



EMI TEST REPORT

Test Report No. : 32CE0004-HO-01-A-R1

Applicant : DENSO CORPORATION
Type of Equipment : Tire Pressure Monitoring System (Receiver)
Model No. : 13BDS
FCC ID : HYQ13BDS
Test regulation : FCC Part 15 Subpart B: 2011
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 32CE0004-HO-01-A. 32CE0004-HO-01-A is replaced with this report.

Date of test: October 18, 2011

Representative test engineer:

T. Nakagawa
Tomohisa Nakagawa
Engineer of WiSE Japan,
UL Verification Service

Approved by:

S. Watanabe
Shinya Watanabe
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>

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

13-EM-F0429

CONTENTS	PAGE
SECTION 1: Customer information	3
SECTION 2: Equipment under test (E.U.T.)	3
SECTION 3: Test specification, procedures & results	4
SECTION 4: Operation of E.U.T. during testing	6
SECTION 5: Radiated Emission	8
APPENDIX 1: Data of EMI test	9
Radiated Emission	9
APPENDIX 2: Test instruments	17
APPENDIX 3: Photographs of test setup.....	18
Radiated Emission	18
Worst Case Position (Horizontal: X-axis/ Vertical:X-axis)	20

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
Address	:	1-1, Showa-cho, Kariya-shi, Aichi-ken, 448-8661, Japan
Telephone Number	:	+81-566-25-4837
Facsimile Number	:	+81-566-61-7086
Contact Person	:	Nobuya Watabe

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

2.1 Identification of E.U.T.

Type of Equipment	:	Tire Pressure Monitoring System (Receiver)
Model No.	:	13BDS
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	October 12, 2011
Country of Mass-production	:	Japan and United States of America
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

Model No: 13BDS (referred to as the EUT in this report) is Tire Pressure Monitoring System (Receiver).
13BDS has variations owing to antenna matching in ANT2.
For details of variations, see "Technical document for Type Approval Section 7".

Feature of EUT:

Tire Pressure Monitoring System is used for monitoring and indicating information of air pressure in vehicle's tires.
Transmitter sends receiver the data that are information of air pressure in vehicle's tire through ANT1 or ANT2.
The receiver and ANT2 are installed inside the vehicle. The ANT1 is installed inside the tire house.

Type of receiving system	:	Super-heterodyne
Frequency of Operation	:	314.98MHz
Oscillator Frequency	:	38.035MHz (Crystal)
Type of Modulation	:	FSK (F1D)
Power Supply	:	DC12.0V
Antenna Type	:	ANT1: Built-in type (Inside the Wheel House) ANT2: Built-in type (Inside the Roof)

FCC15.111(b)

The receiving antenna of this EUT is installed inside the Vehicle and cannot be removed (permanently attached).
Therefore, Radiated emission test was performed.

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

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B: 2011, final revised on July 8, 2011 and effective August 8, 2011

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	19.2dB 912.840MHz, QP Horizontal / Vertical	Complied
	IC: RSS-Gen 4.10	IC: RSS-Gen 6.1			

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

*The test was performed with ANT1 and ANT2(Type1) connected to Receiver Assy as a representative.

Test was performed in other conditions as a reference in order to show that there was no difference in emission level.

*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.

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

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.

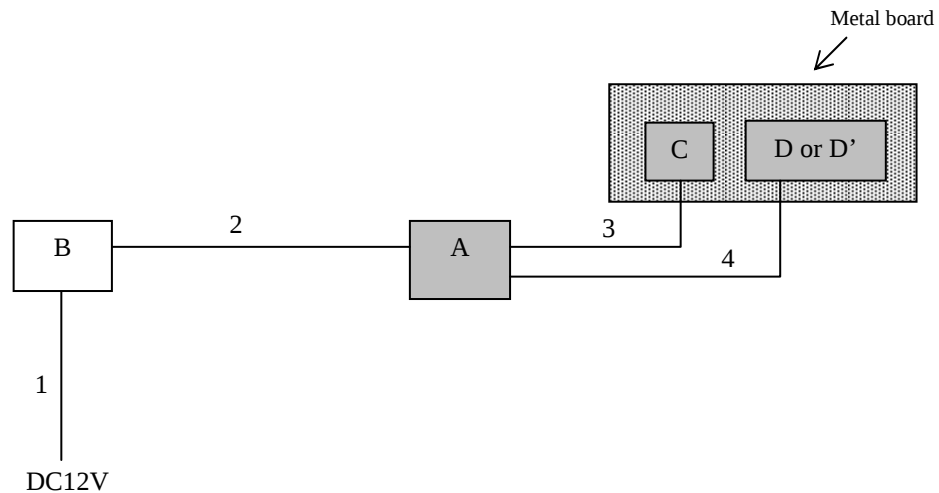
SECTION 4: Operation of E.U.T. during testing

