



EMI TEST REPORT

Test Report No. : 10197084H-A

Applicant : Alps Electric Co., Ltd.
Type of Equipment : TPMS TUNER CONT
Model No. : TWD1G791
Test regulation : FCC Part 15 Subpart B: 2013
FCC ID : CWTWD1G791
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: February 13 and 14, 2014

Representative test engineer:

Yuta Moriya
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>

UL Japan, Inc.

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13-EM-F0429

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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 : +81-229-23-5129
Contact Person : Toru Kinoshita

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

2.1 Identification of E.U.T.

Type of Equipment : TPMS TUNER CONT
Model No. : TWD1G791
Serial No. : Refer to Section 4, Clause 4.2
Receipt Date of Sample : February 6, 2014
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: TWD1G791 (referred to as the EUT in this report) is the TPMS TUNER CONT.

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 : 40.6584MHz / 16MHz

Radio Specification

Frequency of operation : 433.92MHz
Oscillator Frequency : 40.6584MHz
Local Oscillator Frequency : 433.70MHz
Intermediate Frequency : 220kHz
Bandwidth : 100kHz
Type of modulation : FSK
Operating voltage : DC 12V
Antenna Type : Bar Antenna
Operating Temperature : -40 to +85 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: 2013, final revised on September 30, 2013 and effective October 30, 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	17.6dB 867.400MHz 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

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95% using a coverage factor k=2.

Test room (semi- anechoic chamber)	Radiated emission						
	(3m*)(+dB)				(1m*)(+dB)		(0.5m*)(+dB)
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz	1GHz -10GHz	10GHz -18GHz	18GHz -26.5GHz	26.5GHz -40GHz
No.1	4.0dB	5.1dB	5.0dB	5.1dB	6.0dB	4.9dB	4.3dB
No.2	3.9dB	5.2dB	5.0dB	4.9dB	5.9dB	4.7dB	4.2dB
No.3	4.3dB	5.1dB	5.2dB	5.2dB	6.0dB	4.8dB	4.2dB
No.4	4.6dB	5.2dB	5.0dB	5.2dB	6.0dB	5.7dB	4.2dB

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

Radiated emission test(3m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

UL Japan, Inc. Head Office EMC Lab. *NVLAP Lab. code: 200572-0
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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	655103	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	148738	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	134570	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	-	6.2 x 4.7 x 3.0m	2.4 x 3.4m	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Data of EMI, Test instruments, and Test set up

Refer to APPENDIX.

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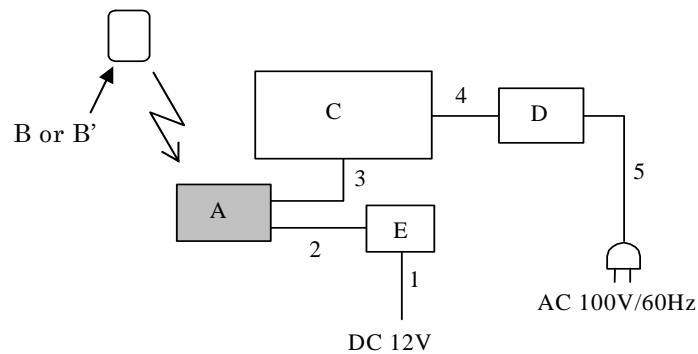
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

Mode	Remarks
Keyless Receiving mode (Rx) 433.92MHz	* TPMS TUNER CONT was operated manually by a test engineer and the test was performed with the EUT receiving 433.92MHz.
TPMS Receiving mode (Rx) 433.92MHz	

*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.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	TPMS TUNER CONT	TWD1G791	393-1	Alps Electric Co., Ltd.	EUT
B	RKE Transmitter	-	001	Alps Electric Co., Ltd.	-
B'	TPMS Transmitter	-	001	Alps Electric Co., Ltd.	-
C	Laptop PC	FMV-C8230	CP271200	FUJITSU LIMITED	-
D	AC Adapter	SEC80N219,0	CP235922-01	FUJITSU LIMITED	-
E	IGN LED BOX	7160-002-2	-	Alps Electric Co., Ltd.	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC cable	1.5	Unshielded	Unshielded	-
2	Signal cable	0.9	Unshielded	Unshielded	-
3	Signal cable	2.9	Unshielded	Unshielded	-
4	DC cable	1.8	Unshielded	Unshielded	-
5	AC cable	1.8	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.4 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. The radiated emission measurements were made with the following detector function of the test receiver.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Test Receiver
IF Bandwidth	QP: BW 120kHz	PK: BW 1MHz, CISPR AV: BW 1MHz

- 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: February 13 and 14, 2014

Test engineer: Yuta Moriya

UL Japan, Inc.

