RADIO TEST REPORT

Test Report No. : 32GE0040-HO-01-A

Applicant	:	**Fuji Heavy Industries Ltd.**
Type of Equipment	:	**Smart LF Oscillator**
Model No.	:	**SSPLF02**
FCC ID	:	**Y8PSSPLF02**
Test regulation	:	**FCC Part 15 Subpart C 2012**
Test Result	:	**Complied**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Date of test: February 9 to 11, 2012

Representative test engineer:

Shinya Watanabe
Engineer of WiSE Japan, UL Verification Service

Approved by :

Takahiro Hatakeda
Leader of WiSE Japan, UL Verification Service

NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.
*As for the range of Accreditation in NVLAP, you may refer to the WEB address, http://www.ul.com/japan/jpn/pages/services/emc/about/mark1/index.jsp#nvlap

CONTENTS PAGE

SECTION 1: Customer information

Company Name	:	Fuji Heavy Industries Ltd.
Address	:	1-1 SUBARU-CHO OTA-SHI GUNMA 373-8555 JAPAN
Telephone Number	:	+81-276-26-2381
Facsimile Number	:	+81-276-26-3069
Contact Person	:	Takashi Nishida

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

2.1 Identification of E.U.T.

Type of Equipment	:	Smart LF Oscillator
Model No.	:	SSPLF02
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC12.0V (Max 0.5A)
Receipt Date of Sample	:	February 1, 2012
Condition of EUT	:	Engineering 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

Smart LF Oscillator, model: SSPLF02 is a transmitter that is installed in a motor vehicle and is used as part of Smart System.

Radio Specification

Radio Type	:	Transmitter
Frequency of Operation	:	134.2kHz
Modulation	:	ASK
Method of Frequency Genenration	:	Crystal
Antenna type	:	Coil Antenna

Smart LF Oscillator (model: SSPLF02) consists of the following parts:

- Computer Assy, Smart Key (ECU)
- Door Antenna
- Trunk Antenna
- Room Antenna / Luggage Antenna

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	FCC Part 15 Subpart C: 2012, final revised on February 1, 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)

The stable voltage (DC2.3 to 6.2V*) is constantly provided to RF Part through the regulator regardless of voltage fluctuation of car battery (DC12V). Therefore, this EUT complies with the requirement.
*The regulated voltage value differs depending on connected LF antennas.

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	21.2dB 0.13420MHz, 0 deg., AV (Door 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	10.4dB 46.434MHz, Vertical, QP (Room Antenna / Luggage 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 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.

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

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116 Facsimile : +81 596 24 8124

	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 Test set up, Data of EMI, and Test instruments

Refer to APPENDIX 1 to 3.

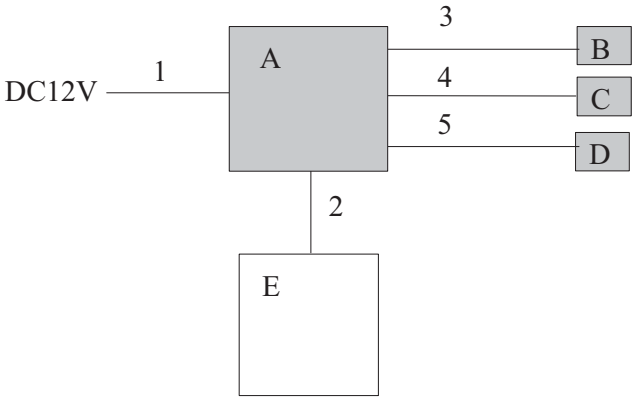
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used : 1) Transmitting mode (Tx) 134.2kHz (Door Antenna, Trunk Antenna, Room Antenna / Luggage Antenna, Maximum Output)
2) Transmitting mode (Tx) 134.2kHz (Room Antenna / Luggage Antenna only, Minimum Output)
* LF output power is controlled by Component Assy, Smart Key.

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	Remarks
A	Computer Assy, Smart Key (ECU)	-	001	-	EUT
B	Door Antenna	-	001	-	EUT
C	Room Antenna / Luggage Antenna	-	001	-	EUT
D	Trunk Antenna	-	001	-	EUT
E	Jig Box	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	DC Cable	2.8	Unshielded	Unshielded	-
2	ECU Cable	2.0	Unshielded	Unshielded	-
3	Door Ant Cable	2.0	Unshielded	Unshielded	-
4	Room Ant / Luggage Ant Cable	2.0	Unshielded	Unshielded	-
5	Trunk Ant Cable	2.0	Unshielded	Unshielded	-

SECTION 5: Radiated emission (Fundamental and Spurious Emission)

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

Frequency : From 9kHz to 30MHz at distance 3m
The EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135deg.) 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

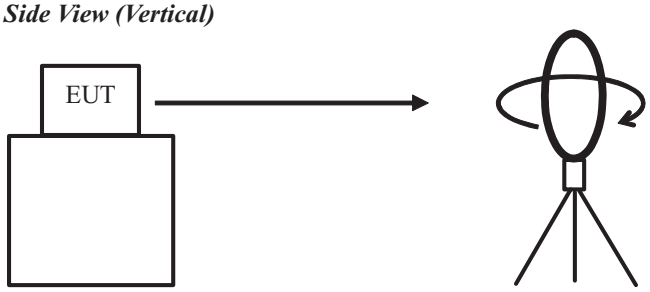
- The carrier level (or, noise levels) was (or were) measured at each position of all three axes X, Y and Z, and the position that has the maximum noise was determined.
With the position, the noise levels of all the frequencies were measured.

* 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

Figure 1: Direction of the Loop Antenna

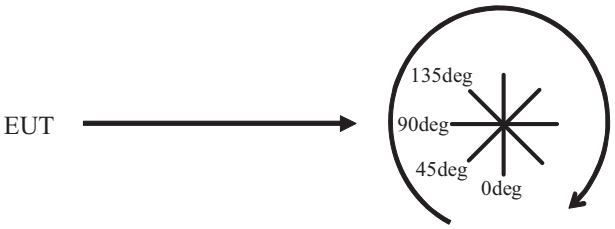
Side View (Vertical)



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

APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Door Antenna

DATA OF RADIATED EMISSION TEST

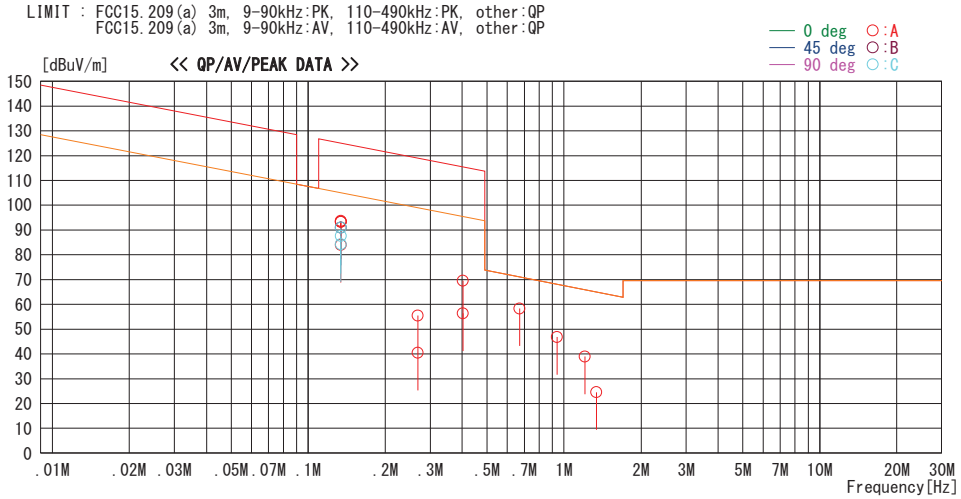
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/09

