RADIO TEST REPORT

Test Report No. : 10013574H-A-R1

Applicant	:	**FUJI HEAVY INDUSTRIES LTD.**
Type of Equipment	:	**Smart system**
Model No.	:	**FJ14-2**
FCC ID	:	**Y8PFJ14-2**
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 10013574H-A. 10013574H-A is replaced with this report.

Date of test: June 3 and 4, 2013

Representative test engineer:
Hironobu Ohnishi
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

REVISION HISTORY

Original Test Report No.: 10013574H-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	10013574H-A	June 21, 2013	-	-
1	10013574H-A-R1	August 9, 2013	P.4	Addition of following sentence. * The EUT does not transmit simultaneously from multiple antennas.
1	10013574H-A-R1	August 9, 2013	P.8	Addition of following sentence. * Antenna (Type 1) and Antenna (Type 2) were evaluated with the worst duty respectively. Worst duty does not change due to the difference in number of connected antenna.

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SECTION 1: Customer information

Company Name	:	FUJI HEAVY INDUSTRIES LTD.
Address	:	1-1, Subaru-cho, ota-shi, Gunma-ken, 373-8555, Japan
Telephone Number	:	+81-276-26-2771
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 system
Model No.	:	FJ14-2
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	DC12.0V
Receipt Date of Sample	:	June 3, 2013
Country of Mass-production	:	United States of America
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: FJ14-2 (referred to as the EUT in this report) is the Smart system.

General Specification

Clock frequencies in the system	:	4.000MHz (CPU)

Radio Specification

[Transmitter]

Radio Type	:	Transmitter
Frequency of Operation	:	134.2 kHz
Oscillator Frequency	:	4.2944 MHz
Type of Modulation	:	OOK (A1D)
Oscillation circuit	:	Crystal
Power Supply	:	DC 12.0V
Antenna	:	Antenna (TYPE 1) (*1) (*3) / (TYPE 2) (*2) *1: Maximum number of this antenna is 2. *2: Maximum number of this antenna is 4.
Antenna Specification	:	Ferrite antenna coil

* The EUT does not transmit simultaneously from multiple antennas.

[Receiver] *4)

Radio Type	:	Receiver
Frequency of Operation	:	314.35 MHz
Oscillator frequency	:	37.95625 MHz (Crystal)
Type of Modulation	:	FSK
Type of receiving system	:	Super-heterodyne
Power Supply	:	DC 5.0V
Antenna Type	:	Internal antenna (Inverted F antenna)

*3) The Antenna (TYPE 1) of this system has variations of model 1 and model 2.
The difference of these variations is only the outer shell, and the test was performed with the representative model 1.

*4) Reference: EUT also has this function. Please refer to No. 10013574H-B (FCC15B).

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification	:	Test specification: FCC Part 15 Subpart C: 2013, final revised on June 11, 2013 and effective July 11, 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

* The revision on June 11, 2013 does not affect the test specification applied to the EUT.

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	6.2dB 0.13420MHz 0 deg., PK with Duty factor (Antenna (TYPE 2))	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	4.7dB 62.268MHz, QP, Vertical (Antenna (TYPE 2))	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.

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	4.3dB	5.0dB	5.1dB	4.9dB	5.8dB	4.4dB	4.3dB
No.2	4.3dB	5.2dB	5.1dB	5.0dB	5.7dB	4.3dB	4.2dB
No.3	4.6dB	5.0dB	5.1dB	5.0dB	5.7dB	4.5dB	4.2dB
No.4	4.8dB	5.2dB	5.0dB	5.0dB	5.7dB	5.2dB	4.2dB

*3m/1m/0.5m = Measurement distance

Radiated emission test(3m)
[Electric Field Strength of Fundamental Emission]
The data listed in this test report has enough margin, more than the site margin.

[Electric Field Strength of Spurious Emission]
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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 8999 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	-	-	8.8 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.

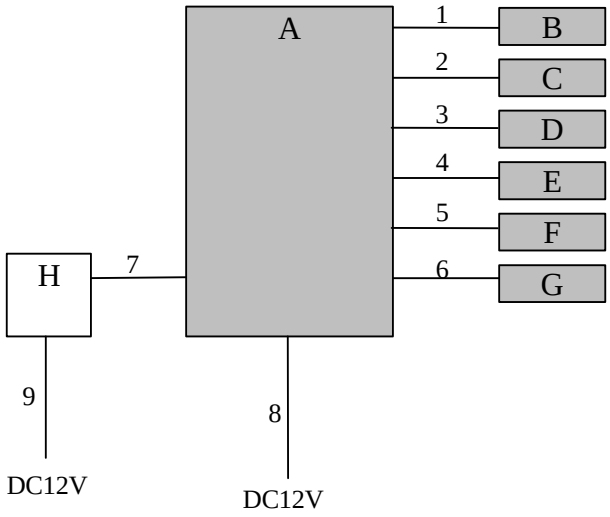
SECTION 4: Operation of E.U.T. during testing

4.1 Operating Modes

The mode is used: Transmitting mode (Tx) 134.2kHz

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.