Head Office EMC Lab.

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APPENDIX 1: Data of EMI test

Radiated Emission
(Below 1GHz)

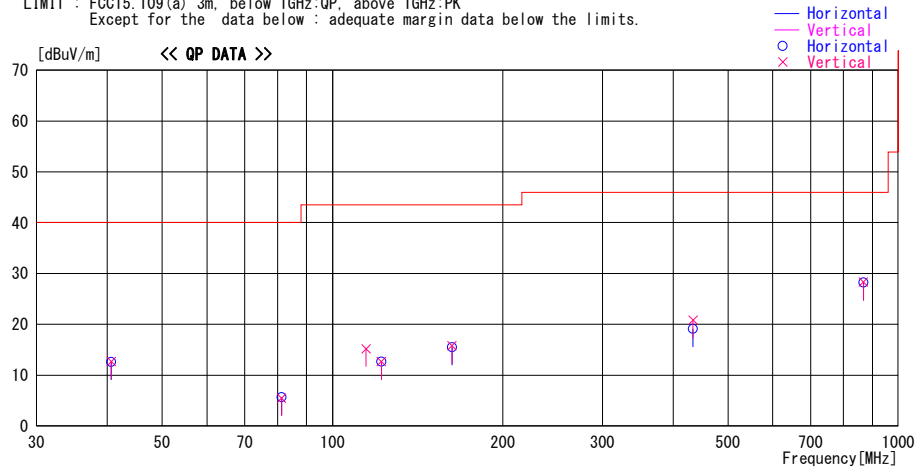
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2014/02/13

Report No. : 10197084H
Temp./Humi. : 23deg. C / 40% RH
Engineer : Yuta Moriya

Mode / Remarks : Keyless Receiving mode Worst-axis (Hori: X / Vert: X)

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.660	23.2	QP	14.3	-24.9	12.6	0	100	Hori.	40.0	27.4	
40.660	23.3	QP	14.3	-24.9	12.7	0	100	Vert.	40.0	27.3	
81.321	23.0	QP	6.7	-24.2	5.5	0	100	Vert.	40.0	34.5	
81.321	23.2	QP	6.7	-24.2	5.7	0	100	Hori.	40.0	34.3	
114.708	26.5	QP	12.3	-23.6	15.2	160	100	Vert.	43.5	28.3	
121.981	23.0	QP	13.2	-23.5	12.7	0	100	Hori.	43.5	30.8	
121.981	23.0	QP	13.2	-23.5	12.7	0	100	Vert.	43.5	30.8	
162.641	23.1	QP	15.5	-23.1	15.5	0	100	Hori.	43.5	28.0	
162.641	23.4	QP	15.5	-23.1	15.8	0	100	Vert.	43.5	27.7	
433.700	22.2	QP	18.1	-21.2	19.1	0	100	Hori.	46.0	26.9	
433.700	23.9	QP	18.1	-21.2	20.8	0	100	Vert.	46.0	25.2	
867.400	22.8	QP	23.8	-18.3	28.3	0	100	Vert.	46.0	17.7	
867.400	22.7	QP	23.8	-18.3	28.2	0	100	Hori.	46.0	17.8	