Report No. : 32GE0040-HO-01

Temp./ Humi. : 24deg. C / 31% RH
Engineer : Shinya Watanabe

Mode / Remarks : Tx 134.2kHz Modulation ON Door Antenna Worst-axis: X-axis

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
0.13420	99.9	PEAK	19.9	6.0	32.2	93.6	125.1	31.5	0	A	164	X
0.13420	90.2	AV	19.9	6.0	32.2	83.9	105.1	21.2	0	A	164	X
0.13420	99.7	PEAK	19.9	6.0	32.2	93.4	125.1	31.7	0	A	180	X ECU Y
0.13420	99.6	PEAK	19.9	6.0	32.2	93.3	125.1	31.8	0	A	185	X ECU Z
0.13420	97.3	PEAK	19.9	6.0	32.2	91.0	125.1	34.1	45	B	163	X
0.13420	94.0	PEAK	19.9	6.0	32.2	87.7	125.1	37.4	90	C	93	X
0.13420	97.2	PEAK	19.9	6.0	32.2	90.9	125.1	34.2	135	C	103	X
0.13420	90.6	PEAK	19.9	6.0	32.2	84.3	125.1	40.8	0	C	179	X Hol.
0.26800	61.9	PEAK	19.7	6.1	32.2	55.5	119.1	63.6	0	A	175	X
0.26800	46.8	AV	19.7	6.1	32.2	40.4	99.1	58.7	0	A	175	X
0.40260	76.1	PEAK	19.6	6.1	32.2	69.6	115.5	45.9	0	A	186	X
0.40260	62.9	AV	19.6	6.1	32.2	56.4	95.5	39.1	0	A	186	X
0.67100	64.9	QP	19.6	6.1	32.2	58.4	71.1	12.7	0	A	183	X
0.93940	53.4	QP	19.5	6.1	32.2	46.8	68.1	21.3	0	A	184	X
1.20780	45.4	QP	19.5	6.2	32.2	38.9	65.9	27.0	0	A	184	X
1.34200	31.0	QP	19.6	6.2	32.2	24.6	65.0	40.4	0	A	184	X NS

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 below 30MHz (Fundamental and Spurious Emission)

Trunk Antenna

DATA OF RADIATED EMISSION TEST

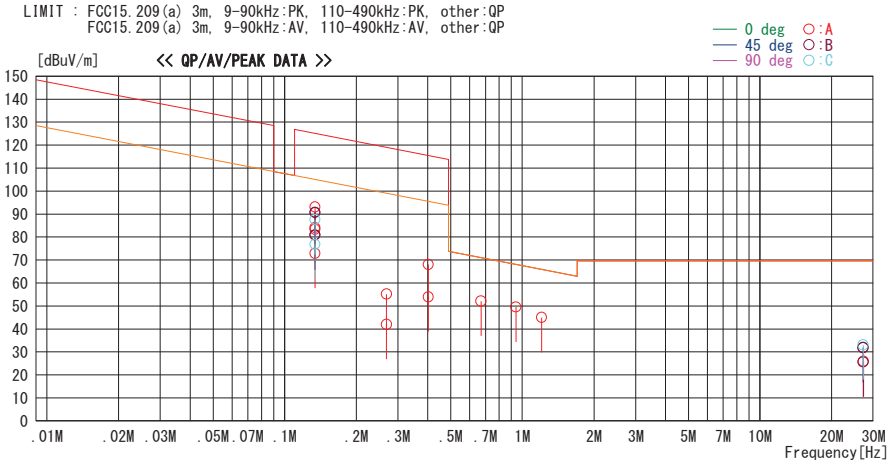
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/09

Report No. : 32GE0040-HO-01

Temp. / Humi. : 24deg. C / 31% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Tx 134.2kHz Modulation ON Trunk-ANT Worst-axis:X-axis

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
0.13420	99.3	PEAK	19.9	6.0	32.2	93.0	125.1	32.1	0	A	198	X
0.13420	97.1	PEAK	19.9	6.0	32.2	90.8	125.1	34.3	45	B	150	X
0.13420	93.9	PEAK	19.9	6.0	32.2	87.6	125.1	37.5	90	C	255	X
0.13420	97.0	PEAK	19.9	6.0	32.2	90.7	125.1	34.4	135	B	154	X
0.13420	90.4	PEAK	19.9	6.0	32.2	84.1	125.1	41.0	0	A	222	LOOP-ANT:HOR_X
0.13420	89.6	AV	19.9	6.0	32.2	83.3	105.1	21.8	0	A	198	X
0.13420	87.3	AV	19.9	6.0	32.2	81.0	105.1	24.1	45	B	150	X
0.13420	83.1	AV	19.9	6.0	32.2	76.8	105.1	28.3	90	C	255	X
0.13420	87.2	AV	19.9	6.0	32.2	80.9	105.1	24.2	135	B	154	X
0.13420	79.2	AV	19.9	6.0	32.2	72.9	105.1	32.2	0	A	222	LOOP-ANT:HOR_X
0.26840	61.5	PEAK	19.7	6.1	32.2	55.1	119.0	63.9	0	A	359	
0.26840	48.4	AV	19.7	6.1	32.2	42.0	99.0	57.0	0	A	359	
0.40260	74.5	PEAK	19.6	6.1	32.2	68.0	115.5	47.5	0	A	165	
0.40260	60.5	AV	19.6	6.1	32.2	54.0	95.5	41.5	0	A	165	
0.67100	58.6	QP	19.6	6.1	32.2	52.1	71.1	19.0	0	A	187	
0.93940	56.1	QP	19.5	6.1	32.2	49.5	68.1	18.6	0	A	352	
1.20780	51.5	QP	19.5	6.2	32.2	45.0	65.9	20.9	0	A	181	
27.16426	38.2	QP	18.9	7.0	32.1	32.0	69.5	37.5	45	B	64	
27.16426	39.3	QP	18.9	7.0	32.1	33.1	69.5	36.4	90	C	235	
27.16426	38.0	QP	18.9	7.0	32.1	31.8	69.5	37.7	135	B	142	
27.16426	31.9	QP	18.9	7.0	32.1	25.7	69.5	43.8	0	B	122	LOOP-ANT:HOR
27.31351	32.1	QP	18.9	7.0	32.1	25.9	69.5	43.6	0	A	10	

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 below 30MHz (Fundamental and Spurious Emission)

Room Antenna Maximum Output

DATA OF RADIATED EMISSION TEST

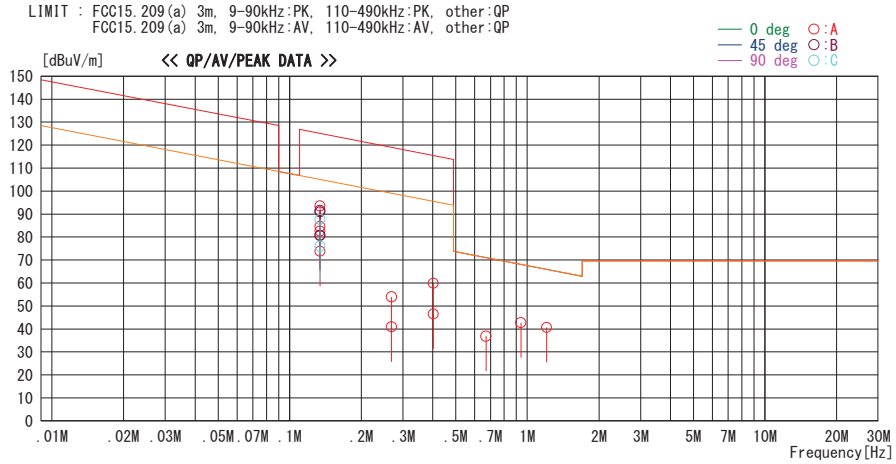
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/09

Report No. : 32GE0040-HO-01

Temp. / Humi. : 24deg. C / 31% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Tx 134.2kHz Modulation ON Room-ANT Worst-axis:X-axis

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



Freq.	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]	
0.13420	97.9	PEAK	19.9	6.0	32.2	91.6	125.1	33.5	45	B	166	X
0.13420	94.0	PEAK	19.9	6.0	32.2	87.7	125.1	37.4	90	C	259	X
0.13420	99.8	PEAK	19.9	6.0	32.2	93.5	125.1	31.6	0	A	4	X
0.13420	97.3	PEAK	19.9	6.0	32.2	91.0	125.1	34.1	135	B	166	X
0.13420	90.8	PEAK	19.9	6.0	32.2	84.5	125.1	40.6	0	A	211	LOOP-ANT:HOR_X
0.13420	88.9	AV	19.9	6.0	32.2	82.6	105.1	22.5	0	A	4	X
0.13420	82.3	AV	19.9	6.0	32.2	76.0	105.1	29.1	90	C	259	X
0.13420	87.1	AV	19.9	6.0	32.2	80.8	105.1	24.3	45	B	166	X
0.13420	86.9	AV	19.9	6.0	32.2	80.6	105.1	24.5	135	B	166	X
0.13420	80.1	AV	19.9	6.0	32.2	73.8	105.1	31.3	0	A	211	LOOP-ANT:HOR_X
0.26840	60.4	PEAK	19.7	6.1	32.2	54.0	119.0	65.0	0	A	158	
0.26840	47.4	AV	19.7	6.1	32.2	41.0	99.0	58.0	0	A	158	
0.40260	66.4	PEAK	19.6	6.1	32.2	59.9	115.5	55.6	0	A	357	
0.40260	53.0	AV	19.6	6.1	32.2	46.5	95.5	49.0	0	A	357	
0.67100	43.4	QP	19.6	6.1	32.2	36.9	71.1	34.2	0	A	37	
0.93940	49.3	QP	19.5	6.1	32.2	42.7	68.1	25.4	0	A	44	
1.20780	47.2	QP	19.5	6.2	32.2	40.7	65.9	25.2	0	A	167	