4.1 Operating modes

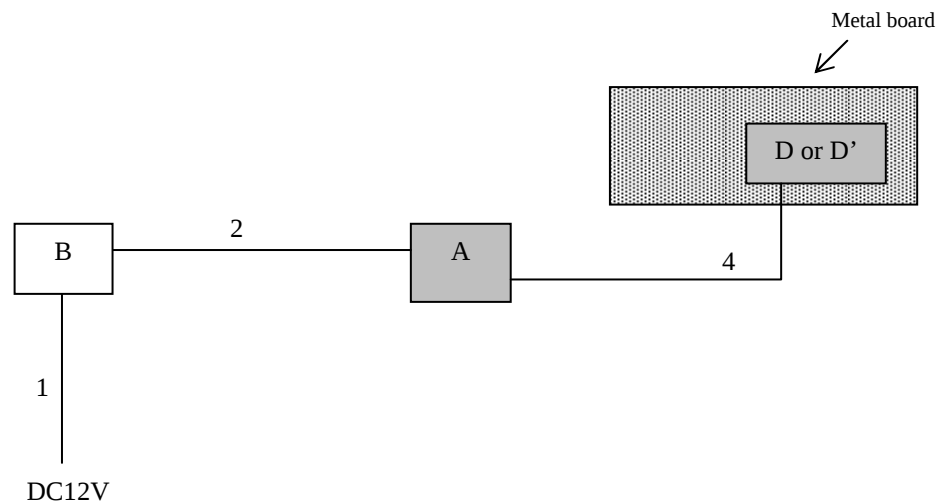
The mode used: 1. TPMS Receiving mode (314.98MHz)
 *Tuning was confirmed to be locked on each mode by checking local oscillator frequency to be stable using a search-coil.

4.2 Configuration and peripherals

<ANT1 & ANT2>



<ANT2 only>



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

*Testing was performed with antenna fixed on a metal board in order to simulate the condition of antenna mounted on the vehicle.

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

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Receiver Assy	13BDS	001	DENSO CORPORATION	EUT
B	Check Bench	-	-	DENSO CORPORATION	-
C	Antenna 1	13BDS	001	DENSO CORPORATION	EUT
D	Antenna 2	13BDS	001	DENSO CORPORATION	EUT
D'	Antenna 2	13BDS	001	DENSO CORPORATION	EUT

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	DC Cable	2.1	Unshielded	Unshielded	-
2	Signal Cable	2.0	Unshielded	Unshielded	-
3	Antenna Cable 1	3.3	Shielded	Shielded	-
4	Antenna Cable 2	6.0	Shielded	Shielded	-

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

6.2 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 center 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.

Testing was performed with antenna fixed on a metal board in order to simulate the condition of antenna mounted on the vehicle.