* This system has two kinds of antenna ports.
- Two ports where Antenna (TYPE 1) is connected
- Four ports where Antenna (TYPE 2) is connected
The test was performed with each representative one of above two kinds of antenna ports.

* Antenna (Type 1) and Antenna (Type 2) were evaluated with the worst duty respectively.
Worst duty does not change due to the difference in number of connected antenna.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart ECU	-	001	-	EUT
B	Antenna (TYPE 1)	-	001	-	EUT
C	Antenna (TYPE 1)	-	001	-	EUT
D	Antenna (TYPE 2)	-	001	-	EUT
E	Antenna (TYPE 2)	-	001	-	EUT
F	Antenna (TYPE 2)	-	001	-	EUT
G	Antenna (TYPE 2)	-	001	-	EUT
H	Jig	-	-	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna (TYPE 1) Cable	3.0	Unshielded	Unshielded	-
2	Antenna (TYPE 1) Cable	3.0	Unshielded	Unshielded	-
3	Antenna (TYPE 2) Cable	3.0	Unshielded	Unshielded	-
4	Antenna (TYPE 2) Cable	3.0	Unshielded	Unshielded	-
5	Antenna (TYPE 2) Cable	3.0	Unshielded	Unshielded	-
6	Antenna (TYPE 2) Cable	3.0	Unshielded	Unshielded	-
7	Signal Cable	3.0	Unshielded	Unshielded	-
8	DC Cable	3.0	Unshielded	Unshielded	-
9	DC Cable	3.0	Unshielded	Unshielded	-

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/ PK with Duty factor	QP	PK/ PK with Duty factor	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- 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.

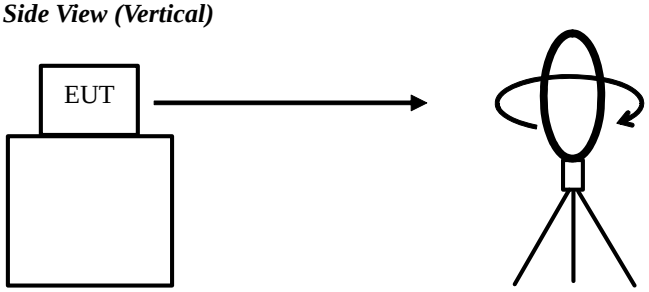
* Part 15 Section 15.31 (f)(2) (9kHz-30MHz)
[Limit at 3m]=[Limit at 300m]-40 x log (3[m]/300[m])
[Limit at 3m]=[Limit at 30m]-40 x log (3[m]/30[m])

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

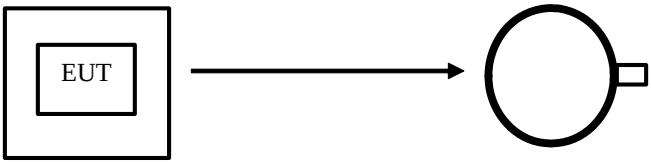
Date: June 3 and 4, 2013 Test engineer: Hironobu Ohnishi

Figure 1: Direction of the Loop Antenna

Side View (Vertical)

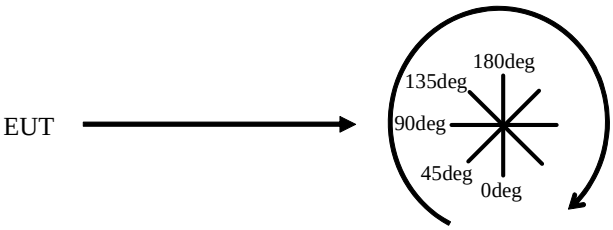


Top View (Horizontal)



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

APPENDIX 1: Data of EMI test

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna (TYPE 1)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 1)