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 below 30MHz (Fundamental and Spurious Emission)

Room Antenna Minimum Output

DATA OF RADIATED EMISSION TEST

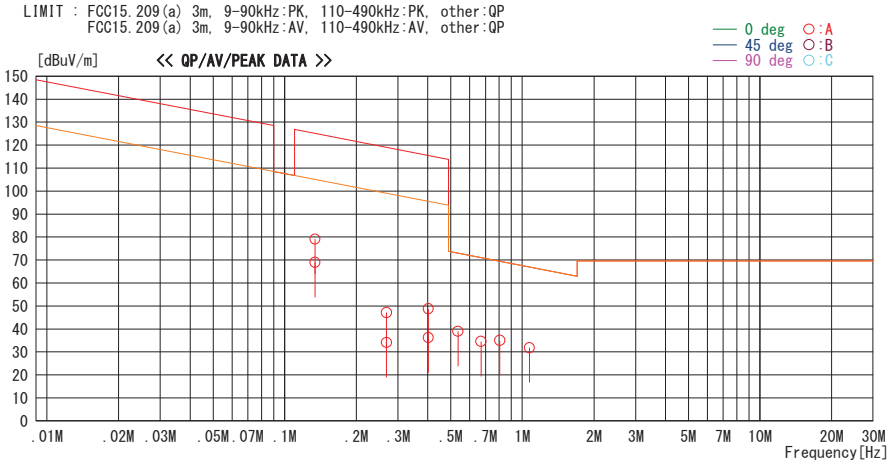
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/10

Report No. : 32GE0040-HO-01

Temp./ Humi. : 24deg. C / 31% RH
Engineer : Tomotaka Sasagawa

Mode / Remarks : Tx 134.2kHz Modulation ON Room-ANT(MIN) Worst-axis:X-axis

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



Freq. [MHz]	Reading [dBuV]	DET	Ant.Fac [dB/m]	Loss [dB]	Gain [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna [deg]		Table [deg]	Comment
0.13420	85.4	PEAK	19.9	6.0	32.2	79.1	125.1	46.0	0	A	182	
0.13420	75.3	AV	19.9	6.0	32.2	69.0	105.1	36.1	0	A	182	
0.26840	53.5	PEAK	19.7	6.1	32.2	47.1	119.0	71.9	0	A	359	
0.26840	40.5	AV	19.7	6.1	32.2	34.1	99.0	64.9	0	A	359	
0.40260	55.3	PEAK	19.6	6.1	32.2	48.8	115.5	66.7	0	A	0	
0.40260	42.8	AV	19.6	6.1	32.2	36.3	95.5	59.2	0	A	0	
0.53680	45.5	QP	19.6	6.1	32.2	39.0	73.0	34.0	0	A	130	
0.67100	41.0	QP	19.6	6.1	32.2	34.5	71.1	36.6	0	A	59	
0.80520	41.5	QP	19.6	6.1	32.2	35.0	69.5	34.5	0	A	15	
1.07360	38.3	QP	19.5	6.2	32.2	31.8	66.9	35.1	0	A	357	

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)

Door Antenna

DATA OF RADIATED EMISSION TEST

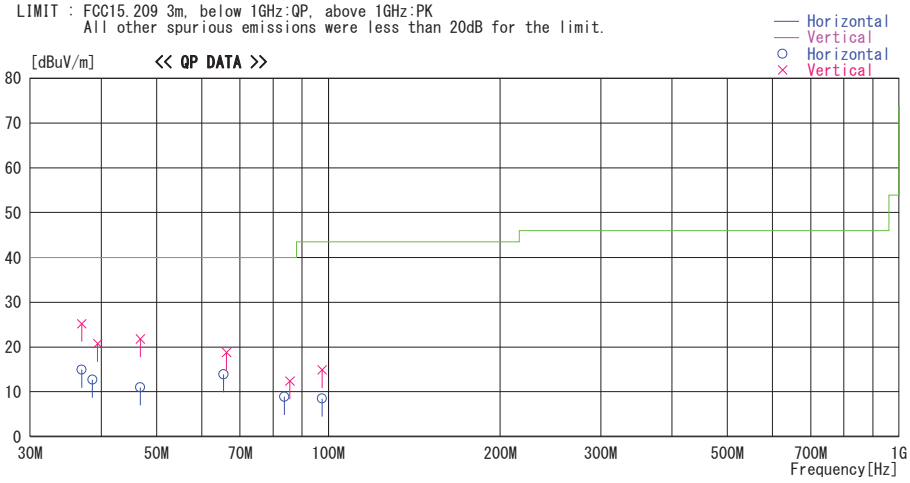
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/11

Report No. : 32GE0040-HO-01

Temp./Humi. : 21deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 134.2kHz Modulation ON Worst axis Door-ANT X-axis, ECU X-axis

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
36.969	24.0	QP	15.9	-24.9	15.0	308	400	Hori.	40.0	25.0	
36.966	34.2	QP	15.9	-24.9	25.2	161	150	Vert.	40.0	14.8	
38.608	22.3	QP	15.3	-24.9	12.7	359	400	Hori.	40.0	27.3	
39.436	30.6	QP	15.0	-24.9	20.7	214	150	Vert.	40.0	19.3	
46.827	34.5	QP	12.1	-24.8	21.8	177	150	Vert.	40.0	18.2	
46.824	23.7	QP	12.1	-24.8	11.0	338	400	Hori.	40.0	29.0	
65.564	31.2	QP	7.2	-24.5	13.9	203	248	Hori.	40.0	26.1	
66.296	36.2	QP	7.1	-24.5	18.8	0	150	Vert.	40.0	21.2	
85.620	29.0	QP	7.5	-24.1	12.4	0	150	Vert.	40.0	27.6	
83.724	25.8	QP	7.2	-24.1	8.9	221	400	Hori.	40.0	31.1	
97.526	22.9	QP	9.7	-24.1	8.5	352	400	Hori.	43.5	35.0	
97.521	29.3	QP	9.7	-24.1	14.9	250	150	Vert.	43.5	28.6	

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 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 30MHz (Spurious Emission)

Trunk Antenna

DATA OF RADIATED EMISSION TEST

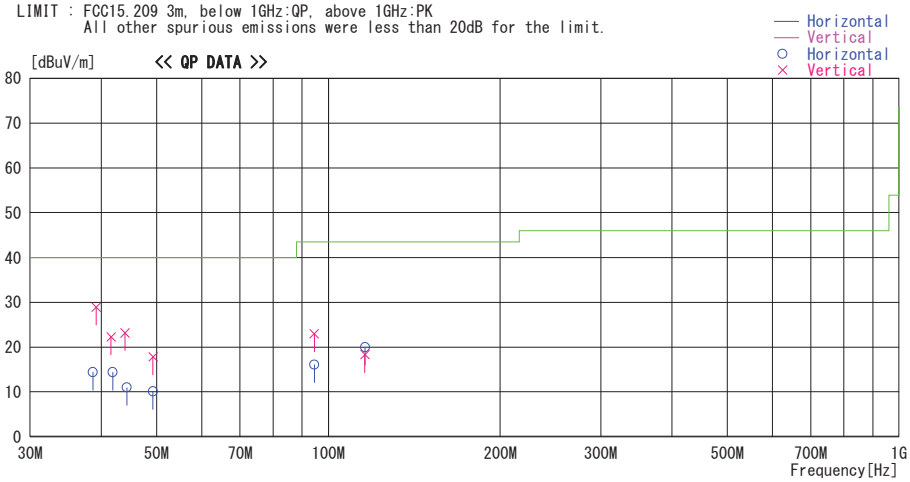
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/11

