



EMI TEST REPORT

Test Report No. : 10017512H-A

Applicant : Alps Electric Co., Ltd.
Type of Equipment : TPMS/KEYLESS RECEIVER
Model No. : TWD1U848
Test regulation : FCC Part 15 Subpart B: 2012
FCC ID : CWTWD1U848
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 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.

Date of test: June 15, 2013

Representative test engineer:

T. Shimada

Takumi Shimada
Engineer of WiSE Japan,
UL Verification Service

Approved by:

M. Nishiyama

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>

UL Japan, Inc.

Head Office EMC Lab.

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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 10017512H-A

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CONTENTS	PAGE
SECTION 1: Customer information	4
SECTION 2: Equipment under test (E.U.T.)	4
SECTION 3: Test specification, procedures & results	5
SECTION 4: Operation of E.U.T. during testing	7
SECTION 5: Radiated Emission	8
APPENDIX 1: Data of EMI test	9
Radiated Emission	9
APPENDIX 2: Test instruments	13
APPENDIX 3: Photographs of test setup.....	14
Radiated Emission	14
Worst Case Position (Horizontal: X-axis/ Vertical:Y-axis)	16

SECTION 1: Customer information

Company Name : Alps Electric Co., Ltd.
Address : 6-3-36, Nakazato, Furukawa, Osaki-city, Miyagi-pref, 989-6181, Japan
Telephone Number : +81-229-23-5111
Facsimile Number : +81-229-24-6334
Contact Person : Toru Kinoshita

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

2.1 Identification of E.U.T.

Type of Equipment : TPMS/KEYLESS RECEIVER
Model No. : TWD1U848
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : June 8, 2013
Country of Mass-production : Estados Unidos Mexicanos
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: TWD1U848 (referred to as the EUT in this report) is the TPMS/KEYLESS RECEIVER.

General Specification

Feature of EUT : This TPMS TUNER CONT receives and detects RF signal from remote control, and performs locking or unlocking of a door.
It also receives RF signal from TPMS sensor, warns trouble of air pressure.
Clock frequency in the system : 35.55MHz (Oscillator circuit)

Radio Specification

Frequency of operation : 315MHz
Oscillator Frequency : 29.5098MHz
Local Oscillator Frequency : 314.77MHz
Intermediate Frequency : 230kHz
Type of modulation : ASK
Operating voltage : DC 9 to 16V
Antenna Type : Built-in Antenna
Operating Temperature : -30 to +80 deg. C

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: 2012, final revised on December 27, 2012 and effective January 28, 2013

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

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	3.9dB 431.863MHz Vertical, QP	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

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)

The data listed in this report meets the limits unless the uncertainty is taken into consideration.

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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.

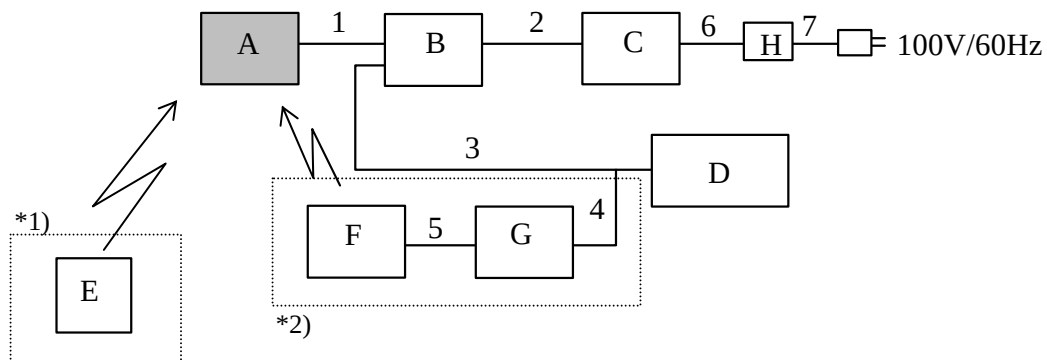
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Mode	Remarks
Keyless Receiving mode TPMS Receiving mode	* Passive Entry System was operated manually by a test engineer and the test was performed with the EUT receiving 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.

*1) Used for Keyless Receiving mode only.