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	0.13420	PK	69.7	19.2	6.0	0.0	-	94.9	125.1	30.2	Fundamental
0	0.26840	PK	26.1	19.1	6.1	0.0	-	51.3	119.0	67.7	
0	0.40260	PK	43.8	19.1	6.1	0.0	-	69.0	115.5	46.5	
0	0.53680	QP	7.7	19.1	6.1	0.0	-	32.9	73.0	40.1	
0	0.67100	QP	30.4	19.2	6.2	0.0	-	55.8	71.1	15.3	
0	0.80520	QP	7.7	19.2	6.2	0.0	-	33.1	69.5	36.4	
0	0.93940	QP	18.7	19.2	6.2	0.0	-	44.1	68.1	24.0	
0	1.20780	QP	11.0	19.1	6.3	0.0	-	36.4	65.9	29.5	
0	1.47620	QP	7.5	19.1	6.3	0.0	-	32.9	64.2	31.3	
0	1.74460	QP	4.7	19.1	6.3	0.0	-	30.1	69.5	39.4	
0	2.01300	QP	4.9	19.2	6.3	0.0	-	30.4	69.5	39.1	

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

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	0.13420	PK	69.7	19.2	6.0	0.0	-7.0	87.9	105.1	17.2	Fundamental
0	0.26840	PK	26.1	19.1	6.1	0.0	-7.0	44.3	99.0	54.7	
0	0.40260	PK	43.8	19.1	6.1	0.0	-7.0	62.0	95.5	33.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

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	0.13420	PK	80.7	19.2	6.0	0.0	-	105.9	125.1	19.2	Fundamental
0	0.26840	PK	18.8	19.1	6.1	0.0	-	44.0	119.0	75.0	
0	0.40260	PK	38.9	19.1	6.1	0.0	-	64.1	115.5	51.4	
0	0.53680	QP	11.9	19.1	6.1	0.0	-	37.1	73.0	35.9	
0	0.67100	QP	18.2	19.2	6.2	0.0	-	43.6	71.1	27.5	
0	0.93940	QP	21.2	19.2	6.2	0.0	-	46.6	68.1	21.5	
0	1.20780	QP	18.7	19.1	6.3	0.0	-	44.1	65.9	21.8	
0	1.47620	QP	15.0	19.1	6.3	0.0	-	40.4	64.2	23.8	
0	1.74460	QP	11.1	19.1	6.3	0.0	-	36.5	69.5	33.0	
0	2.01300	QP	8.2	19.2	6.3	0.0	-	33.7	69.5	35.8	

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

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	0.13420	PK	80.7	19.2	6.0	0.0	-7.0	98.9	105.1	6.2	Fundamental
0	0.26840	PK	18.8	19.1	6.1	0.0	-7.0	37.0	99.0	62.0	
0	0.40260	PK	38.9	19.1	6.1	0.0	-7.0	57.1	95.5	38.4	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

Radiated Emission below 30MHz (Fundamental and Spurious Emission)

Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

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	0.13420	PK	55.3	19.2	6.0	0.0	-	80.5	125.1	44.6	Fundamental
0	0.26840	PK	22.3	19.1	6.1	0.0	-	47.5	119.0	71.5	
0	0.40260	PK	23.8	19.1	6.1	0.0	-	49.0	115.5	66.5	
0	0.53680	QP	13.0	19.1	6.1	0.0	-	38.2	73.0	34.8	
0	0.67100	QP	7.2	19.2	6.2	0.0	-	32.6	71.1	38.5	
0	0.80520	QP	10.0	19.2	6.2	0.0	-	35.4	69.5	34.1	
0	0.93940	QP	6.7	19.2	6.2	0.0	-	32.1	68.1	36.0	
0	1.07360	QP	7.7	19.1	6.2	0.0	-	33.0	66.9	33.9	
0	1.20780	QP	6.0	19.1	6.3	0.0	-	31.4	65.9	34.5	
0	1.34200	QP	5.9	19.1	6.3	0.0	-	31.3	65.0	33.7	
0	1.61040	QP	5.0	19.1	6.3	0.0	-	30.4	63.4	33.0	

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

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	0.13420	PK	55.3	19.2	6.0	0.0	-7.0	73.5	105.1	31.6	Fundamental
0	0.26840	PK	22.3	19.1	6.1	0.0	-7.0	40.5	99.0	58.5	
0	0.40260	PK	23.8	19.1	6.1	0.0	-7.0	42.0	95.5	53.5	

Result = Reading + Ant Factor + Loss (Cable+Attenuator+Filter) - Gain(Amprifier) + Duty factor (Refer to Duty factor data sheet)

Radiated Emission above 30MHz (Spurious Emission)

Antenna (TYPE 1)