Report No. : 32GE0040-HO-01

Temp./Humi. : 21deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 134.2kHz Modulation ON Worst axis Trunk-ANT X-axis, ECU X-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 Factor [dB/m]	Loss& Gain [dB]	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
38.651	24.0	QP	15.3	-24.9	14.4	311	400	Hori.	40.0	25.6	
39.187	38.7	QP	15.1	-24.9	28.9	245	100	Vert.	40.0	11.1	
41.908	25.2	QP	14.0	-24.8	14.4	243	324	Hori.	40.0	25.6	
41.603	33.0	QP	14.1	-24.8	22.3	145	100	Vert.	40.0	17.7	
44.040	34.9	QP	13.1	-24.8	23.2	199	100	Vert.	40.0	16.8	
44.376	22.8	QP	13.0	-24.8	11.0	359	400	Hori.	40.0	29.0	
49.301	31.3	QP	11.3	-24.8	17.8	290	100	Vert.	40.0	22.2	
49.302	23.6	QP	11.3	-24.8	10.1	171	389	Hori.	40.0	29.9	
94.478	31.0	QP	9.2	-24.1	16.1	212	237	Hori.	43.5	27.4	
94.477	37.9	QP	9.2	-24.1	23.0	248	100	Vert.	43.5	20.5	
115.952	31.3	QP	12.4	-23.7	20.0	359	380	Hori.	43.5	23.5	
115.859	29.6	QP	12.4	-23.7	18.3	100	100	Vert.	43.5	25.2	

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 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 30MHz (Spurious Emission)

Room Antenna / Luggage Antenna Maximum Output

DATA OF RADIATED EMISSION TEST

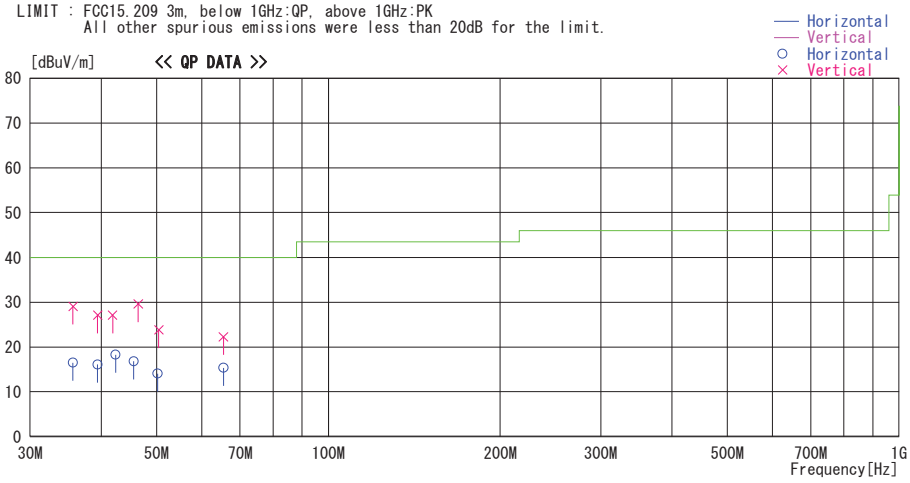
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/11

Report No. : 32GE0040-HO-01

Temp./Humi. : 21deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 134.2kHz Modulation ON, Maximum Output, Room-ANT X-axis, ECU X-axis

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
35.696	25.1	QP	16.3	-24.9	16.5	120	315	Hori.	40.0	23.5	
35.699	37.7	QP	16.3	-24.9	29.1	359	100	Vert.	40.0	10.9	
39.435	26.0	QP	15.0	-24.9	16.1	291	340	Hori.	40.0	23.9	
39.436	37.0	QP	15.0	-24.9	27.1	208	100	Vert.	40.0	12.9	
41.900	37.9	QP	14.0	-24.8	27.1	130	100	Vert.	40.0	12.9	
42.408	29.3	QP	13.8	-24.8	18.3	167	297	Hori.	40.0	21.7	
45.629	29.1	QP	12.5	-24.8	16.8	160	400	Hori.	40.0	23.2	
46.434	42.1	QP	12.3	-24.8	29.6	112	100	Vert.	40.0	10.4	
50.191	27.9	QP	11.0	-24.8	14.1	164	294	Hori.	40.0	25.9	
50.460	37.7	QP	10.9	-24.8	23.8	188	100	Vert.	40.0	16.2	
65.490	32.7	QP	7.2	-24.5	15.4	188	251	Hori.	40.0	24.6	
65.491	39.6	QP	7.2	-24.5	22.3	202	100	Vert.	40.0	17.7	

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 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 30MHz (Spurious Emission)

Room Antenna / Luggage Antenna Minimum Output

DATA OF RADIATED EMISSION TEST

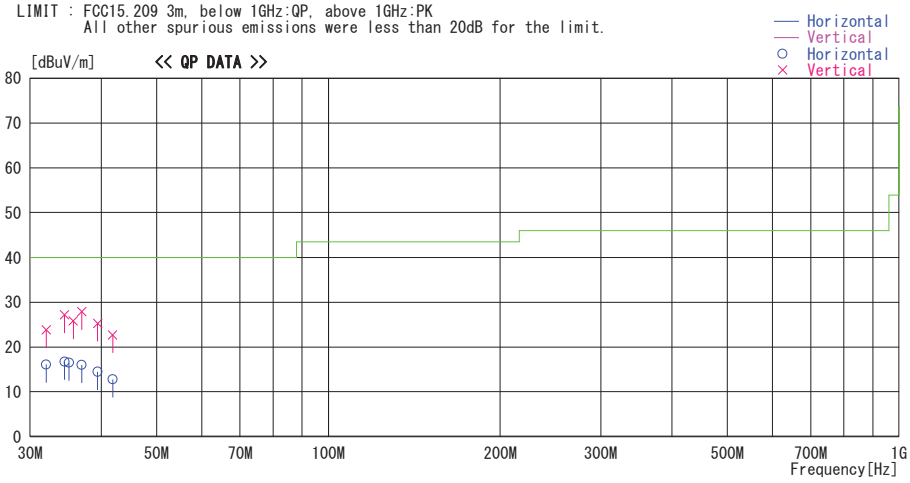
UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/02/11

Report No. : 32GE0040-HO-01

Temp./Humi. : 21deg. C / 34% RH
Engineer : Hiroshi Kukita

Mode / Remarks : Tx 134.2kHz Modulation ON, Minimum Output, Room-ANT X-axis, ECU X-axis

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna Factor	Loss& Gain	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
32.037	30.9	QP	17.9	-25.0	23.8	190	100	Vert.	40.0	16.2	
32.042	23.2	QP	17.9	-25.0	16.1	153	388	Hori.	40.0	23.9	
34.501	35.4	QP	16.8	-25.0	27.2	184	100	Vert.	40.0	12.8	
34.509	24.9	QP	16.8	-25.0	16.7	135	400	Hori.	40.0	23.3	
35.130	24.9	QP	16.5	-24.9	16.5	141	367	Hori.	40.0	23.5	
35.735	34.4	QP	16.3	-24.9	25.8	171	100	Vert.	40.0	14.2	
36.965	25.0	QP	15.9	-24.9	16.0	121	400	Hori.	40.0	24.0	
36.971	36.9	QP	15.9	-24.9	27.9	167	100	Vert.	40.0	12.1	
39.428	24.4	QP	15.0	-24.9	14.5	23	400	Hori.	40.0	25.5	
39.433	35.2	QP	15.0	-24.9	25.3	236	100	Vert.	40.0	14.7	
41.902	23.6	QP	14.0	-24.8	12.8	345	400	Hori.	40.0	27.2	
41.904	33.5	QP	14.0	-24.8	22.7	156	100	Vert.	40.0	17.3	

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)