6.5 Test result

Summary of the test results: Pass

Date: October 18, 2011

Test engineer: Takeshi Choda

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

APPENDIX 1: Data of EMI test

Radiated Emission

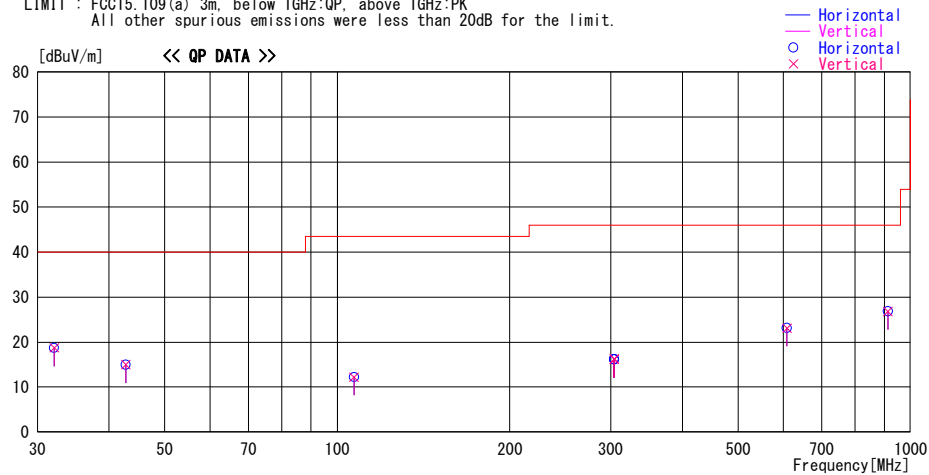
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01
Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna1 and Antenna2(Type1), Worst-axis(Hor:X, Ver:X)

LIMIT : FCC15.109(a) 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]	
32.100	22.6	QP	17.8	-21.7	18.7	0	100	Vert.	40.0	21.3	
32.100	22.6	QP	17.8	-21.7	18.7	0	300	Hori.	40.0	21.3	
42.800	23.1	QP	13.6	-21.7	15.0	0	300	Hori.	40.0	25.0	
42.800	23.1	QP	13.6	-21.7	15.0	0	100	Vert.	40.0	25.0	
107.000	22.0	QP	11.1	-20.9	12.2	0	100	Vert.	43.5	31.3	
107.000	22.0	QP	11.1	-20.9	12.2	0	300	Hori.	43.5	31.3	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	X
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	X
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	Y
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	Y
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	Z
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	Z
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Vert.	46.0	22.9	
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Hori.	46.0	22.9	
912.840	21.2	QP	22.2	-16.6	26.8	0	100	Hori.	46.0	19.2	
912.840	21.2	QP	22.2	-16.6	26.8	0	100	Vert.	46.0	19.2	

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.

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

DATA OF RADIATED EMISSION TEST

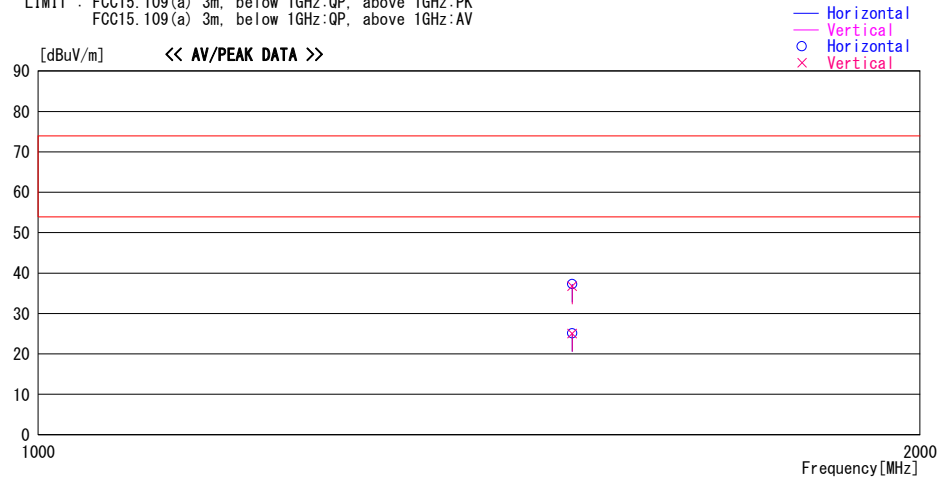
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna1 and Antenna2(Type1), Worst-axis(Hor:X, Ver: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]							
1521.400	43.2	PK	25.5	-31.4	37.3	0	100	Hori.	73.9	36.6	
1521.400	42.7	PK	25.5	-31.4	36.8	0	100	Vert.	73.9	37.1	
1521.400	31.0	AV	25.5	-31.4	25.1	0	100	Vert.	53.9	28.8	
1521.400	31.0	AV	25.5	-31.4	25.1	0	100	Hori.	53.9	28.8	