DATA OF RADIATED EMISSION TEST

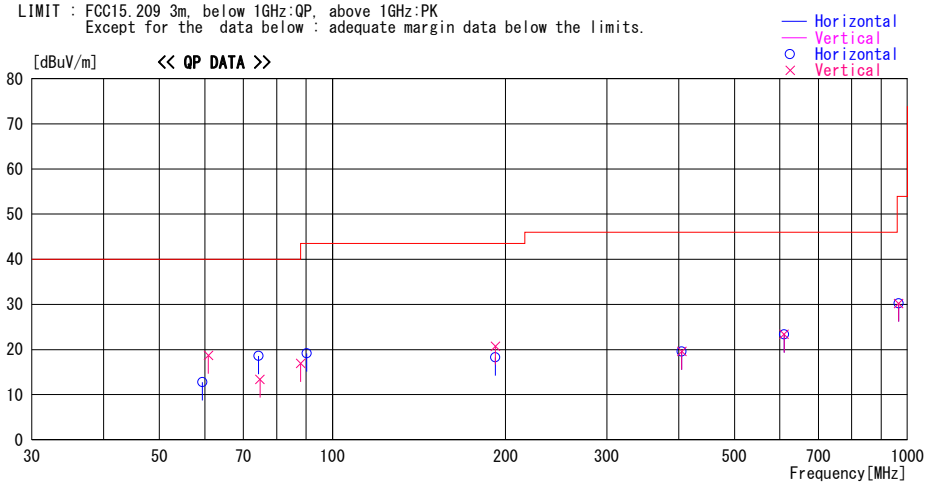
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/04

Report No. : 10013574H

Temp./Humi. : 22deg. C / 63% RH
Engineer : Hironobu Ohnishi

Mode / Remarks : Tx 134.2kHz Antenna(TYPE1) Worst axis(Hor.:Antenna X, ECU X / Ver.:Antenna X ,ECU X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



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]	
59.398	28.8	QP	8.4	-24.4	12.8	98	333	Hori.	40.0	27.2	
60.848	35.0	QP	8.1	-24.4	18.7	102	100	Vert.	40.0	21.3	
74.433	35.8	QP	6.8	-24.0	18.6	187	249	Hori.	40.0	21.4	
74.793	30.6	QP	6.8	-24.0	13.4	285	100	Vert.	40.0	26.6	
90.210	34.6	QP	8.3	-23.7	19.2	329	361	Hori.	43.5	24.3	
88.040	32.7	QP	8.0	-23.8	16.9	69	100	Vert.	43.5	26.6	
192.074	26.3	QP	16.9	-22.5	20.7	219	100	Vert.	43.5	22.8	
192.074	23.9	QP	16.9	-22.5	18.3	359	300	Hori.	43.5	25.2	NS
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Hori.	46.0	26.4	NS
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Vert.	46.0	26.4	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Hori.	46.0	22.6	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Vert.	46.0	22.6	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Hori.	53.9	23.7	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Vert.	53.9	23.7	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 test result is rounded off to one or two decimal places, so some differences might be observed.

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

Radiated Emission above 30MHz (Spurious Emission)

Antenna (TYPE 2)

DATA OF RADIATED EMISSION TEST

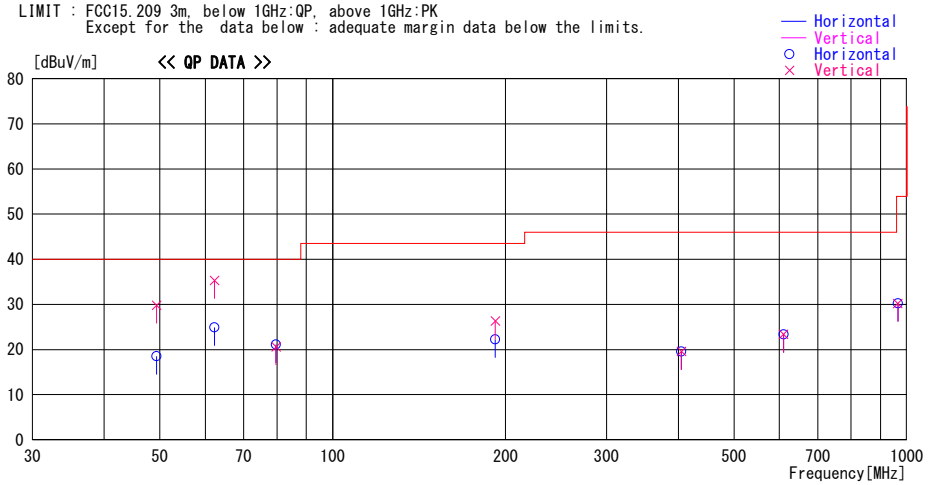
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/04

