EMI TEST REPORT

Test Report No. : 30KE0045-HO-02

Applicant	:	**DENSO CORPORATION**
Type of Equipment	:	**Remote Keyless Entry System and TPMS (Receiver)**
Model No.	:	**23AAA**
FCC ID	:	**HYQ23AAA**
Test standard	:	**FCC Part 15 Subpart B 2010**
Test Result	:	**Complied**

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3. This sample tested is in compliance with the above regulation.
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Date of test:

November 11 and 12, 2010

Representative test engineer:

Hiroyuki Furutaka
Engineer of EMC Service

Approved by:

Shinya Watanabe
Leader of EMC 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

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CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	DENSO CORPORATION
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Contact Person	:	Nobuya Watabe

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

2.1 Identification of E.U.T.

Type of Equipment	:	Remote Keyless Entry System and TPMS (Receiver)
Model No.	:	23AAA
Serial No.	:	Refer to Section 4, Clause 4.2
Receipt Date of Sample	:	November 10, 2010
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: 23AAA (referred to as the EUT in this report) is Remote Keyless Entry System and TPMS (Receiver).
23AAA has 12 variations. For details of variations, see "Theory of Operation".
Hereinafter, Remote Keyless Entry System is called "RKES" in this report.

Feature of EUT:
<RKES mode>

RKES is mainly used for locking or unlocking the doors of the vehicle.
The transmitter sends a radio wave signal while the button is pushed.
The receiver becomes active in response to the signal from the transmitter.

<TPMS mode>

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.
The data also include temperature, battery voltage and identity code of transmitter.
The receiver judges the data.
If the data of air pressure and others are not normal condition, the receiver sends signal to a warning lamp.
Then, the warning lamp warns drivers.

AUTOMATIC LOCATION System is used for showing air pressure in vehicle's each tire. The multiple antennas fitted to the vehicle transmit a low-frequency wave signal. The system automatically detects the wheel position involved in a pressure reading, even after tire rotation.

Type of receiving system	:	Super-heterodyne
Frequency of Operation	:	RKES: 314.35MHz, TPMS: 314.98MHz
Oscillator Frequency	:	25.2MHz (Crystal)
Type of Modulation	:	RKES: ASK (A1D), TPMS: FSK (F1D)
Power Supply	:	DC12.0V
Antenna Type	:	Internal antenna (Inverse F antenna / Inverse L antenna)

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.

SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2010, final revised on October 13, 2010. 2010
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 **IC:** RSS-Gen 7.2.2	Receiver	N/A *1)	N/A	N/A
Radiated emission	**FCC:** ANSI C63.4: 2003 8. Radiated emission measurements **IC:** RSS-Gen 4.10	Receiver	N/A	19.6dB 920.350MHz Vertical RKES Rx mode (314.35MHz)	Complied
*Note: UL Japan, Inc's EMI Work Procedure QPM05. *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 (10m*)(±dB)**		
	9kHz -30MHz	30MHz -300MHz	300MHz -1GHz
No.1	2.7dB	4.8dB	5.0dB
No.2	-	-	-
No.3	-	-	-
No.4	-	-	-

*10m = Measurement distance

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	2.9dB	4.8dB	5.0dB	3.9dB	4.3dB	4.5dB	4.3dB
No.2	3.5dB	4.8dB	5.1dB	4.0dB	4.2dB	4.4dB	4.2dB
No.3	3.8dB	4.6dB	4.7dB	4.0dB	4.2dB	4.5dB	4.2dB
No.4	3.5dB	4.4dB	4.9dB	4.0dB	4.2dB	4.6dB	4.2dB

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

Radiated emission test
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.

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

4.1 Operating modes

The mode used: 1. RKES Receiving mode (314.35MHz)
2. TPMS Receiving mode (314.98MHz)

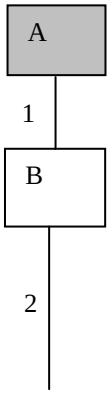
Variation No. 3 was tested as the EUT in this test report, because it has the highest emission level compared to the other representative variants (Variation No. 1, 5, 7, and 11) of the table in "Theory of Operation".

Among Variation No.1 to 12,

- the difference due to the feeding point of the internal antenna was confirmed with Variation No. 1, 3, 5, and 7.
- the difference due to internal antenna type was confirmed with Variation No. 3 and 11.
- regarding Automatic Location System, variants with the system mounted were tested, which were the worst condition for EMI.

As a result, enough margin for the limit was observed.

4.2 Configuration and peripherals



DC12.0V

*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	Remote Keyless Entry System and TPMS (Receiver)	23AAA	2 (Variation No. 3) *1)	DENSO CORPORATION	Only serial No. 2 was EUT. Serial No. 1, 3, 4, and 5 were tested just for reference. For details, see "Theory of Operation."
			1 (Variation No. 1) Reference data		
			3 (Variation No. 5) Reference data		
			4 (Variation No. 7) *1) Reference data		
			5 (Variation No. 11) Reference data		
B	Checker	-	1004816-02-01	DENSO CORPORATION	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Signal Cable	1.2	Unshielded	Unshielded	-
2	DC Cable	1.4	Unshielded	Unshielded	-

***1) Variations owing to antenna matching (Inverse F Antenna Type)** *See "Theory of Operation" for details.
TYPE 2 which was used for the tests has 308 "Nothing" and 309 "Capacitor 6pF". TYPE 4 which was used for the tests has 306 "Capacitor 6pF" and 307 "Nothing".
The result of Radiated emission test was mainly from characteristics of Local Oscillator.
If the range of 306, 307, 308 and 309 becomes "Capacitor 0.5 - 100pF", or "Inductor 1 - 100nH", there is no influence on the result of Radiated emission test.

SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 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 0.5m, 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 1.

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 representative X-axis since no difference was found among each position.

5.5 Test result

Summary of the test results: Pass

Date: November 11, 2010 Test engineer: Tomohisa Nakagawa
November 12, 2010 Hiroyuki Furutaka