-21.7	28.5	191	100	Vert.	40.0	11.5	
199.358	21.5	QP	16.3	-19.8	18.0	28	316	Hori.	43.5	25.5	NS
199.358	21.5	QP	16.3	-19.8	18.0	208	100	Vert.	43.5	25.5	NS
377.154	21.5	QP	16.7	-18.8	19.4	43	100	Hori.	46.0	26.6	NS
377.154	21.5	QP	16.7	-18.8	19.4	354	100	Vert.	46.0	26.6	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)

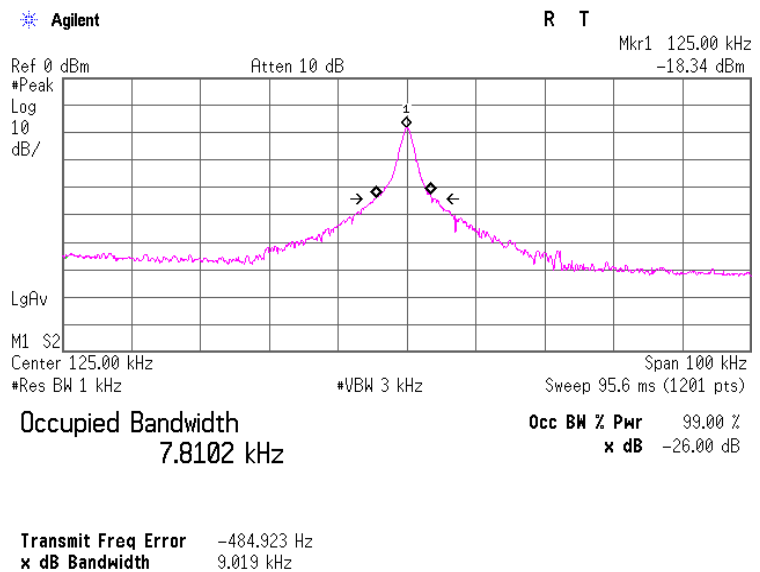
*The test result is rounded off to one or two decimal places, so some differences might be observed.

-26dB Bandwidth

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 Head Office EMC Lab. No.2 Semi Anechoic Chamber

REPORT NO : 32GE0121-HO-01
 REGULATION : Reference data
 TEST DISTANCE : 3m
 DATE : 5/1/2012
 TEMPERATURE : 24 deg. C
 HUMIDITY : 61 % RH
 Engineer : Shinya Watanabe

FREQ	-26dB Bandwidth
[kHz]	[kHz]
125.0	9.019

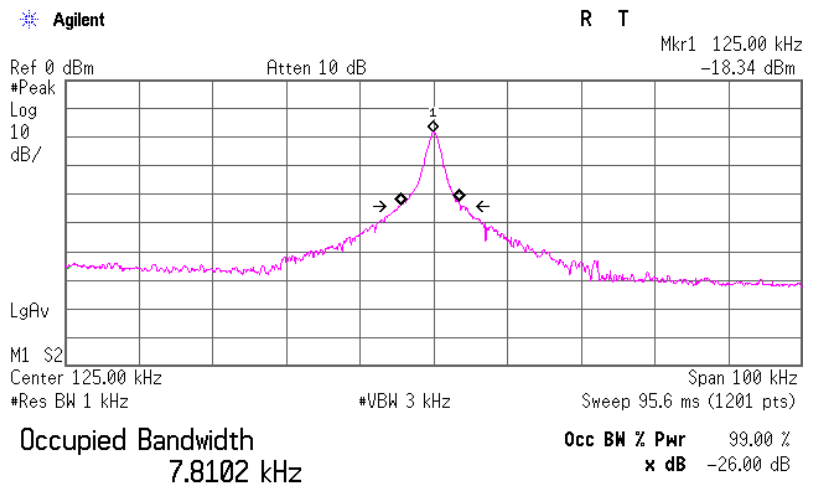


99% Occupied Bandwidth

UL Japan, Inc.
 Head Office EMC Lab. No.2 Semi Anechoic Chamber

REPORT NO : 32GE0121-HO-01
 REGULATION : Reference data
 TEST DISTANCE : 3m
 DATE : 5/1/2012
 TEMPERATURE : 24 deg. C
 HUMIDITY : 61 % RH
 Engineer : Shinya Watanabe

FREQ	99% Occupied Bandwidth
[kHz]	[kHz]
125.0	7.810



Transmit Freq Error -484.923 Hz
 x dB Bandwidth 9.019 kHz

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2012/02/06 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	100300	RE	2012/04/03 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-13	Coaxial Cable	Fujikura	3D-2W(12m)/5D-2W(5m)/5D-2W(0.8m)/5D-2W(1m)	-	RE	2012/02/16 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2012/03/05 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2011/11/23 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/10/23 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/10/23 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2012/02/16 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12

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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