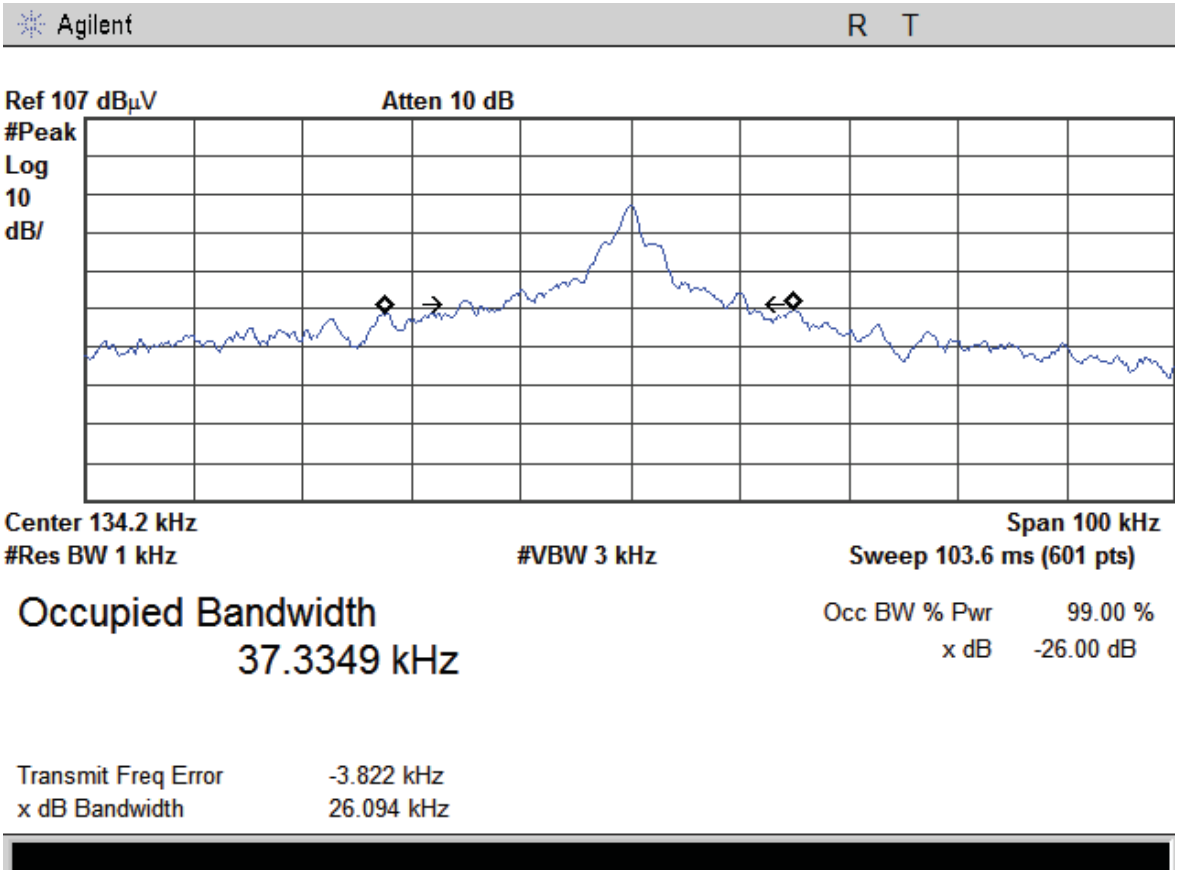
*The limit is rounded down to one decimal place.
*The test result is rounded off to one or two decimal places, so some differences might be observed.

-26dB Bandwidth and 99% Occupied Bandwidth

Door Antenna

Report No.	32GE0040-HO-01
Test place	Head Office EMC Lab.
Semi Anechoic Chamber	No.4
Date	02/10/2012
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shinya Watanabe
Mode	Tx 134.2kHz Door Antenna

FREQ [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
134.2	26.094	37.335

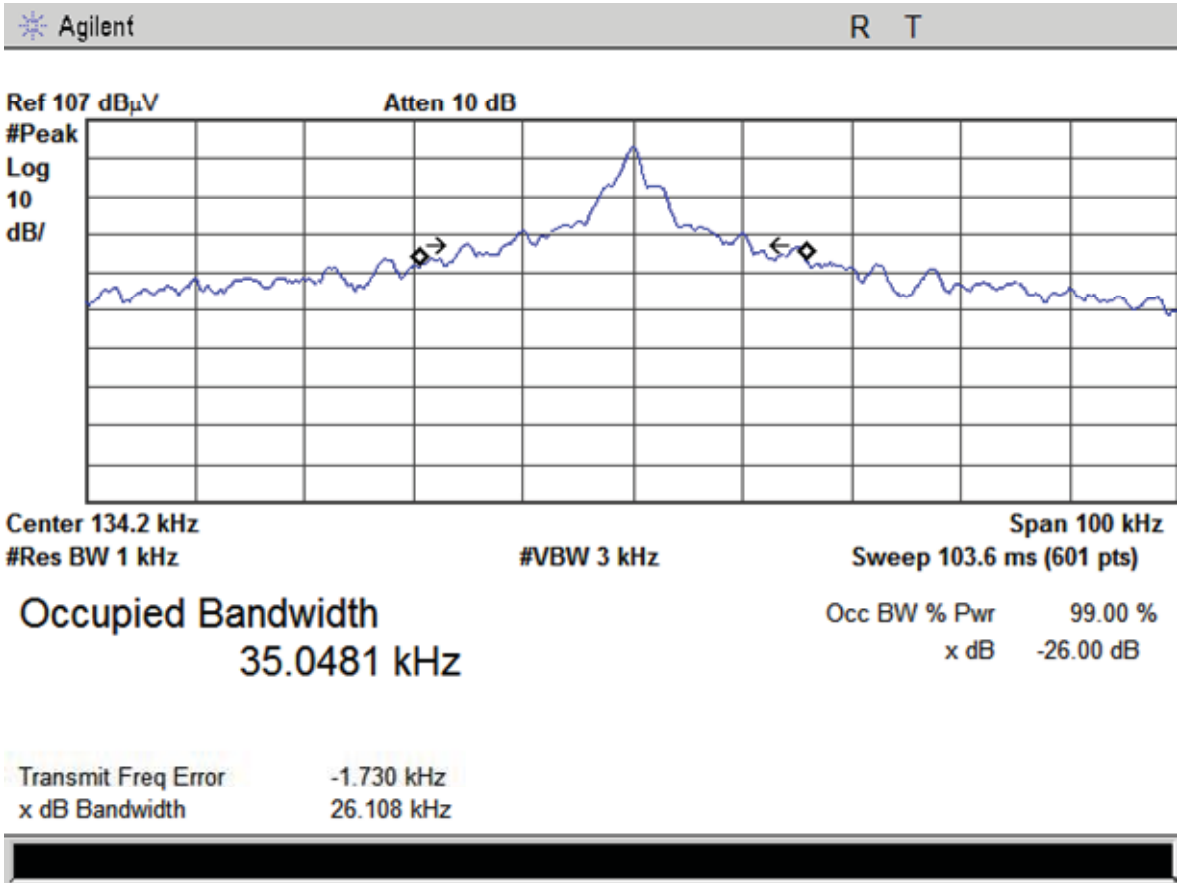


-26dB Bandwidth and 99% Occupied Bandwidth

Trunk Antenna

Report No.	32GE0040-HO-01
Test place	Head Office EMC Lab.
Semi Anechoic Chamber	No.4
Date	02/10/2012
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shinya Watanabe
Mode	Tx 134.2kHz Trunk Antenna

