




EMI TEST REPORT

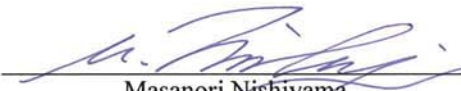
Test Report No. : 32AE0200-HO-03-A-R2

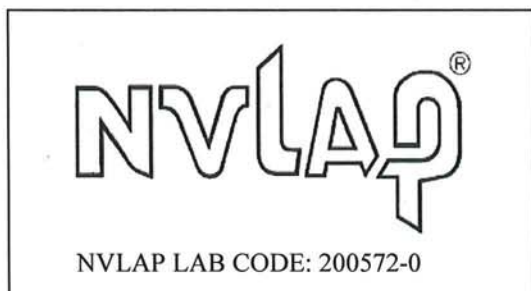
Applicant : Panasonic Corporation Automotive Systems Company
Type of Equipment : SMART PCU
(RF Receiver Part)
Model No. : HM1120CA
Test regulation : FCC Part 15 Subpart B: 2012
FCC ID : ACJ932HM1120CA
Test Result : Complied

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.
6. This report is a revised version of 32AE0200-HO-03-A-R1. 32AE0200-HO-03-A-R1 is replaced with this report.

Date of test: January 19, 2012

Representative test engineer: 
Satofumi Matsuyama
Engineer of WiSE Japan,
UL Verification Service

Approved by: 
Masanori Nishiyama
Leader of WiSE Japan,
UL Verification Service



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>

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SECTION 1: Customer information

Company Name : Panasonic Corporation Automotive Systems Company
Address : 4261 Ikonobe-cho, Tsuzuki-ku, Yokohama city, Kanagawa-ken
224-8520, Japan
Telephone Number : +81-45-939-1665
Facsimile Number : +81-45-939-1917
Contact Person : Masahiro Yoshii

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

2.1 Identification of E.U.T.

Type of Equipment : SMART PCU
(RF Receiver Part)
Model No. : HM1120CA
Serial No. : Refer to Clause 4.2
Rating : DC 6 - 16V
Receipt Date of Sample : November 18, 2011
Country of Mass-production : China and Japan
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

General Specification

Clock frequency(ies) in the system : 16MHz (CPU Main Clock)

Radio Specification

Radio Type : Transceiver

[Transmitter part]

Frequency of Operation : 125kHz
Modulation : ASK
Method of Frequency Generation : Crystal
Output voltage : DC 7.0V
Antenna type : Ferrite Antenna

[Receiver part]

Frequency of Operation : 313.85MHz
Crystal oscillator frequency : 21.948717MHz
Local frequency : 314.124MHz
IF frequency : 274kHz
Antenna type : Monopole Antenna
Antenna gain : -15dBi

UL Japan, Inc.

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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 February 1, 2012

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

*The revision on February 1, 2012 does not affect the test specification applied to the EUT.

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	16.5dB 942.372MHz, Horizontal/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	4.2dB	5.0dB	5.1dB	5.6dB	5.9dB	4.4dB	4.3dB
No.2	4.1dB	5.2dB	5.1dB	5.7dB	5.8dB	4.3dB	4.2dB
No.3	4.5dB	5.0dB	5.2dB	5.7dB	5.8dB	4.5dB	4.2dB
No.4	4.7dB	5.2dB	5.2dB	5.7dB	5.8dB	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.

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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 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 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
RF Receiving (Rx) mode	313.85MHz

Receiver type: Super heterodyne

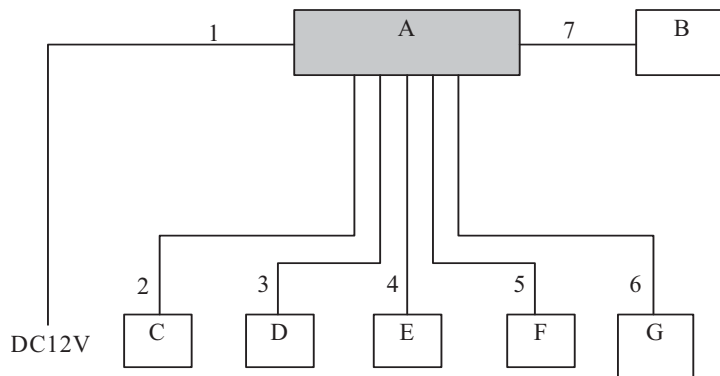
*Tuning was confirmed to be locked by checking local oscillator frequency to be stable using a search-coil.

The EUT has 2 types: Wagon type and Sedan type.