*2) Used for TPMS Receiving mode only.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	TPMS/KEYLESS RECEIVER	TWD1U848	R13060701	Alps Electric Co., Ltd.	EUT
B	RS232C Level Converter	-	RSLC01	Alps Electric Co., Ltd.	Jig
C	Personal Computer	FMVNC4BC3	CP271200	FUJITSU LIMITED	-
D	Car Battery	HTSS-55B19L	0092S67010	BOSCH	-
E	RKE Transmitter	TFWB1U946	BF4TX01	Alps Electric Co., Ltd.	-
F	TPMS Transmitter	TFWB1U946-T	TTR01	Alps Electric Co., Ltd.	-
G	TPMS DUMMY TRANSMITTER	TPMSDUS	TDTR01	Alps Electric Co., Ltd.	-
H	AC Adapter	SEB80N2-19.0	04X20745E	FUJITSU LIMITED	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Signal cable	2.0	Unshielded	Unshielded	-
2	RS232C cable	2.0	Unshielded	Unshielded	-
3	DC cable	1.5	Unshielded	Unshielded	-
4	DC cable	1.5	Unshielded	Unshielded	-
5	Signal cable	0.2	Unshielded	Unshielded	-
6	DC Cable	1.8	Unshielded	Unshielded	-
7	AC Cable	2.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.1 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

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

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

- The 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.

5.5 Test result

Summary of the test results: Pass

Date: June 15, 2013

Test engineer: Tsubasa Takayama

APPENDIX 1: Data of EMI test

Radiated Emission (Below 1GHz)

DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/15

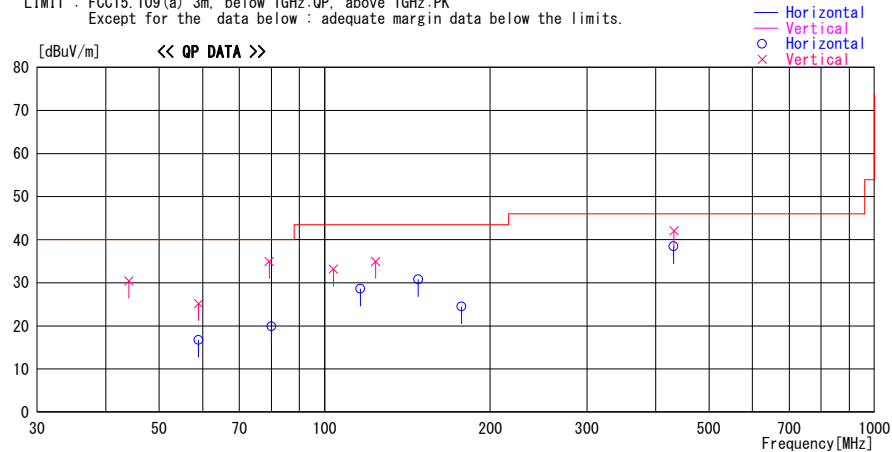
Report No. : 10017512H

Temp./Humi. : 23deg. C / 60% RH
Engineer : Takumi Shimada

Mode / Remarks : TPMS Receiving mode (Worstaxis Hor : X, Ver : Y)

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

Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
44.068	41.8	QP	13.2	-24.6	30.4	157	100	Vert.	40.0	9.6	
59.018	41.1	QP	8.5	-24.4	25.2	120	100	Vert.	40.0	14.8	
59.018	32.6	QP	8.5	-24.4	16.7	147	400	Hori.	40.0	23.3	
79.316	52.2	QP	6.9	-24.1	35.0	252	100	Vert.	40.0	5.0	
79.976	37.1	QP	6.9	-24.1	19.9	298	400	Hori.	40.0	20.1	
116.100	39.3	QP	12.8	-23.5	28.6	190	400	Hori.	43.5	14.9	
123.842	44.8	QP	13.6	-23.4	35.0	277	100	Vert.	43.5	8.5	
103.792	45.8	QP	11.0	-23.6	33.2	183	100	Vert.	43.5	10.3	
148.000	38.9	QP	15.0	-23.1	30.8	330	400	Hori.	43.5	12.7	
177.526	30.5	QP	16.8	-22.8	24.5	112	400	Hori.	43.5	19.0	
431.333	41.3	QP	17.8	-20.6	38.5	324	113	Hori.	46.0	7.5	
431.863	44.9	QP	17.8	-20.6	42.1	164	117	Vert.	46.0	3.9	

CHART:WITH FACTOR ANT TYPE:-30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.+D. FACTOR) - 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 (Below 1GHz)