FREQ [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
134.2	26.108	35.048

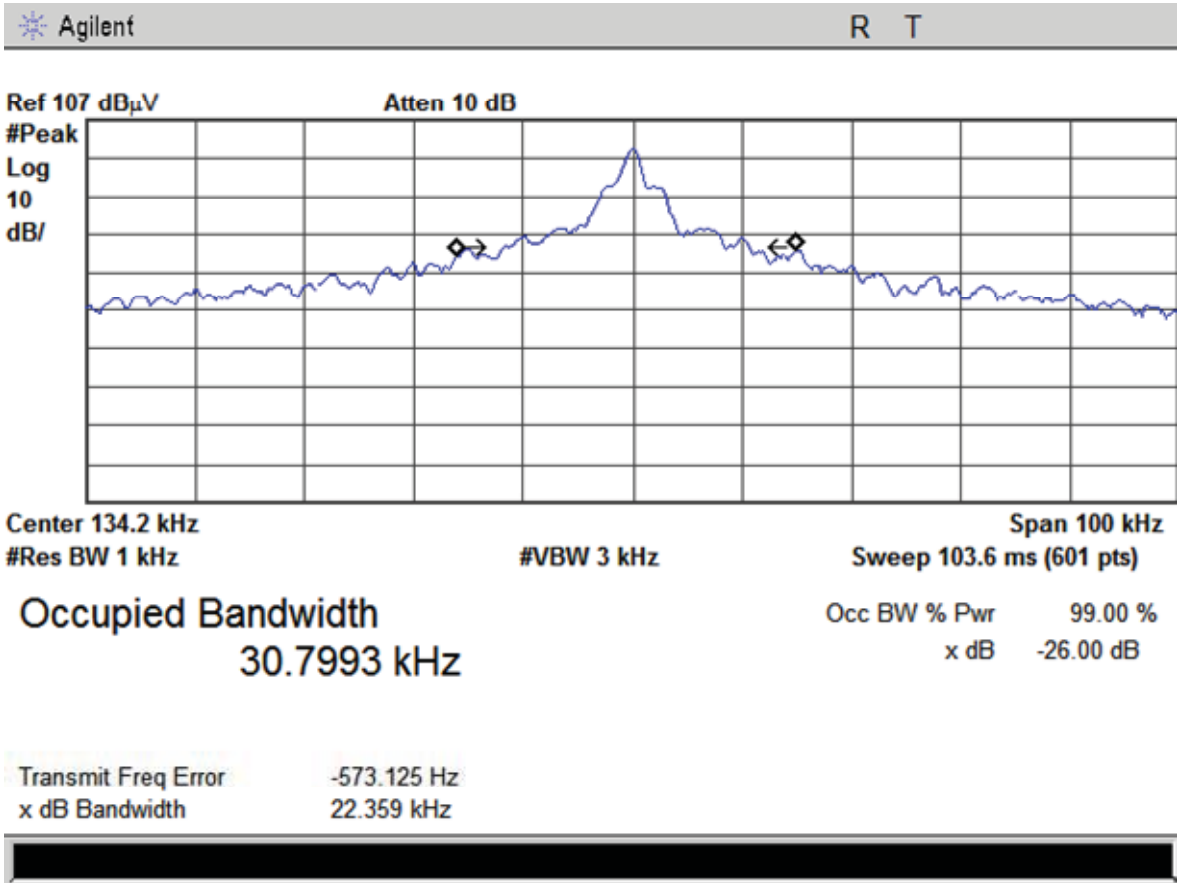


-26dB Bandwidth and 99% Occupied Bandwidth

Room Antenna / Luggage Antenna

Report No.	32GE0040-HO-01
Test place	Head Office EMC Lab.
Semi Anechoic Chamber	No.4
Date	02/10/2012
Temperature / Humidity	24 deg. C / 32 % RH
Engineer	Shinya Watanabe
Mode	Tx 134.2kHz Room Antenna / Luggage Antenna

FREQ [kHz]	-26dB Bandwidth [kHz]	99% Occupied Bandwidth [kHz]
134.2	22.359	30.799



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2012/02/06 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2011/10/19 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2011/10/19 * 12
MCC-113	Coaxial cable	Fujikura/Suhner/TSJ	5D-2W(10m)/SFM141 (5m)/421-010(1m)/ sucoform141-PE(1m)/RFM-E121(Switcher)	-/04178	RE	2011/07/04 * 12
MCC-31	Coaxial cable	UL Japan	-	-	RE	2011/07/28 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MAT-09	Attenuator(6dB)	Weinschel Corp	2	BK7973	RE	2011/11/02 * 12
MSA-05	Spectrum Analyzer	Advantest	R3273	160400285	RE	2011/11/23 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2011/11/16 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2011/11/16 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2011/03/25 * 12
MAT-32	Attenuator(6dB)	TME	UFA-01	-	RE	2011/03/02 * 12

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with traceable calibrations. Each calibration 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