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 (Reference)

DATA OF RADIATED EMISSION TEST

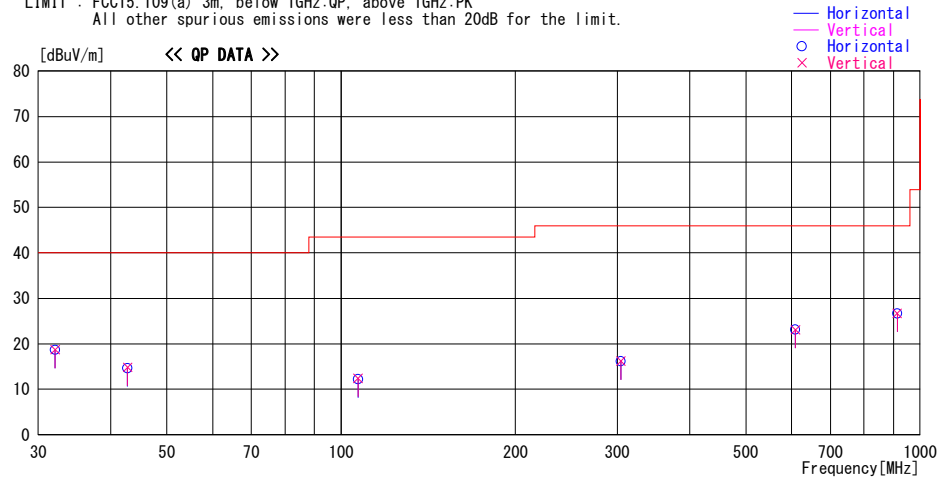
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna2(Type1), Worst-axis(Hor:X, Ver:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
32.100	22.6	QP	17.8	-21.7	18.7	0	100	Vert.	40.0	21.3	
32.100	22.6	QP	17.8	-21.7	18.7	0	300	Hori.	40.0	21.3	
42.800	22.7	QP	13.6	-21.7	14.6	0	300	Hori.	40.0	25.4	
42.800	22.9	QP	13.6	-21.7	14.8	0	100	Vert.	40.0	25.2	
107.000	22.2	QP	11.1	-20.9	12.4	0	100	Vert.	43.5	31.1	
107.000	22.0	QP	11.1	-20.9	12.2	0	300	Hori.	43.5	31.3	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Vert.	46.0	22.9	
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Hori.	46.0	22.9	
912.840	21.1	QP	22.2	-16.6	26.7	0	100	Hori.	46.0	19.3	
912.840	21.1	QP	22.2	-16.6	26.7	0	100	Vert.	46.0	19.3	

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.

Radiated Emission (Reference)

DATA OF RADIATED EMISSION TEST

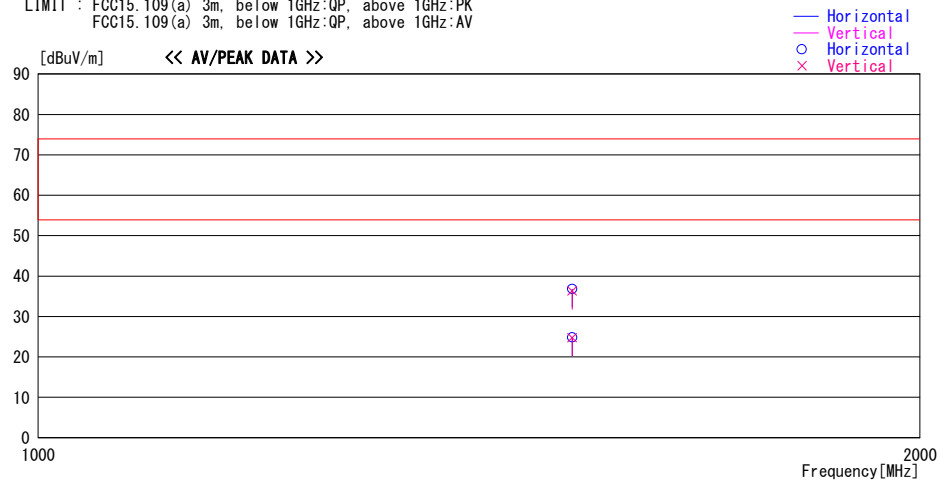
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna2(Type1), Worst-axis(Hor:X, Ver: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]							
1521.400	42.7	PK	25.5	-31.4	36.8	0	100	Hori.	73.9	37.1	
1521.400	42.2	PK	25.5	-31.4	36.3	0	100	Vert.	73.9	37.6	
1521.400	30.7	AV	25.5	-31.4	24.8	0	100	Vert.	53.9	29.1	
1521.400	30.7	AV	25.5	-31.4	24.8	0	100	Hori.	53.9	29.1	