DATA OF RADIATED EMISSION TEST

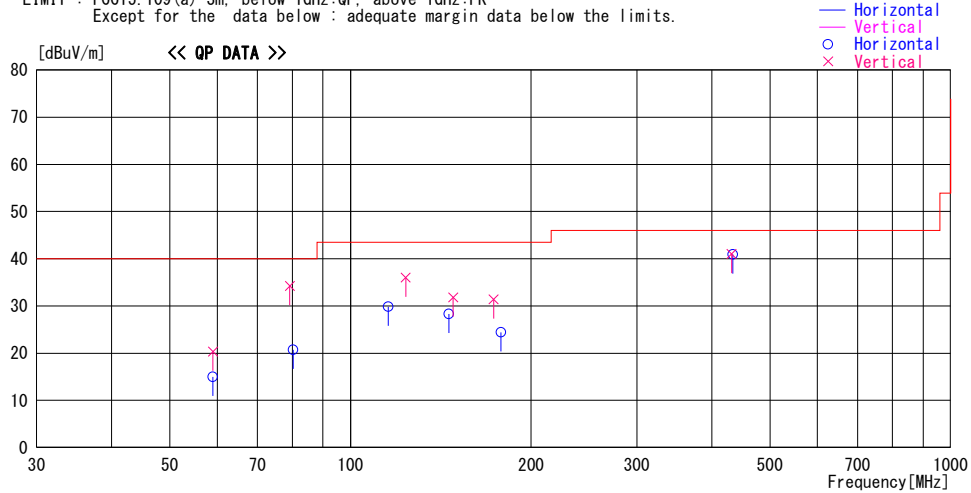
UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/15

Report No. : 10017512H

Temp./Humi. : 23deg. C / 60% RH
Engineer : Takumi Shimada

Mode / Remarks : Keyless Receiving mode (Worstaxis Hor : X, Ver : 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 [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
59.018	30.9	QP	8.5	-24.4	15.0	145	400	Hori.	40.0	25.0	
59.018	36.2	QP	8.5	-24.4	20.3	261	100	Vert.	40.0	19.7	
79.238	51.4	QP	6.9	-24.1	34.2	201	100	Vert.	40.0	5.8	
80.321	37.9	QP	6.9	-24.1	20.7	146	400	Hori.	40.0	19.3	
115.614	40.5	QP	12.8	-23.5	29.8	160	400	Hori.	43.5	13.7	
123.607	45.8	QP	13.6	-23.4	36.0	240	100	Vert.	43.5	7.5	
145.792	36.5	QP	14.9	-23.1	28.3	130	400	Hori.	43.5	15.2	
148.316	39.9	QP	15.0	-23.1	31.8	61	100	Vert.	43.5	11.7	
173.211	37.7	QP	16.5	-22.8	31.4	187	100	Vert.	43.5	12.1	
178.256	30.4	QP	16.8	-22.8	24.4	173	400	Hori.	43.5	19.1	
431.577	43.8	QP	17.8	-20.6	41.0	12	183	Vert.	46.0	5.0	
433.927	43.7	QP	17.8	-20.6	40.9	74	100	Hori.	46.0	5.1	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.+D. FACTOR) - GAIN(AMP)

*The limit is rounded down to one decimal place.

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Radiated Emission (Above 1GHz)

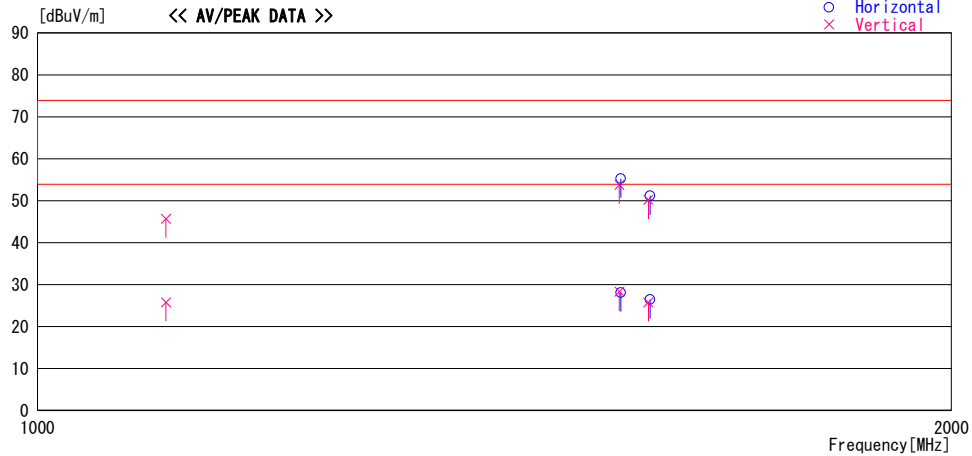
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.1 Semi Anechoic Chamber
Date : 2013/06/15

Report No. : 10017512H
Temp./Humi. : 23deg. C / 60% RH
Engineer : Takumi Shimada

Mode / Remarks : TPMS Receiving mode(Worstaxis Hor : X, Ver : Y)

