



RADIO TEST REPORT

Test Report No. : 31DE0073-HO-01-A-R1

Applicant : DENSO CORPORATION
Type of Equipment : Tire Pressure Warning System (LF Transmitter)
Model No. : 22AAA
FCC ID : HYQ22AAA
Test regulation : FCC Part 15 Subpart C: 2010
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.
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6. This report is a revised version of 31DE0073-HO-01-A. 31DE0073-HO-01-A is replaced with this report.

Date of test:

November 29, 2010

**Representative
test engineer:**

M. Kawamura

Keisuke Kawamura
Engineer of EMC Service

Approved by:

S. Watanabe

Shinya Watanabe
Leader of EMC Service



NVLAP LAB CODE: 200572-0

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SECTION 1: Customer information

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

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

2.1 Identification of E.U.T.

Type of Equipment : Tire Pressure Warning System (LF Transmitter)
Model No. : 22AAA
Serial No. : Refer to Clause 4.2
Rating : DC 12.0V
Receipt Date of Sample : November 29, 2010
Country of Mass-production : Japan and China
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

General Specification

Clock frequency(ies) in the system : 4MHz

Radio Specification

Radio Type : Transmitter
Frequency of Operation : 125 kHz
Oscillator frequency : 4MHz Resonator
Modulation : OOK (A1D)
Antenna type : Ant 1: Ferrite antenna coil
Ant 2: Ferrite antenna coil

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SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C: 2010, final revised on October 13, 2010

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted Emission
Section 15.209 Radiated emission limits, general requirements

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.

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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 7.2.2	<FCC> Section 15.207 <IC> RSS-Gen 7.2.2	-	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 2.6, 2.7	Radiated	N/A	12.4dB 0.12500MHz, AV	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 2.6, 2.7	Radiated	N/A	11.3dB 39.085MHz, Vertical, QP	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.QPM05 and QPM15.

*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.

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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	3.5dB	5.1dB	5.2dB	4.8dB	5.1dB	4.4dB	4.3dB
No.2	4.0dB	5.1dB	5.2dB	4.8dB	5.0dB	4.3dB	4.2dB
No.3	4.2dB	4.7dB	5.2dB	4.8dB	5.0dB	4.5dB	4.2dB
No.4	4.0dB	5.0dB	5.1dB	4.8dB	5.0dB	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.

3.5 Test Location

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

Refer to APPENDIX.

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

4.1 Operating Modes

Mode	Remarks
Transmitting mode (Tx)	125kHz, Modulated on (Mod on) *1)

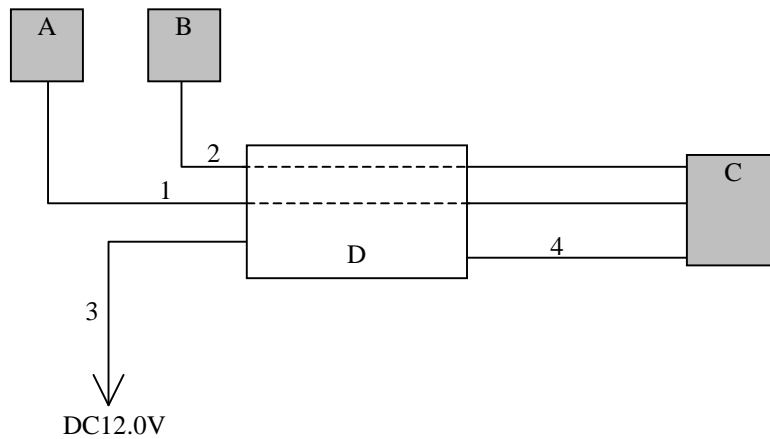
Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

*1) There are two Antennas (ANT 1, ANT 2).

ANT 1 and ANT 2 are same specification and output power.

The transmission from ANT1 and ANT2 is performed by the time division, and they are not transmitted simultaneously. Therefore, the test was performed with ANT 1 as a representative of these two Antennas after preliminary check.

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	Remarks
A	ANT 1	22AAA	8	DENSO	EUT
B	ANT 2	22AAA	43	DENSO	EUT
C	Initiator driver	22AAA	001	DENSO	EUT
D	Checker	-	-	DENSO	*1)

List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	3.5	Unshielded	Unshielded	*1)
2	Antenna Cable	3.7	Unshielded	Unshielded	*1)
3	DC Cable	1.3	Unshielded	Unshielded	-
4	DC & Signal Cable	1.3	Unshielded	Unshielded	-

*1) Item D does not influence the radio performance since Cable 1 and Cable 2 are connected to Item C through Item D.

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SECTION 5: Radiated emission (Fundamental and Spurious Emission)

Test Procedure

The Radiated Electric Field Strength intensity has been measured on No 4 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 were performed for vertical polarization (antenna angle: 0deg., 45deg., 90deg., and 135 deg.) and horizontal 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 AV detector.

The radiated emission measurements were made with the following detector function of the test receiver (below 1GHz) and the spectrum analyzer (above 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/AV	QP	PK/AV	QP	QP
IF Bandwidth	200Hz	200Hz	9kHz	9kHz	120kHz

- The carrier level (or, noise levels) was (or were) 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 2

Test result : Pass

Date: November 29, 2010

Test engineer: Keisuke Kawamura

UL Japan, Inc.

Head Office EMC Lab.

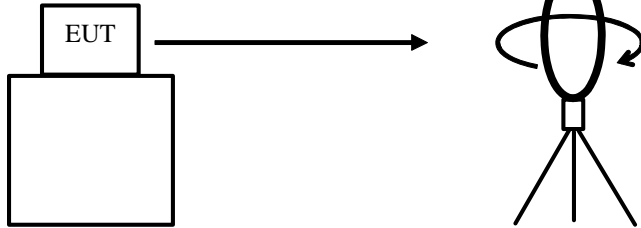
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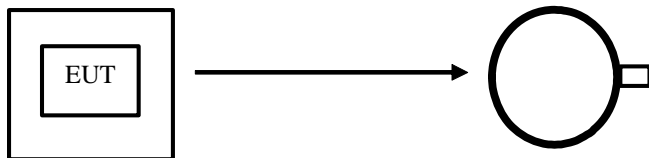
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Figure 1: Direction of the Loop Antenna

Side View (Vertical)



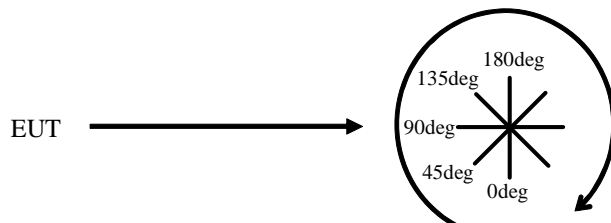
.....
Top View (Horizontal)



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	200kHz	2kHz	6.2kHz	Auto	Peak	Max Hold	Spectrum Analyzer

Test data : APPENDIX 2
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 -26dB 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 2
Test result : Pass

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