APPENDIX 3: Photographs of test setup

Radiated emission

Door Antenna

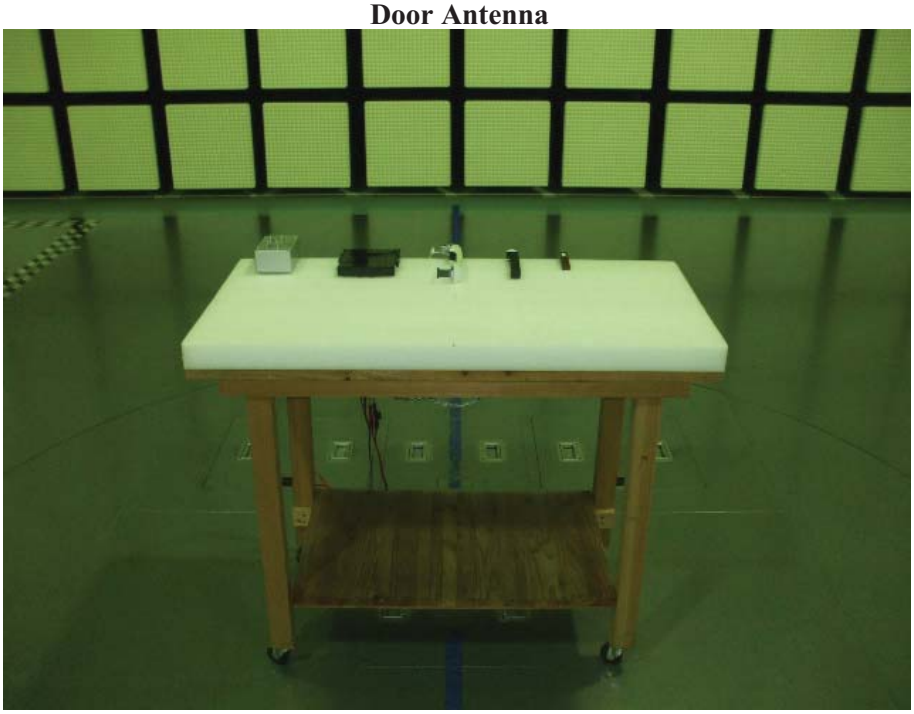


Photo 1

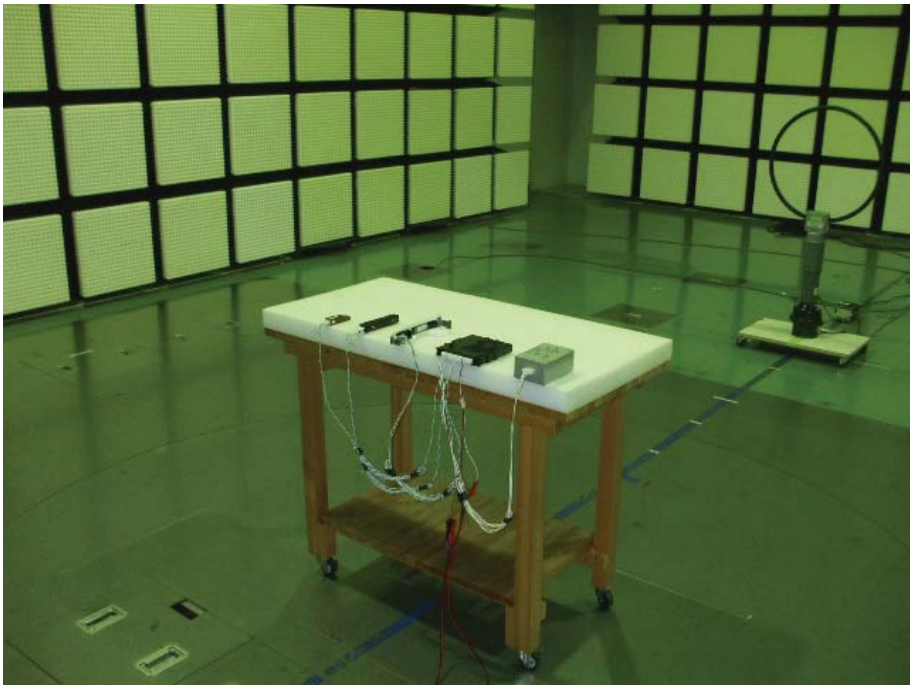


Photo 2

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

Radiated emission

Trunk Antenna

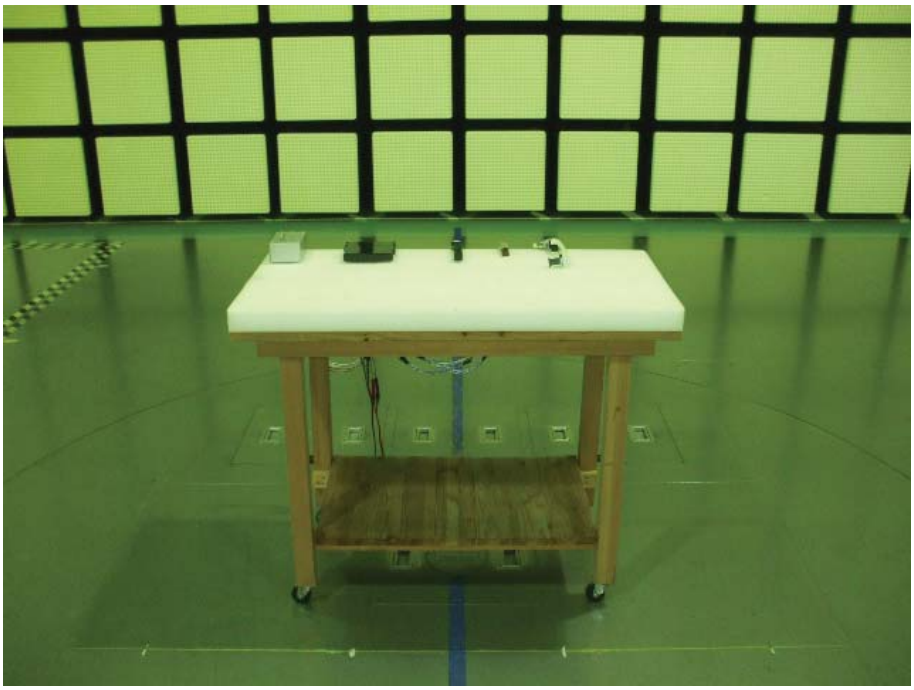


Photo 1

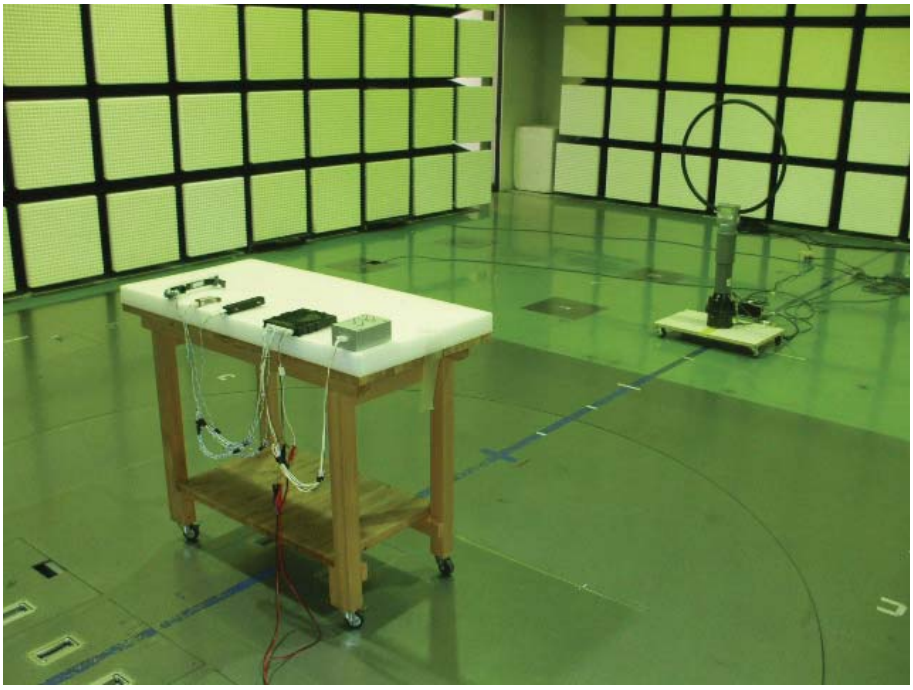


Photo 2

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

Radiated emission

Room Antenna / Luggage Antenna

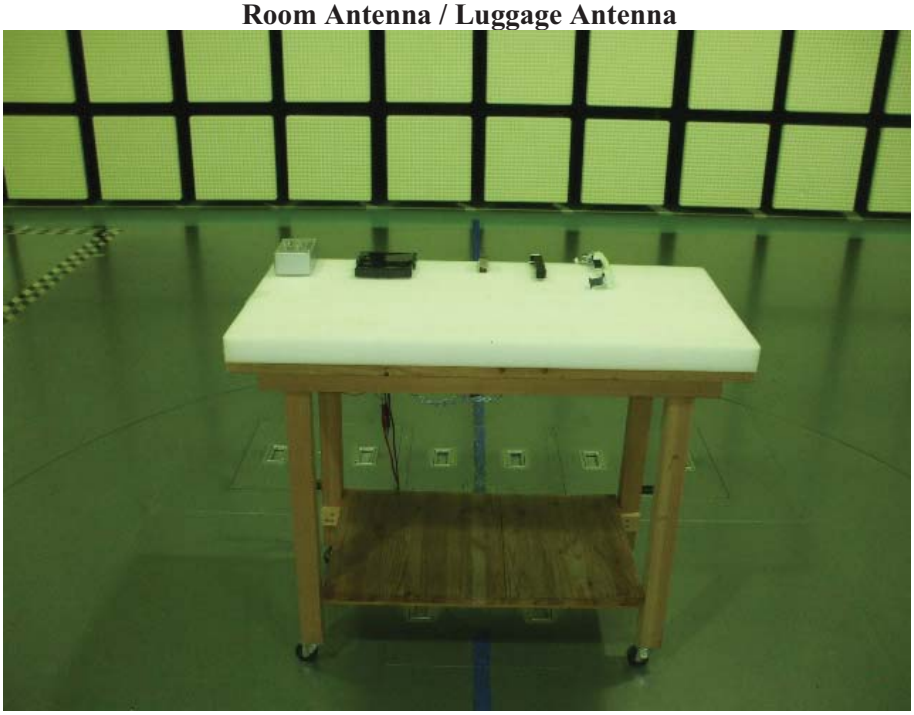


Photo 1

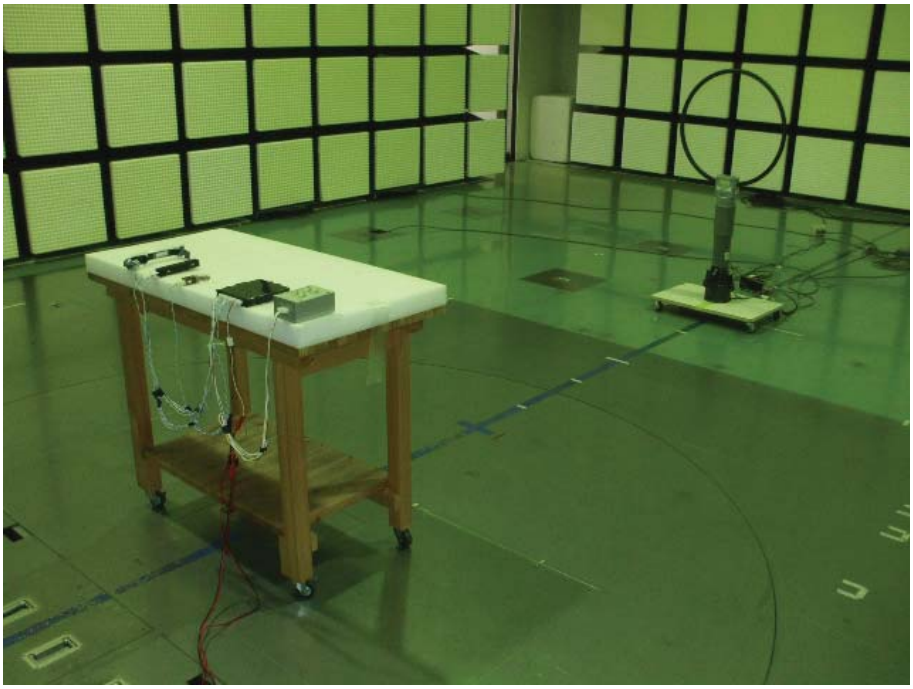


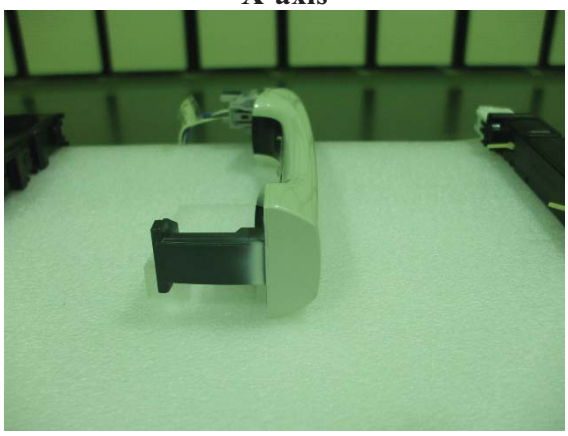
Photo 2

UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

Worst Case Position

Door Antenna
Below 30MHz:X-axis
Above 30MHz(Hori:X-axis /Vert:X-axis)