Report No. : 10013574H

Temp./Humi. : 22deg. C / 63% RH
Engineer : Hironobu Ohnishi

Mode / Remarks : Tx 134.2kHz Antenna (TYPE 2) Worst axis(Hor.:Antenna Y, ECU X / Ver.:Antenna Y ,ECU X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



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
49.380	43.1	QP	11.3	-24.6	29.8	303	100	Vert.	40.0	10.2	
49.380	31.8	QP	11.3	-24.6	18.5	359	400	Hori.	40.0	21.5	
62.268	41.3	QP	7.9	-24.3	24.9	192	366	Hori.	40.0	15.1	
62.268	51.7	QP	7.9	-24.3	35.3	135	100	Vert.	40.0	4.7	
79.713	37.7	QP	6.9	-24.0	20.6	311	100	Vert.	40.0	19.4	
79.713	38.2	QP	6.9	-24.0	21.1	177	245	Hori.	40.0	18.9	
192.081	31.9	QP	16.9	-22.5	26.3	265	100	Vert.	43.5	17.2	
192.081	27.8	QP	16.9	-22.5	22.2	144	255	Hori.	43.5	21.3	
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Vert.	46.0	26.4	NS
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Hori.	46.0	26.4	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Hori.	46.0	22.6	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Vert.	46.0	22.6	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Hori.	53.9	23.7	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Vert.	53.9	23.7	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 test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission above 30MHz (Spurious Emission)

Antenna (TYPE 2)

DATA OF RADIATED EMISSION TEST

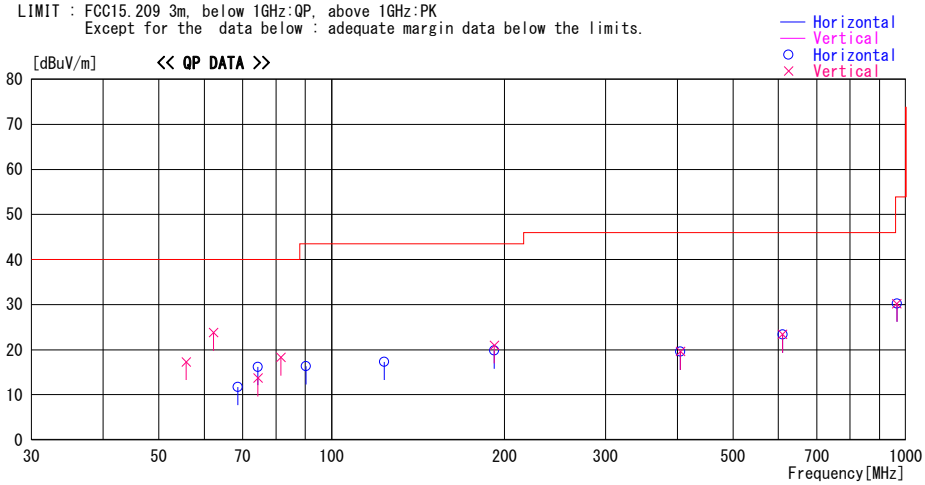
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/04

Report No. : 10013574H

Temp./Humi. : 22deg. C / 63% RH
Engineer : Hironobu Ohnishi

Mode / Remarks : Tx 134.2kHz Antenna(TYPE2) Worst axis(Hor.:Antenna Y, ECU X / Ver.:Antenna Y ,ECU X)

LIMIT : FCC15.209 3m, below 1GHz:QP, above 1GHz:PK
Except for the data below : adequate margin data below the limits.