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



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]	
1102.205	57.1	PK	24.1	-35.5	45.7	181	100	Vert.	73.9	28.2	
1102.205	37.2	AV	24.1	-35.5	25.8	181	100	Vert.	53.9	28.1	
1554.423	62.9	PK	25.7	-34.8	53.8	134	100	Vert.	73.9	20.1	
1554.423	37.4	AV	25.7	-34.8	28.3	134	100	Vert.	53.9	25.6	
1556.208	64.4	PK	25.7	-34.8	55.3	343	100	Hori.	73.9	18.6	
1556.208	37.2	AV	25.7	-34.8	28.1	343	100	Hori.	53.9	25.8	
1589.184	59.1	PK	25.8	-34.7	50.2	177	100	Vert.	73.9	23.7	
1589.184	34.7	AV	25.8	-34.7	25.8	177	100	Vert.	53.9	28.1	
1591.188	35.4	AV	25.8	-34.7	26.5	123	100	Hori.	53.9	27.4	
1591.188	60.1	PK	25.8	-34.7	51.2	123	100	Hori.	73.9	22.7	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:-HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN. +D. FACTOR) - GAIN(AMP)

*The limit is rounded down to one decimal place.

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Radiated Emission (Above 1GHz)

DATA OF RADIATED EMISSION TEST

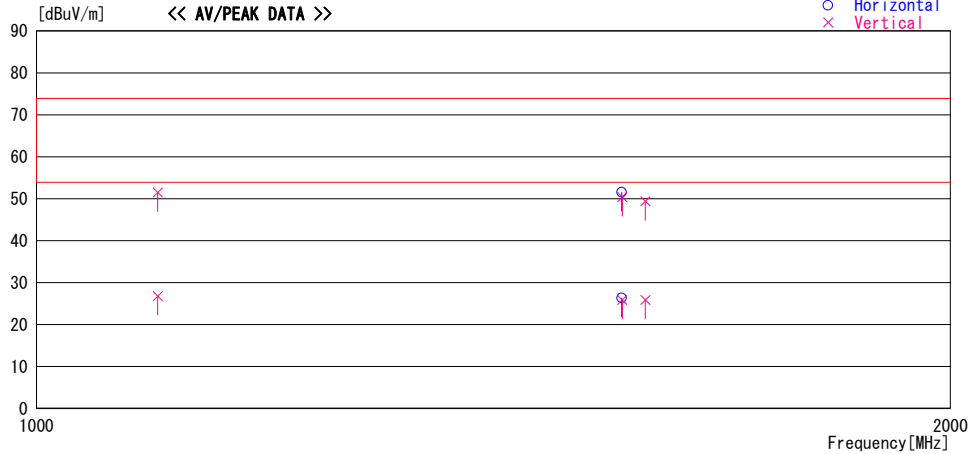
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Engineer : Takumi Shimada

Mode / Remarks : Keyless Receiving mode (Worstaxis Hor : X, Ver : 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 [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
1096.193	62.9	PK	24.1	-35.5	51.5	357	100	Vert.	73.9	22.4	
1096.193	38.2	AV	24.1	-35.5	26.8	357	100	Vert.	53.9	27.1	
1558.612	60.7	PK	25.7	-34.8	51.6	97	100	Hori.	73.9	22.3	
1558.612	35.5	AV	25.7	-34.8	26.4	97	100	Hori.	53.9	27.5	
1559.124	35.0	AV	25.7	-34.8	25.9	277	100	Vert.	53.9	28.0	
1559.124	59.5	PK	25.7	-34.8	50.4	277	100	Vert.	73.9	23.5	
1586.612	34.8	AV	25.8	-34.7	25.9	176	100	Vert.	53.9	28.0	
1586.612	58.3	PK	25.8	-34.7	49.4	176	100	Vert.	73.9	24.5	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-300MHz:BICONICAL, 300MHz-1000MHz:LOGPERIODIC, 1000MHz:-HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN. +D. FACTOR) - 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.

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
KBA-05	Biconical Antenna	Schwarzbeck	BBA9106	2513	RE	2012/11/18 * 12
KLA-04	Logperiodic Antenna	Schwarzbeck	USLP9143	361	RE	2012/11/18 * 12
MAT-08	Attenuator(6dB)	Weinschel Corp	2	BK7971	RE	2012/11/06 * 12
MCC-02	Coaxial Cable	Suhner/storm/Agilent/ TSJ	-	-	RE	2012/09/13 * 12
MPA-13	Pre Amplifier	MITEQ	MLA-10K01-B01-35	1237616	RE	2013/02/07 * 12
MHA-05	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	253	RE	2013/05/13 * 12
MCC-142	Microwave Cable	Junkosha	MWX221	1203S213(1m) / 1204S063(5m)	RE	2013/04/19 * 12
MPA-01	Pre Amplifier	Agilent	8449B	3008A01671	RE	2013/02/22 * 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

UL Japan, Inc.

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