X-axis

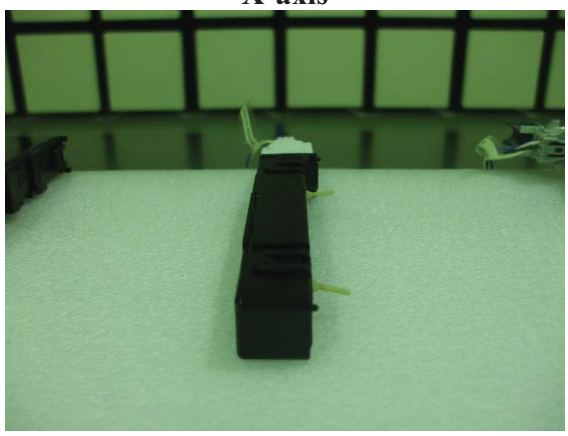


Y-axis

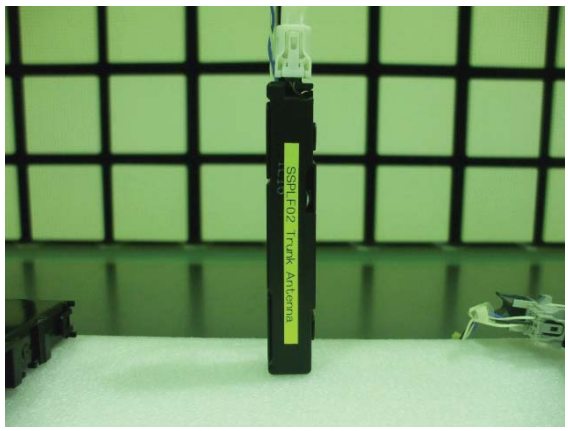
Z-axis

Trunk Antenna
Below 30MHz:X-axis
Above 30MHz(Hori:X-axis /Vert:X-axis)

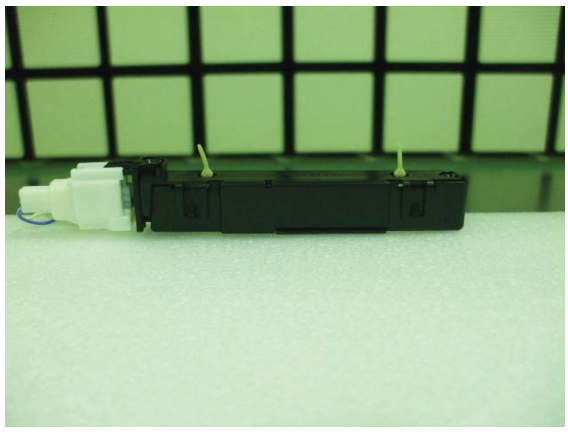
X-axis



Y-axis



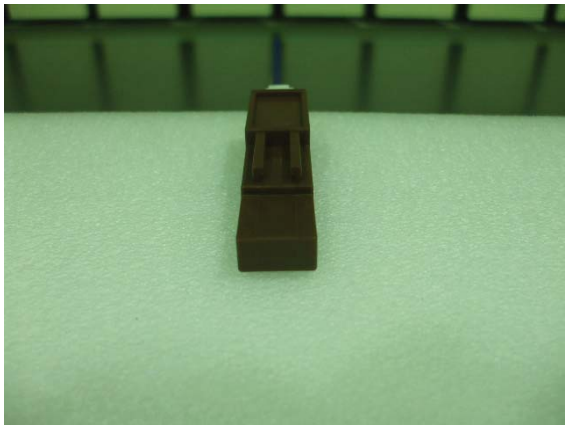
Z-axis



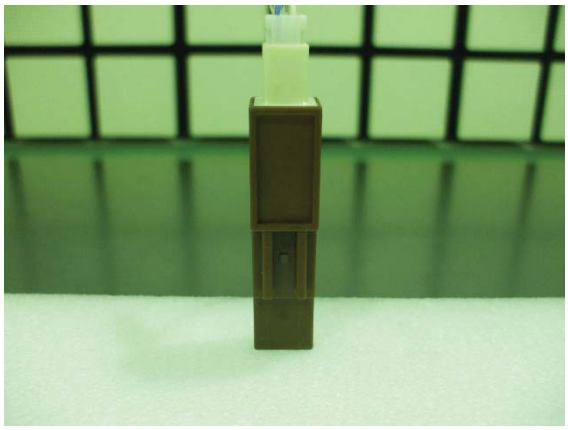
Worst Case Position

Room Antenna / Luggage Antenna
Below 30MHz:-Xaxis
Above 30MHz(Hori:X-axis /Vert:X-axis)

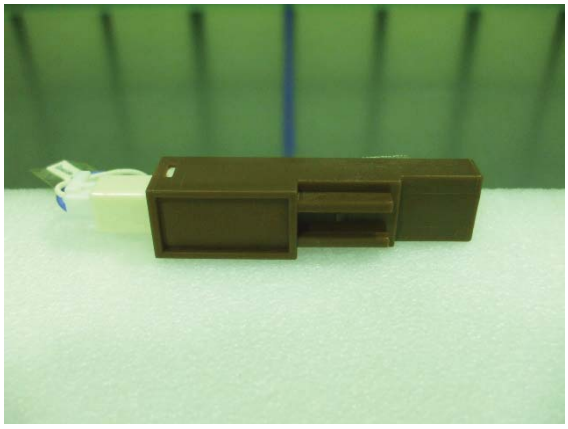
X-axis



Y-axis

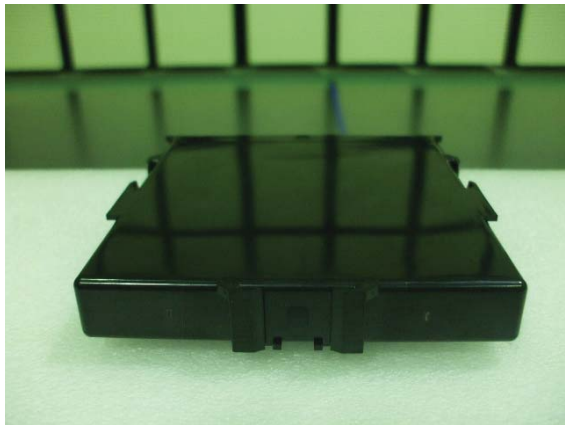


Z-axis

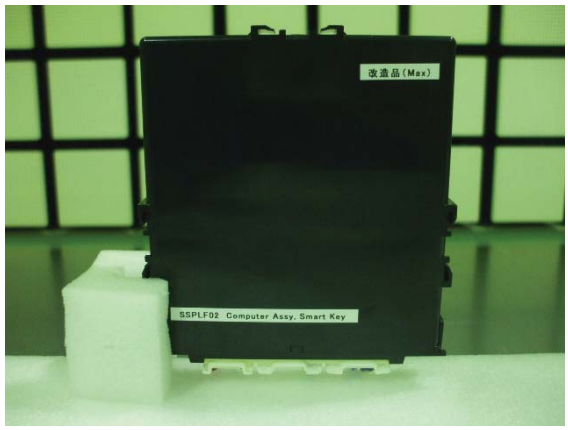


ECU
Below 30MHz:X-axis
Above 30MHz(Hori:X-axis /Vert:X-axis)

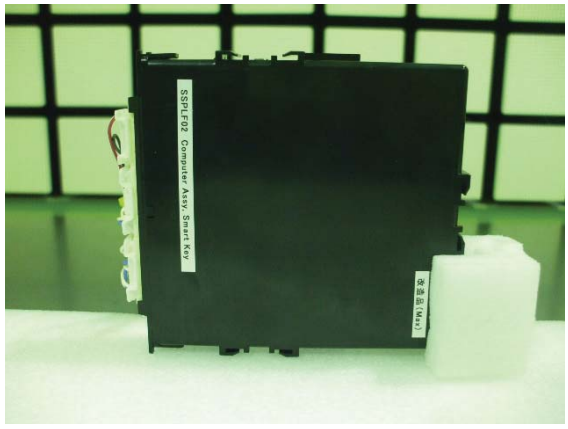
X-axis



Y-axis



Z-axis



UL Japan, Inc.
Head Office EMC Lab.
4383-326 Asama-cho, Ise-shi, Mie-ken 516-0021 JAPAN
Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124