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 (Reference)

DATA OF RADIATED EMISSION TEST

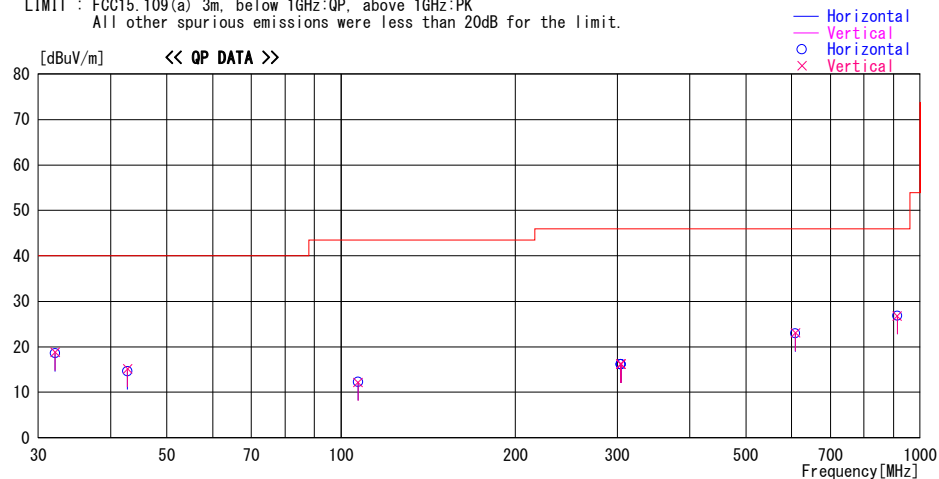
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna1 and Antenna2(Type2), Worst-axis(Hor:X, Ver:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



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]							
32.100	22.7	QP	17.8	-21.7	18.8	0	100	Vert.	40.0	21.2	
32.100	22.5	QP	17.8	-21.7	18.6	0	300	Hori.	40.0	21.4	
42.800	22.7	QP	13.6	-21.7	14.6	0	300	Hori.	40.0	25.4	
42.800	23.3	QP	13.6	-21.7	15.2	0	100	Vert.	40.0	24.8	
107.000	22.0	QP	11.1	-20.9	12.2	0	100	Vert.	43.5	31.3	
107.000	22.1	QP	11.1	-20.9	12.3	0	300	Hori.	43.5	31.2	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	X
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	X
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	Y
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	Y
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	Z
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	Z
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Vert.	46.0	22.9	
608.560	21.8	QP	19.7	-18.5	23.0	0	100	Hori.	46.0	23.0	
912.840	21.2	QP	22.2	-16.6	26.8	0	100	Hori.	46.0	19.2	
912.840	21.2	QP	22.2	-16.6	26.8	0	100	Vert.	46.0	19.2	

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 (Reference)

