EMISSION TEST REPORT

Test Report No. : 18L0024-02
TOYOTA MOTOR CORPORATION
Model: TMIM-4
FCC Part 15 Subpart C

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2. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

3. This equipment is in compliance with above regulation. We hereby certify that the data are contain a true representation of the emission profile.

4. The results in this report apply only to the sample tested.

5. This test report clearly shows that EUT, TMIM-4, Immobilizer is in compliance with FCC Part 15 Subpart C, specification.

Date of test: December 15, 1998 **Issued date:** December 25, 1998

Tested by: _____ **Approved by:** _____

Naoki Sakamoto
EMC section

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Group Leader of EMC section

Form Version No. 1

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Table of Contents Page

1 GENERAL INFORMATION **3**
1.1 Tested Methodology 4
1.2 Tested Facility 4

2 PRODUCT DESCRIPTION **5**
2.1 Product Description 5
2.2 Tested System Details 6

3 SYSTEM TEST CONFIGURATION **7**
3.1 Justification 7
3.2 Test Procedure 7
Figure 3.3 Configuration of Tested System 8

4 RADIATED MEASUREMENT PHOTOS **9**
Figure 4.1 Radiated Measurement Photos 9
4.2 Measurement Uncertainty 10

5 RADIATED EMISSION DATA **11**
5.1 Rdiated Emission Data 11
5.2 Field Strength Calculation 12

6 TEST EQUIPMENT USED **13**

APPENDIX **14**
Test Data **A1 - A6**

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1 GENERAL INFORMATION

APPLICANT	: TOYOTA MOTOR CORPORATION
REGULATION(S)	: FCC Part 15 Subpart C
MODEL NUMBER	: TMIM-4
SERIAL NUMBER	: 8018714
KIND OF EQUIPMENT	: TOYOTA Immobilizer
TESTED DATE	: December 15, 1998
REPORT FILE NUMBER	: 18L0024-02
TEST SITE	: A-PEX Yokowa NO.3 Open Test Site

1.1 Tested Methodology

Radiated testing were performed according to the procedures in FCC/ANSI C63.4(1992).
Radiated testing was performed at a distance of 3 meters from the antenna to EUT .

1.2 Test Facility

The open area site measurement facility used to collect the radiated data is located on 108, Yokowa-cho, Ise-shi, Mie-ken, 516-1106 Japan.
This site has been fully described in a report dated August 1, 1997 submitted to FCC office, and accepted in a letter dated September 16, 1997 (31040/SIT 1300F2).

2 PRODUCT DESCRIPTION

2.1 Product Description

When the engine key in which a transponder chip has been built is inserted into the key cylinder, the amplifier starts generating a radio frequency field by use of its coiled antenna.
The coiled antenna of the amplifier receives the key ID code from the transponder chip built in the engine key and the amplifier transmits the key ID code to the engine management system.

This technical description is as follows:

- Operating voltage range of the amplifier : 8 to 16 V
- Operating voltage range of the Engine management system: 8 to 16V
- Operating temperature range : - 30 to 80
- Frequency (transmitting) : 134.2 KHz 1%
- Frequency (receiving) : 123.0 KHz 4%
  : 134.6 KHz 4%
- Modulation : FSK
- Transmission time per 1 cycle : 50 msec
- Intermission time per 1 cycle : 40 msec
- Continuous time including intermissions : Max. 10 sec
- Power supply : 12 VDC
- The frequency of oscillation : 17.1776 MHz
- The frequency of operation : 134.2 KHz

2.2 Tested System Details

The FCC IDs for all equipment, plus description of all cables used in the tested system are:

Model	FCC ID	Description	Cable description	Backshell Material
(1) TOYOTA M/N: TMIM-4 S/N: 8018714 (EUT)	NI4TMIM-4	TOYOTA Immobilizer		
(2) TOYOTA M/N: N/A S/N: N/A		Transponder		
(3) YUASA M/N: 50B24L S/N: N/A		Car Battery		

3 SYSTEM TEST CONFIGURATION

3.1 Justification

The measurement was performed with the system configuration shown in Figure 3.2.
The running mode was taken as the EUT operation mode.

3.2 Test Procedure

3.2 Tabletop Equipment Radiated Emissions

EUT was placed on a platform of nominal size, 1m by 1.5m, raised 80cm above the conducting ground plane.
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. Transmitter was tested 3 orthogonal positions(horizontal, vertical and 360 degree perimeter).

Figure3.3 Configuration of Tested System

(1) 10 KHz 30 MHz
The measurement for 10 KHz30 MHz was performed to check the dispatching message for immobilizer.