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
55.821	32.3	QP	9.4	-24.4	17.3	30	100	Vert.	40.0	22.7	
62.264	40.2	QP	7.9	-24.3	23.8	158	100	Vert.	40.0	16.2	
68.697	28.9	QP	6.9	-24.1	11.7	142	291	Hori.	40.0	28.3	
74.429	30.9	QP	6.8	-24.0	13.7	278	100	Vert.	40.0	26.3	
74.449	33.4	QP	6.8	-24.0	16.2	164	255	Hori.	40.0	23.8	
81.583	35.1	QP	7.1	-23.9	18.3	168	100	Vert.	40.0	21.7	
90.172	31.8	QP	8.2	-23.7	16.3	345	341	Hori.	43.5	27.2	
123.441	26.9	QP	13.6	-23.2	17.3	359	272	Hori.	43.5	26.2	
192.058	26.6	QP	16.9	-22.5	21.0	178	100	Vert.	43.5	22.5	
192.058	25.4	QP	16.9	-22.5	19.8	91	300	Hori.	43.5	23.7	
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Hori.	46.0	26.4	NS
405.000	22.8	QP	17.6	-20.8	19.6	359	100	Vert.	46.0	26.4	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Hori.	46.0	22.6	NS
610.000	23.4	QP	19.6	-19.6	23.4	359	100	Vert.	46.0	22.6	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Hori.	53.9	23.7	NS
965.000	23.1	QP	23.4	-16.3	30.2	359	100	Vert.	53.9	23.7	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 test result is rounded off to one or two decimal places, so some differences might be observed.

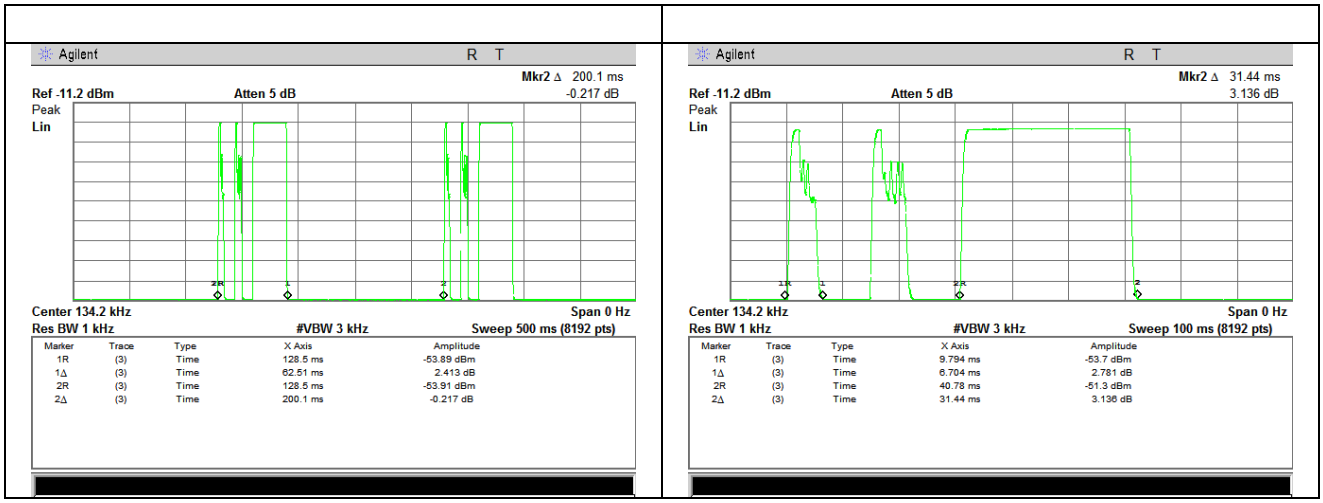
Duty factor data sheet

Antenna (TYPE 1)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 1)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
44.85	100.00	0.45	-7.0

ON time = 6.704 * 2 + 31.44 = 44.85
Duty = 20log10(ON time/Cycle)