Wagon type has 5 types of LF Antennas (TR Antenna, M/TI Antenna, R Antenna, F Antenna, FRDR Antenna (Mirror)).
Sedan type has 5 types of LF Antennas (TR Antenna, M/TI Antenna, R Antenna, F Antenna, FRDR Antenna (nonmetal or metal)).

The test was performed with representative antenna of each type (Wagon and Sedan).

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Wagon type

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SMART PCU (RF Receiver Part)	HM1120CA	No.3	Panasonic Corporation Automotive Systems Company	EUT
B	Switch jig	13MY	-	Panasonic Corporation Automotive Systems Company	-
C	TR Antenna	38387-SLE-003	SLE001	Panasonic Corporation Automotive Systems Company	-
D	M/TI Antenna	38387-SZW-003	TF0001	Panasonic Corporation Automotive Systems Company	-
E	R Antenna	38388-TF0-003	SZW002	Panasonic Corporation Automotive Systems Company	-
F	F Antenna	38387-SZW-003	SZW001	Panasonic Corporation Automotive Systems Company	-
G	FRDR Antenna (Mirror)	38383-TP6	001	Panasonic Corporation Automotive Systems Company	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.2	Unshielded	Unshielded	-
2	Antenna Cable	2.2	Unshielded	Unshielded	-
3	Antenna Cable	2.0	Unshielded	Unshielded	-
4	Antenna Cable	2.0	Unshielded	Unshielded	-
5	Antenna Cable	2.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Unshielded	Unshielded	-
7	Signal Cable	0.15	Unshielded	Unshielded	-

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Sedan type

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	SMART PCU (RF Receiver Part)	HM1120CA	No.3	Panasonic Corporation Automotive Systems Company	EUT
B	Switch jig	13MY	-	Panasonic Corporation Automotive Systems Company	-
C	TR Antenna	38387-SLE-003	SLE001	Panasonic Corporation Automotive Systems Company	-
D	M/TI Antenna	38388-TF0-003	TF0001	Panasonic Corporation Automotive Systems Company	-
E	R Antenna	38387-SZW-003	SZW002	Panasonic Corporation Automotive Systems Company	-
F	F Antenna	38387-SZW-003	SZW001	Panasonic Corporation Automotive Systems Company	-
G	FRDR Antenna (metal)	TR0-7B000-000	001	Panasonic Corporation Automotive Systems Company	-

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	1.2	Unshielded	Unshielded	-
2	Antenna Cable	2.2	Unshielded	Unshielded	-
3	Antenna Cable	2.0	Unshielded	Unshielded	-
4	Antenna Cable	2.0	Unshielded	Unshielded	-
5	Antenna Cable	2.0	Unshielded	Unshielded	-
6	Antenna Cable	2.0	Unshielded	Unshielded	-
7	Signal Cable	0.15	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : See data
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	Spectrum Analyzer
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

APPENDIX 1: Data of EMI test

Radiated Emission
Wagon type

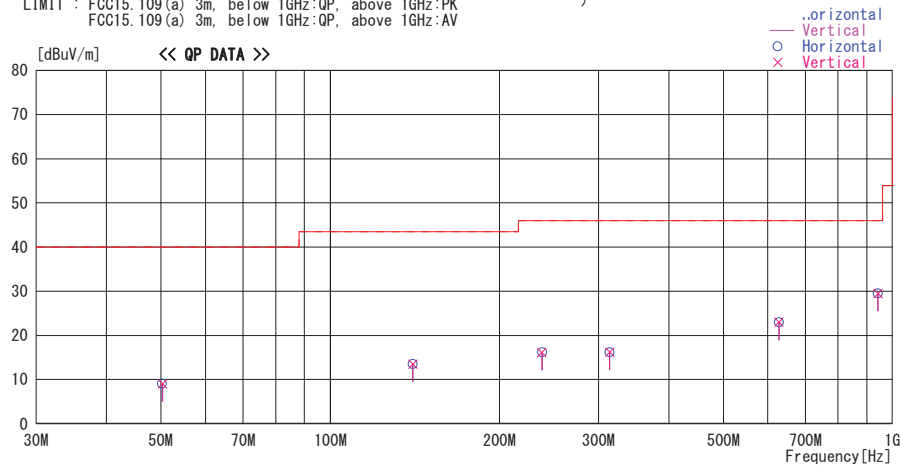
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.4 Semi Anechoic Chamber
Date : 2012/01/19

Report No. : 32AE0200-HO-03
Power : DC 12.0V
Temp./Humi. : 23 deg. C / 35% RH
Engineer : Satofumi Matsuyama