DATA OF RADIATED EMISSION TEST

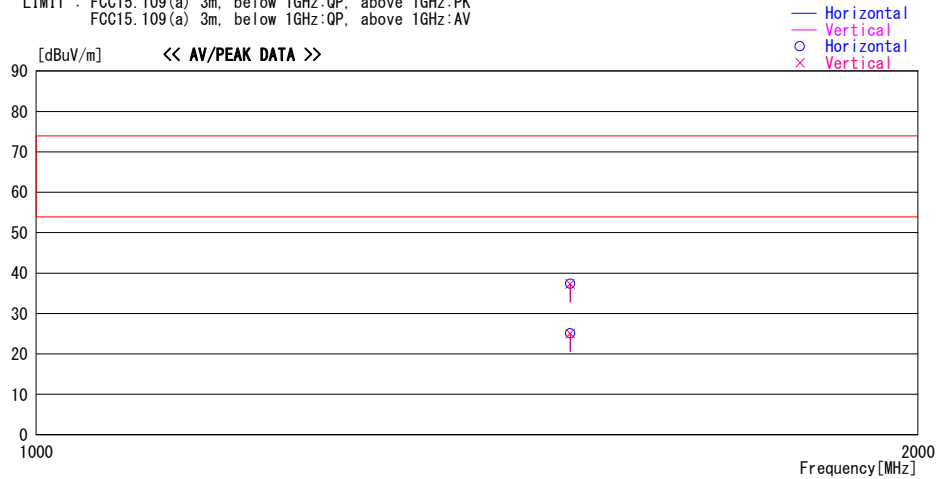
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna1 and Antenna2(Type2), Worst-axis(Hor:X, Ver: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]							
1521.400	43.3	PK	25.5	-31.4	37.4	0	100	Hori.	73.9	36.5	
1521.400	43.2	PK	25.5	-31.4	37.3	0	100	Vert.	73.9	36.6	
1521.400	31.0	AV	25.5	-31.4	25.1	0	100	Vert.	53.9	28.8	
1521.400	31.0	AV	25.5	-31.4	25.1	0	100	Hori.	53.9	28.8	

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 (Reference)

DATA OF RADIATED EMISSION TEST

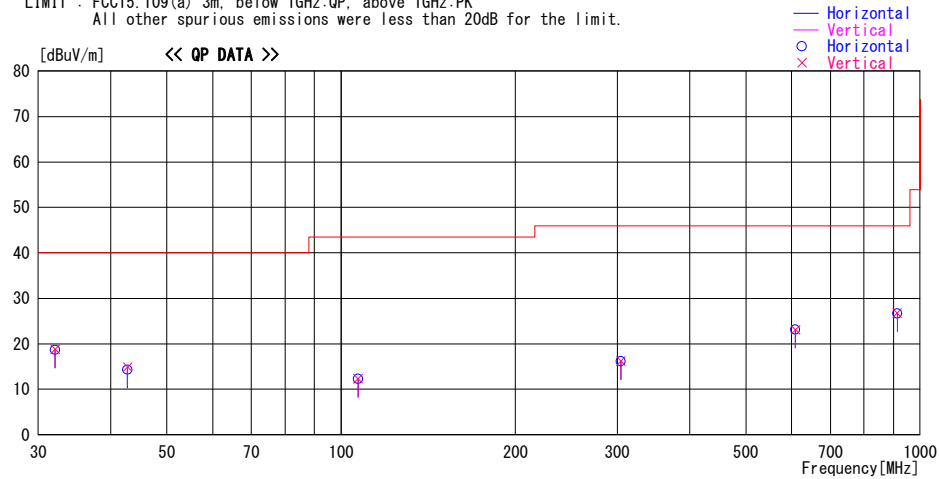
UL Japan, Inc. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna2(Type2), Worst-axis(Hor:X, Ver:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
32.100	22.7	QP	17.8	-21.7	18.8	0	100	Vert.	40.0	21.2	
32.100	22.6	QP	17.8	-21.7	18.7	0	300	Hori.	40.0	21.3	
42.800	22.4	QP	13.6	-21.7	14.3	0	300	Hori.	40.0	25.7	
42.800	23.0	QP	13.6	-21.7	14.9	0	100	Vert.	40.0	25.1	
107.000	22.1	QP	11.1	-20.9	12.3	0	100	Vert.	43.5	31.2	
107.000	22.1	QP	11.1	-20.9	12.3	0	300	Hori.	43.5	31.2	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Hori.	46.0	29.8	
304.280	21.0	QP	14.1	-18.9	16.2	0	100	Vert.	46.0	29.8	
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Vert.	46.0	22.9	
608.560	21.9	QP	19.7	-18.5	23.1	0	100	Hori.	46.0	22.9	
912.840	21.1	QP	22.2	-16.6	26.7	0	100	Hori.	46.0	19.3	
912.840	21.2	QP	22.2	-16.6	26.8	0	100	Vert.	46.0	19.2	