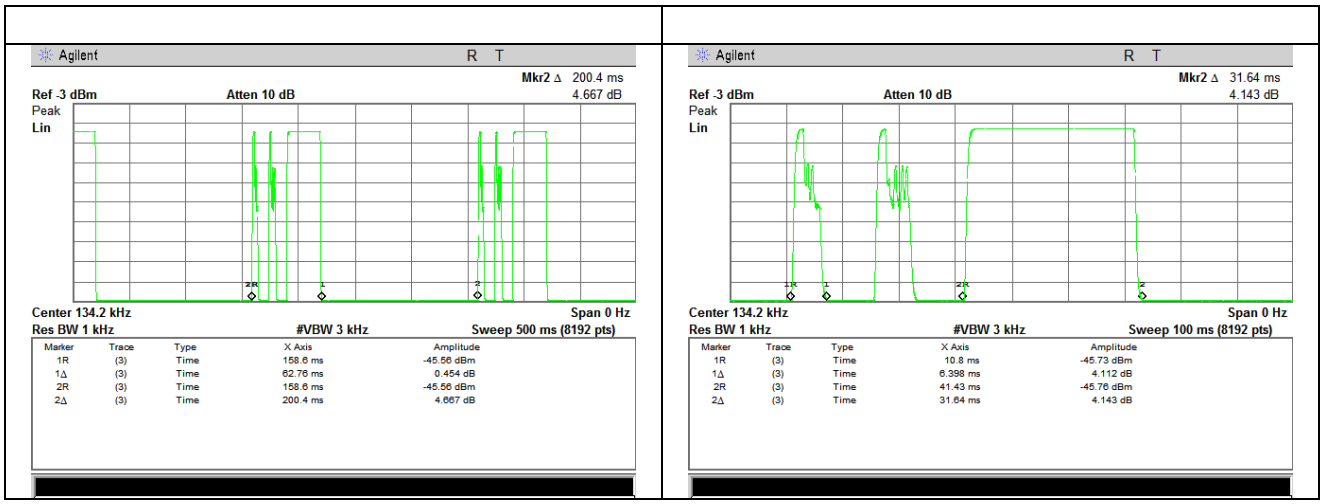
Duty factor data sheet

Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
44.44	100.00	0.44	-7.0

ON time = 6.398 * 2 + 31.64 = 44.44
Duty = 20log10(ON time/Cycle)



Duty factor data sheet

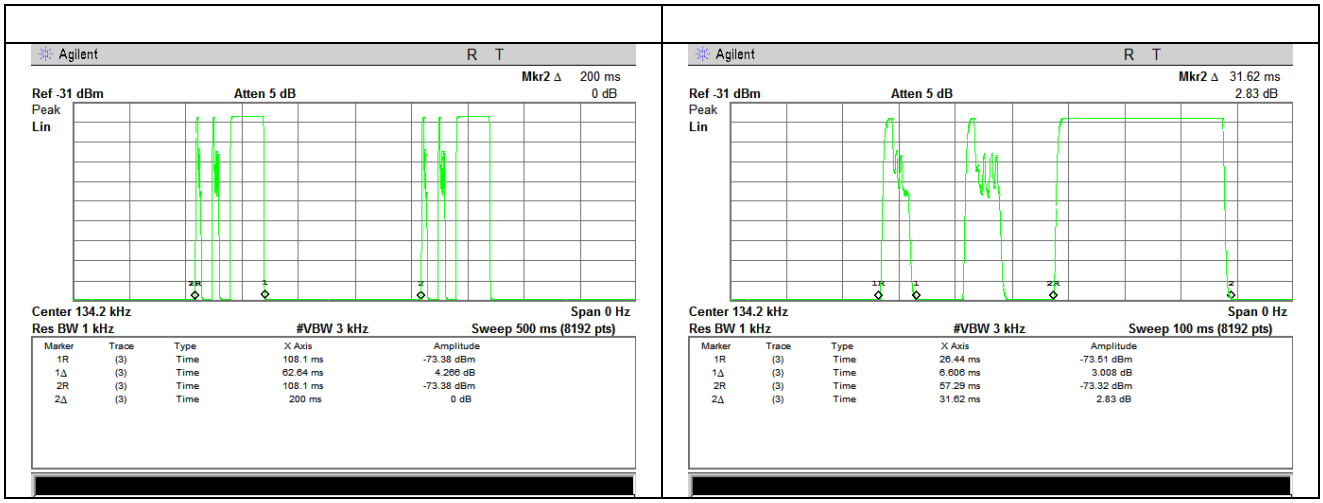
Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

ON time [ms]	Cycle [ms]	Duty (On time/Cycle)	Duty [dB]
44.83	100.00	0.45	-7.0

ON time = 6.606 * 2 + 31.62 = 44.83

Duty = 20log10(ON time/Cycle)



-26dB Bandwidth and 99% Occupied Bandwidth

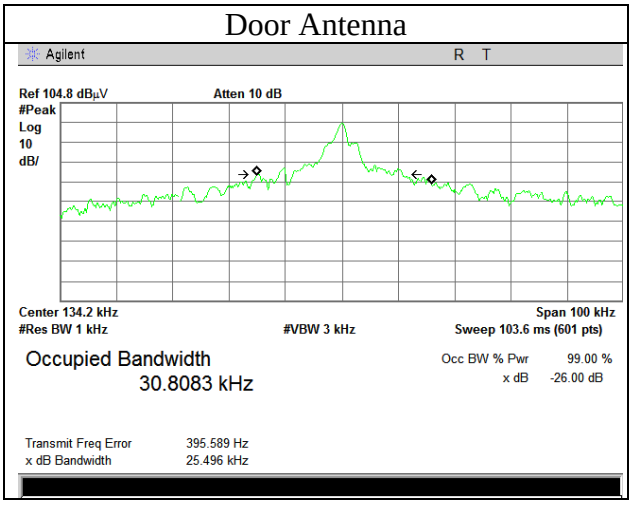
Antenna (TYPE 1)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 1)