Mode / Remarks : RF Rx 313.85MHz, Wagon type, Worst-axis(PCU H:X V:X, Ant H:Z V:Z)

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	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
50.250	23.0	QP	11.0	-24.9	9.1	0	300	Hori.	40.0	30.9	
50.346	22.9	QP	11.0	-24.9	9.0	0	100	Vert.	40.0	31.0	
140.244	22.5	QP	14.6	-23.6	13.5	0	100	Vert.	43.5	30.0	
140.250	22.5	QP	14.6	-23.6	13.5	0	300	Hori.	43.5	30.0	
237.899	21.7	QP	17.1	-22.7	16.1	0	100	Vert.	46.0	29.9	
238.349	21.8	QP	17.1	-22.7	16.2	0	300	Hori.	46.0	29.8	
314.124	22.1	QP	16.3	-22.2	16.2	0	100	Hori.	46.0	29.8	
314.124	22.1	QP	16.3	-22.2	16.2	0	100	Vert.	46.0	29.8	
628.248	22.4	QP	21.0	-20.4	23.0	0	100	Hori.	46.0	23.0	
628.248	22.4	QP	21.0	-20.4	23.0	0	100	Vert.	46.0	23.0	
942.372	22.1	QP	25.2	-17.8	29.5	0	100	Hori.	46.0	16.5	
942.372	22.1	QP	25.2	-17.8	29.5	0	100	Vert.	46.0	16.5	

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
 Wagon type

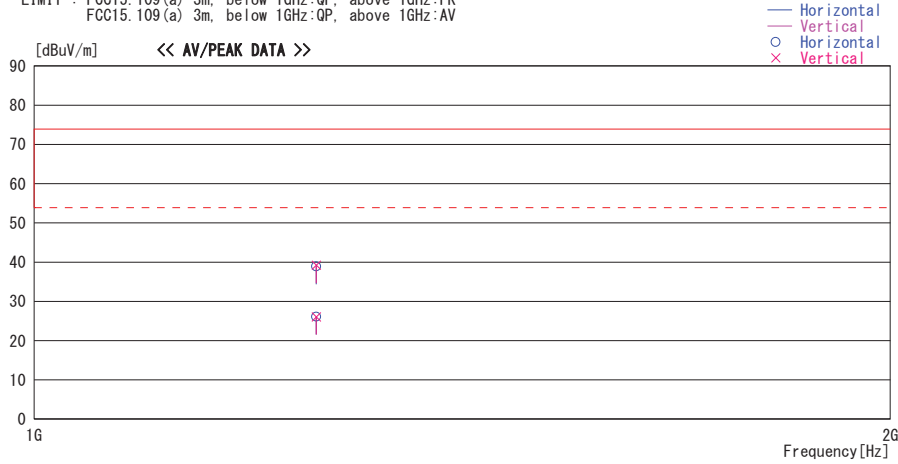
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 Power : DC 12.0V
 Temp./Humi. : 23 deg. C / 35% RH
 Engineer : Satofumi Matsuyama

Mode / Remarks : RF Rx 313.85MHz, Wagon type, Worst-axis(PCU H:X V: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	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
1256.496	46.8	PK	24.6	-32.2	39.2	0	100	Vert.	73.9	34.7	
1256.496	46.5	PK	24.6	-32.2	38.9	0	100	Hori.	73.9	35.0	
1256.496	33.7	AV	24.6	-32.2	26.1	0	100	Vert.	53.9	27.8	
1256.496	33.7	AV	24.6	-32.2	26.1	0	100	Hori.	53.9	27.8	

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Radiated Emission
Sedan type