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 (Reference)

DATA OF RADIATED EMISSION TEST

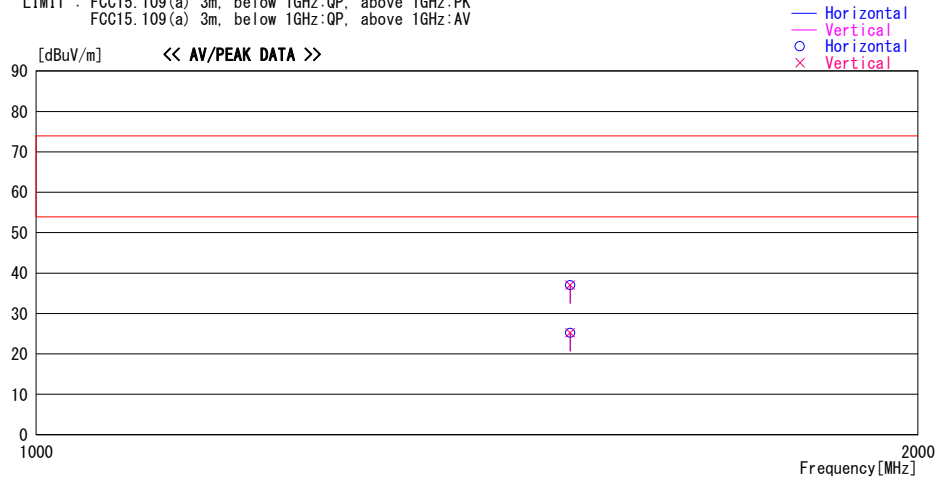
UL Japan, Inc. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2011/10/18

Report No. : 32CE0004-HO-01

Temp./Humi. : 23 deg. C / 60% RH
Engineer : Takeshi Choda

Mode / Remarks : Rx 314.98MHz, Antenna2(Type2), Worst-axis(Hor:X, Ver:X)

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
[MHz]	[dBuV]		Factor	Gain	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1521.400	42.9	PK	25.5	-31.4	37.0	0	100	Hori.	73.9	36.9	
1521.400	43.0	PK	25.5	-31.4	37.1	0	100	Vert.	73.9	36.8	
1521.400	31.1	AV	25.5	-31.4	25.2	0	100	Vert.	53.9	28.7	
1521.400	31.1	AV	25.5	-31.4	25.2	0	100	Hori.	53.9	28.7	

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.

APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-02	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-06902	RE	2011/06/21 * 12
MOS-22	Thermo-Hygrometer	Custom	CTH-201	0003	RE	2011/02/23 * 12
MJM-14	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MSA-10	Spectrum Analyzer	Agilent	E4448A	MY46180655	RE	2011/02/15 * 12
MTR-07	Test Receiver	Rohde & Schwarz	ESCI	100635	RE	2010/10/27 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	VHA91032008	RE	2011/09/10 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	201	RE	2011/09/10 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	-	RE	2011/02/18 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	BK7970	RE	2010/11/05 * 12
MPA-09	Pre Amplifier	Agilent	8447D	2944A10845	RE	2011/09/26 * 12
MHA-06	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	254	RE	2011/01/16 * 12
MPA-12	MicroWave System Amplifier	Agilent	83017A	MY39500780	RE	2011/03/10 * 12
MCC-132	Microwave Cable	HUBER+SUHNER	SUCOFLEX104	336161/4(1m) / 340639(5m)	RE	2011/09/06 * 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.

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