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
(Below 1GHz)**

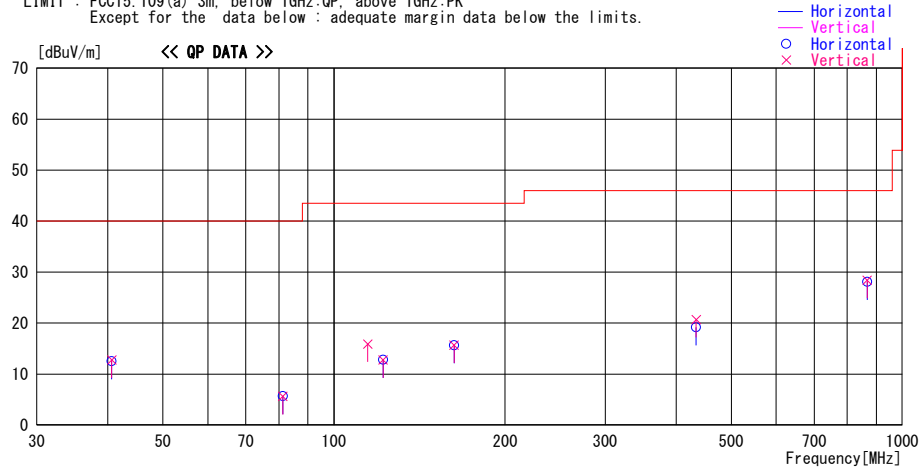
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Engineer : Yuta Moriya

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



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
			[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
40.660	23.1	QP	14.3	-24.9	12.5	0	100	Hori.	40.0	27.5	
40.660	23.4	QP	14.3	-24.9	12.8	0	100	Vert.	40.0	27.2	
81.321	23.1	QP	6.7	-24.2	5.6	0	100	Vert.	40.0	34.4	
81.321	23.2	QP	6.7	-24.2	5.7	0	100	Hori.	40.0	34.3	
114.709	27.2	QP	12.3	-23.6	15.9	164	100	Vert.	43.5	27.6	
121.981	23.1	QP	13.2	-23.5	12.8	0	100	Hori.	43.5	30.7	
121.981	23.1	QP	13.2	-23.5	12.8	0	100	Vert.	43.5	30.7	
162.641	23.2	QP	15.5	-23.1	15.6	0	100	Hori.	43.5	27.9	
162.641	23.3	QP	15.5	-23.1	15.7	0	100	Vert.	43.5	27.8	
433.700	22.3	QP	18.1	-21.2	19.2	0	100	Hori.	46.0	26.8	
433.700	23.8	QP	18.1	-21.2	20.7	0	100	Vert.	46.0	25.3	
867.400	22.9	QP	23.8	-18.3	28.4	0	100	Vert.	46.0	17.6	
867.400	22.6	QP	23.8	-18.3	28.1	0	100	Hori.	46.0	17.9	

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

*The limit is rounded down to one decimal place.

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

Radiated Emission
(Above 1GHz)

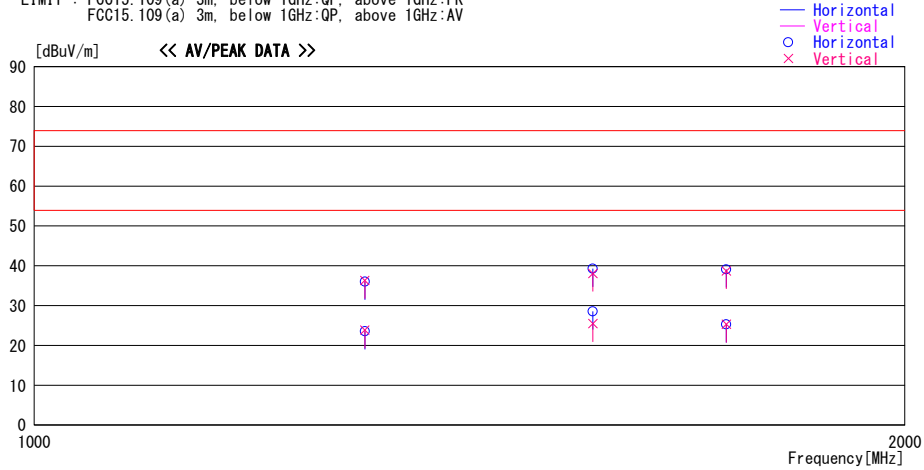
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Engineer : Yuta Moriya

Mode / Remarks : Keyless Receiving mode Worst-axis(Hori:X / Vert:X)