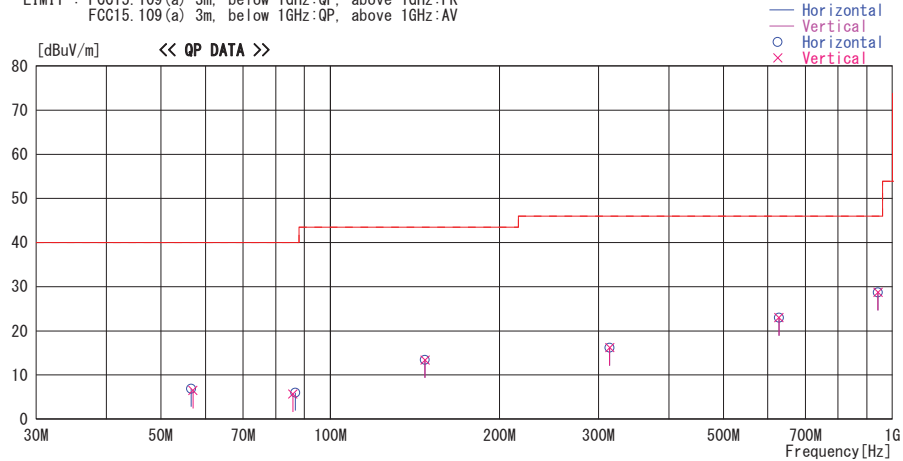
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LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
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Frequency [MHz]	Reading [dBuV]	DET	Antenna	Loss&	Level [dBuV/m]	Angle [Deg]	Height [cm]	Polar.	Limit [dBuV/m]	Margin [dB]	Comment
			Factor [dB/m]	Gain [dB]							
56.588	22.6	QP	9.0	-24.7	6.9	0	300	Hori.	40.0	33.1	
56.998	22.3	QP	8.9	-24.7	6.5	0	100	Vert.	40.0	33.5	
85.842	22.3	QP	7.6	-24.2	5.7	0	100	Vert.	40.0	34.3	
86.715	22.5	QP	7.7	-24.2	6.0	0	300	Hori.	40.0	34.0	
147.375	22.0	QP	14.9	-23.5	13.4	0	300	Hori.	43.5	30.1	
147.450	22.0	QP	14.9	-23.5	13.4	0	100	Vert.	43.5	30.1	
314.124	22.1	QP	16.3	-22.2	16.2	0	100	Hori.	46.0	29.8	
314.124	22.1	QP	16.3	-22.2	16.2	0	100	Vert.	46.0	29.8	
628.248	22.4	QP	21.0	-20.4	23.0	0	100	Hori.	46.0	23.0	
628.248	22.4	QP	21.0	-20.4	23.0	0	100	Vert.	46.0	23.0	
942.372	21.3	QP	25.2	-17.8	28.7	0	100	Hori.	46.0	17.3	
942.372	21.3	QP	25.2	-17.8	28.7	0	100	Vert.	46.0	17.3	

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CALCULATION: RESULT = READING + ANT FACTOR + LOSS (CABLE+ATTEN.) - GAIN (AMP)

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Radiated Emission
 Sedan type

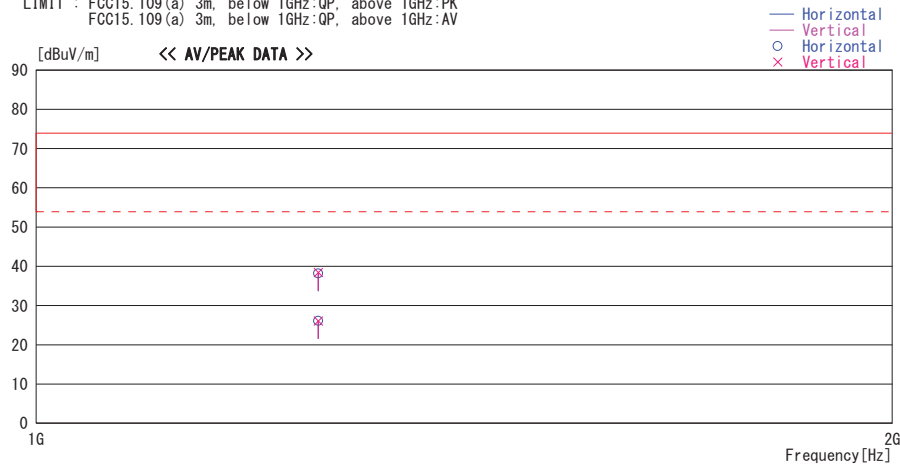
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LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
 FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1256.496	46.0	PK	24.6	-32.2	38.4	0	100	Vert.	73.9	35.5	
1256.496	45.8	PK	24.6	-32.2	38.2	0	100	Hori.	73.9	35.7	
1256.496	33.7	AV	24.6	-32.2	26.1	0	100	Vert.	53.9	27.8	
1256.496	33.7	AV	24.6	-32.2	26.1	0	100	Hori.	53.9	27.8	

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*The limit is rounded down to one decimal place.
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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	2011/03/01 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	-	RE	2011/02/23 * 12
MJM-07	Measure	PROMART	SEN1955	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-04	Spectrum Analyzer	Agilent	E4448A	US44300523	RE	2011/04/08 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2011/10/19 * 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-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2011/11/02 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2011/03/04 * 12
MHA-21	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	9120D-557	RE	2011/08/11 * 12
MCC-56	Microwave Cable	Suhner	SUCOFLEX104	270875/4(1m)/ 284655(5m)	RE	2011/03/02 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 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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