



## EMI TEST REPORT

**Test Report No. : 29CE0196-HO-01-A-R1**

**Applicant** : TOYOTA MOTOR CORPORATION  
**Type of Equipment** : Remote Keyless Entry System (Receiver)  
**Model No.** : TMRF-001  
**FCC ID** : NI4TMRF-001  
**Test regulation** : FCC Part 15 Subpart B 2008  
**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 above regulation.
4. The test results in this report are traceable to the national or international standards.
5. This test report must not be used by the customer product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. Original test report number of this report is 29CE0196-HO-01-A.

**Date of test:**

November 12, 2008

**Tested by:**

Norihisa Hashimoto  
EMC Services

**Approved by :**

Makoto Kosaka  
EMC Services

NVLAP<sup>®</sup>

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://uljapan.co.jp/emc/nvlap.html>

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## **SECTION 1: Customer information**

Company Name : TOYOTA MOTOR CORPORATION  
Address : 1 Toyota-cho, Toyota-shi, Aichi-ken, 471-8572 Japan  
Telephone Number : +81-565-94-1007  
Facsimile Number : +81-565-94-1192  
Contact Person : Takaaki Enomoto

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

### **2.1 Identification of E.U.T.**

Type of Equipment : Remote Keyless Entry System (Receiver)  
Model No. : TMRF-001  
Serial No. : 1  
Receipt Date of Sample : November 10, 2008  
Country of Mass-production : Japan  
Condition of EUT : Engineering prototype  
(Not for Sale: This sample is not mass-produced items.)  
Modification of EUT : No Modification by the test lab

### **2.2 Product Description**

Model No: TMRF-001 (referred to as the EUT in this report) is the Remote Keyless Entry System (Receiver).

Frequency of Operation : 312.15MHz  
Oscillator frequency : 38.70625MHz (Crystal)  
Local Oscillator frequency : 309.65MHz (38.70625MHz x 8)  
Intermediate frequency : 2.5MHz  
Type of Modulation : FSK  
Type of receiving system : Super-heterodyne  
Antenna Type : ANT1: Built-in (Receiver)  
ANT2: External / Printed antenna on the glass (Fixed)  
Operating voltage (inner) : DC 5V (Nominal supply voltage)

### **FCC15.111(b)**

The Receiver antenna (of this EUT) is installed inside the EUT and cannot be removed. EUT has also an external antenna, but it is installed into the vehicle by professionals. Therefore, this EUT complies with the requirement in section 15.111(b).

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### **SECTION 3: Test specification, procedures & results**

#### **3.1 Test specification**

Test Specification : FCC Part 15 Subpart B 2008, final revised on May 19, 2008  
 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	<b>FCC:</b> ANSI C63.4: 2003 7. AC powerline conducted emission measurements <b>IC:</b> RSS-Gen 7.2.2	Receiver	N/A *1)	N/A	N/A
Radiated emission	<b>FCC:</b> ANSI C63.4: 2003 8. Radiated emission measurements <b>IC:</b> RSS-Gen 4.10	Receiver	N/A	[ANT2: Glass Antenna] 23.8dB 580.594MHz Horizontal, Vertical, QP	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.

\*These tests were performed without any deviations from test procedure except for addition or exclusion.

#### **3.3 Additions or deviations to standards**

No addition, deviation, nor exclusion has been made from standards.

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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	Conducted emission	Radiated emission (10m*)			Radiated emission (3m*)			Radiated emission (3m*)		
		150kHz-30MHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	9kHz-30MHz	30MHz-300MHz	300MHz-1GHz	1GHz-18GHz	18GHz-40GHz
No.1 semi-anechoic chamber (±)	3.7dB	3.1dB		4.4dB	4.2dB	3.2dB	3.8dB	3.9dB	5.9dB	6.1dB
No.2 semi-anechoic chamber (±)	3.7dB	-		-	-	3.2dB	4.4dB	4.0dB	5.9dB	6.1dB
No.3 semi-anechoic chamber (±)	3.7dB	-		-	-	3.2dB	4.6dB	4.0dB	5.9dB	6.1dB
No.4 semi-anechoic chamber (±)	3.7dB	-		-	-	3.2dB	3.9dB	3.9dB	5.9dB	6.1dB

\*10m/3m = 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	4.75 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 1 to 3.

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

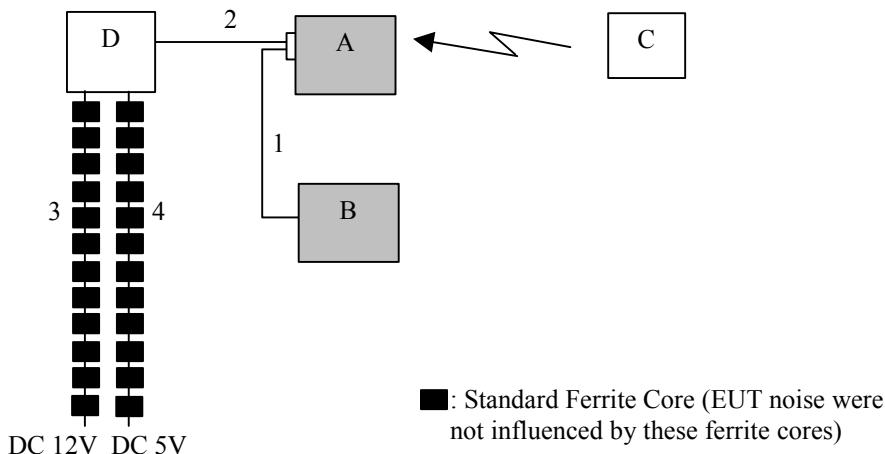
### 4.1 Operating modes

The mode is used : Receiving mode (312.15MHz)

\*1) Remote Keyless Entry System (Transmitter) was operated manually by a test engineer and the test was performed with the EUT receiving 312.15MHz.

\*2) In specification the antenna which is more sensitive to receiving is automatically chosen (Diversity type). A test engineer chose the antenna with switch of checker and tested both ANT1 and ANT2.

### 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	Remote Keyless Entry System (Receiver)	TMRF-001	1	DENSO CORPORATION	EUT (ANT1)
B	Remote Keyless Entry System (Printed antenna on the glass (Fixed))	-	1	DENSO CORPORATION	EUT (ANT2)
C	Remote Keyless Entry System (Transmitter)	-	2	DENSO CORPORATION	-
D	Checker bench	-	-	DENSO CORPORATION	-

#### List of cables used

No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna Cable	3.1	Shielded	Shielded	-
2	Signal Cable	3.4	Unshielded	Unshielded	-
3	DC Cable	2.0	Unshielded	Unshielded	Standard Ferrite Core x 12
4	DC Cable	2.0	Unshielded	Unshielded	Standard Ferrite Core x 12

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## **SECTION 5: Radiated Emission**

### **5.1 Operating environment**

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

### **5.2 Test configuration**

EUT was placed on a urethane platform of nominal size, 0.5m by 1.0m, 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 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 spectrum analyzer.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz 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 Receiver (including Built-in antenna) and Glass antenna to see the position of maximum noise. As the result there is no change in the noise levels.

### **5.5 Test result**

Summary of the test results: Pass

Date: November 12, 2008

Test engineer: Norihisa Hashimoto

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