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



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]							
1301.100	43.0	PK	25.2	-32.2	36.0	271	100	Hori.	73.9	37.9	
1301.100	43.3	PK	25.2	-32.2	36.3	250	100	Vert.	73.9	37.6	
1301.100	30.6	AV	25.2	-32.2	23.6	271	100	Hori.	53.9	30.3	
1301.100	30.8	AV	25.2	-32.2	23.8	250	100	Vert.	53.9	30.1	
1559.999	44.9	PK	25.8	-31.4	39.3	8	100	Hori.	73.9	34.6	
1559.999	34.2	AV	25.8	-31.4	28.6	8	100	Hori.	53.9	25.3	
1734.800	43.8	PK	26.2	-30.9	39.1	0	100	Hori.	73.9	34.8	
1734.800	30.0	AV	26.2	-30.9	25.3	0	100	Vert.	53.9	28.6	
1734.800	43.4	PK	26.2	-30.9	38.7	0	100	Vert.	73.9	35.2	
1734.800	30.0	AV	26.2	-30.9	25.3	0	100	Hori.	53.9	28.6	
1559.999	43.7	PK	25.8	-31.4	38.1	11	100	Vert.	73.9	35.8	
1559.999	31.1	AV	25.8	-31.4	25.5	11	100	Vert.	53.9	28.4	

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

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Radiated Emission
(Above 1GHz)

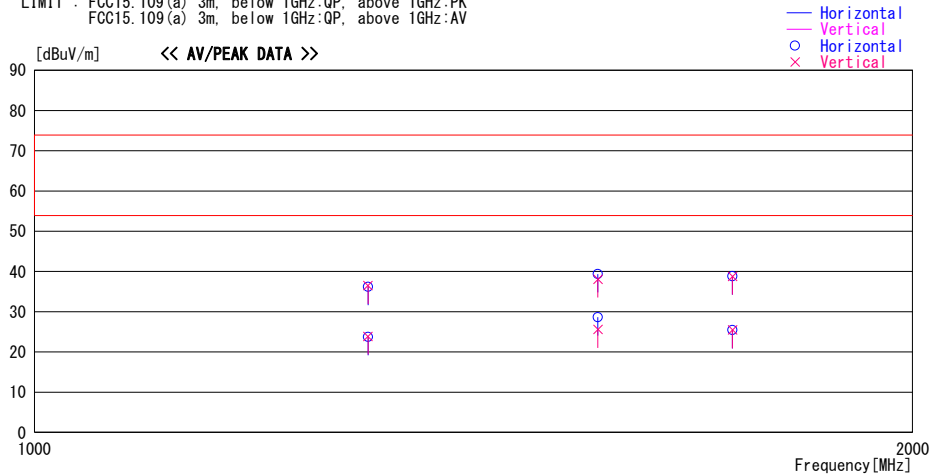
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FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain					[dBuV/m]	[dB]	
1301.100	43.2	PK	25.2	-32.2	36.2	272	100	Hori.	73.9	37.7	
1301.100	43.5	PK	25.2	-32.2	36.5	250	100	Vert.	73.9	37.4	
1301.100	30.7	AV	25.2	-32.2	23.7	272	100	Hori.	53.9	30.2	
1301.100	30.9	AV	25.2	-32.2	23.9	250	100	Vert.	53.9	30.0	
1559.982	45.0	PK	25.8	-31.4	39.4	7	122	Hori.	73.9	34.5	
1559.982	34.3	AV	25.8	-31.4	28.7	7	122	Hori.	53.9	25.2	
1734.800	43.5	PK	26.2	-30.9	38.8	0	100	Hori.	73.9	35.1	
1734.800	30.2	AV	26.2	-30.9	25.5	0	100	Vert.	53.9	28.4	
1734.800	43.5	PK	26.2	-30.9	38.8	0	100	Vert.	73.9	35.1	
1734.800	30.2	AV	26.2	-30.9	25.5	0	100	Hori.	53.9	28.4	
1559.982	43.7	PK	25.8	-31.4	38.1	10	100	Vert.	73.9	35.8	
1559.982	31.2	AV	25.8	-31.4	25.6	10	100	Vert.	53.9	28.3	

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

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2013/02/28 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2013/02/26 * 12
MJM-09	Measure	KDS	E19-55	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-01	Test Receiver	Rohde & Schwarz	ESI40	100084	RE	2013/11/12 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2013/11/24 * 12
MLA-08	Logperiodic Antenna	Schwarzbeck	UKLP9140-A	N/A	RE	2013/11/24 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2013/06/18 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2013/11/26 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2013/03/12 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2013/08/12 * 12
MCC-141	Microwave Cable	Junkosha	MWX221	1305S002R(1m) / 1204S062(5m)	RE	2013/05/28 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2013/03/19 * 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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