-26dB Bandwidth [kHz]
25.496

99% Occupied Bandwidth [kHz]
30.8083

Door Antenna



-26dB Bandwidth and 99% Occupied Bandwidth

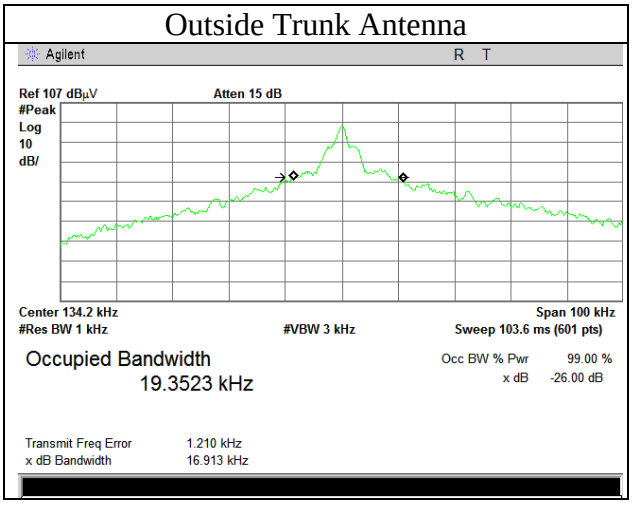
Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

-26dB Bandwidth [kHz]
16.913

99% Occupied Bandwidth [kHz]
19.3523

Outside Trunk Antenna



26dB Bandwidth and 99% Occupied Bandwidth

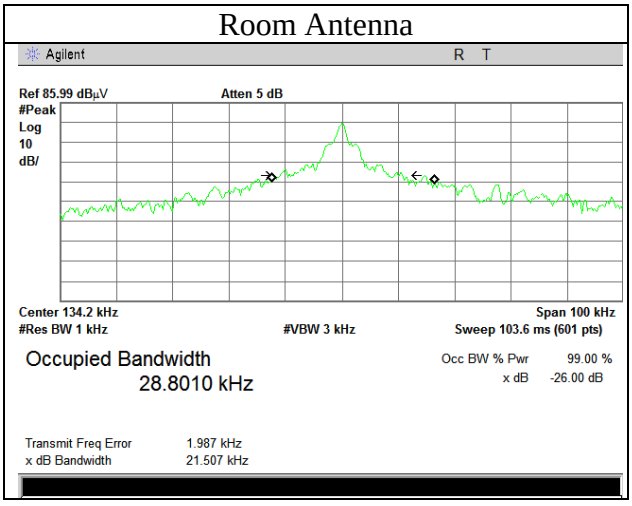
Antenna (TYPE 2)

Test place	Head Office EMC Lab. No.1 Semi Anechoic Chamber
Order No.	10013574H
Date	06/03/2013
Temperature/ Humidity	22 deg. C / 63% RH
Engineer	Hironobu Ohnishi
Mode	Tx 134.2kHz, Antenna (TYPE 2)

-26dB Bandwidth [kHz]
21.507

99% Occupied Bandwidth [kHz]
28.8010

Room Antenna



APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-01	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 10m	DA-06881	RE	2012/08/01 * 12
MOS-27	Thermo-Hygrometer	CUSTOM	CTH-201	A08Q26	RE	2013/02/26 * 12
MJM-01	Measure	KDS	ES19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-09	EMI Test Receiver	Rohde & Schwarz	ESU26	100412	RE	2012/06/14 * 12
MLPA-01	Loop Antenna	Rohde & Schwarz	HFH2-Z2	100017	RE	2012/10/12 * 12
MCC-143	Coaxial Cable	UL Japan	-	-	RE	2012/07/27 * 12
MCC-03	Coaxial Cable	Fujikura/Suhner/TSJ	5D-2W(20m)/3D-2W(7.5m)/RG400u(1.5m)/RFM-E421(Switcher)	-/01068(Switcher)	RE	2013/01/23 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2013/03/12 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2012/11/06 * 12
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2012/11/18 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2012/11/18 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/TSJ	-	-	RE	2012/09/13 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2013/03/12 * 12
MSA-06	Spectrum Analyzer	Agilent	E4407B	MY45107638	RE	2013/04/05 * 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