(2) 30 MHz 1 GHz
The measurement for 30 MHz1 GHz was performed to check the digital system except immobolize.

4 RADIATED MEASUREMENT PHOTOS

Figure 4.1 Radiated Measurement Photos

Front View

Rear View

4.2 Measurement Uncertainty

Radiated Emission Test

The measurement uncertainty (with a 95% confidence level) for this test was 3.3dB.

The data listed in this test report may exceed the test limit because it does not have enough margin (more that 3.3dB).

The data listed in this test report has enough margin, more that 3.3dB.

5 RADIATED EMISSION DATA

5.1 Radiated Emission Data

The minimum margin to the limit is as follows :

*** 10KHz 30MHz**

Frequency (MHz)	Receiver Reading (dBV)	Correction Factor (dBV)	Field Strength (dBV/m)	Limit (dBV/m)	Margin (dBV)
0.1338	82.2	-2.1	80.1	105.1	25.0
0.5368	59.2	-2.1	57.1	73.0	15.9

*Extrapolation factor 40dB / decade (15.31 (f) (2)) for 15.209

*** 30MHz 1GHz**

Frequency (MHz)	Receiver Reading (dBV)	Correction Factor (dBV)	Field Strength (dBV/m)	Limit (dBV/m)	Margin (dBV)
85.90	50.8	-15.2	35.6	40.0	4.4

* All readings are QP mode. (except 110490 KHz, the data for this band is taken by AV mode)
* The spurious was not preceibved regarding to the frequency above 1GHz.

5.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor, Cable Factor and Antenna Pad, and subtracting the Amplifier Gain from the measured reading. The sample calculation is as follows :

FS = RA + AF + CF + AT - AG

where FS = Field Strength
RA = Receiver Reading
AF = Antenna Factor
CF = Cable Factor
AT = Antenna Pad
AG = Amplifier Gain

Assume a receiver reading of 59.2/50.8dBV is obtained. The antenna Factor of 19.8/7.1 dB, Cable Factor of 0.1/2.7dB and Antenna Pad of 6.0/3.0dB is added. The Amplifier Gain of 28.0 dB is subtracted, giving a field strength of 57.1/35.6 dBV/m.

*** 10KHz 30MHz**
FS = 59.2 + 19.8 + 0.1 + 6.0 - 28.0 = 57.1 dBV/m

*** 30MHz 1GHz**
FS = 50.8 + 7.1 + 2.7 + 3.0 - 28.0 = 35.6 dBV/m

6 TEST EQUIPMENT USED

INSTRUMENTS	Mfr.	MODEL	C/N	Calibrated Until
Pre Amplifier	Hewlett Packard	8447D	AP1	June 10, 1999
Pre Amplifier	Anritsu	MH648A	AP2	January 1, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA1	May 3, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA2	July 6, 1999
Biconical Antenna	Schwarzbeck	BBA9106	BA5	July 6, 1999
Logperiodic Antenna	Schwarzbeck	UHALP9108A	LA5	July 6, 1999
Logperiodic Antenna	Schwarzbeck	UKLP9140-ALA7		May 3, 1999
Double Ridge Guide Horn Antenna	A.H. System inc.	SHS-200/571	YTHA2	July 23, 1999
Loop Antenna	Rohde & Schwarz	HFH2-Z2	LP1	October 20, 1999
LISN	Rohde & Schwarz	ESH2-Z5	LS1	June 14, 1999
LISN	Rohde & Schwarz	ESH3-Z5	LS2	June 14, 1999
LISN	Schwarzbeck	NSLK8127	LS3	June 14, 1999
LISN	Rohde & Schwarz	ESH3-Z5	LS4	June 14, 1999
LISN	Schwarzbeck	NNLK8121	LS5	June 14, 1999
Spectrum Analyzer	Hewlett Packard	8567A	SA1	June 11, 1999
Spectrum Analyzer	Hewlett Packard	8567A	SA2	June 11, 1999
Spectrum Analyzer	Hewlett Packard	8567A	SA3	June 10, 1999
Spectrum Analyzer	Hewlett Packard	8567A	SA4	June 11, 1999
Test Receiver	Rohde & Schwarz	ESHS-20	TR1	April 3, 1999
Test Receiver	Rohde & Schwarz	ESVS-30	TR2	July 5, 1999
Test Receiver	Rohde & Schwarz	ESHS-30	TR3	July 14, 1999
Test Receiver	Rohde & Schwarz	ESVS-10	TR4	July 14, 1999
Test Receiver	Rohde & Schwarz	ESHS-10	TR5	March 23, 1999
Test Receiver	Rohde & Schwarz	ESVS-10	TR6	March 23, 1999
Electro Magnetic Interface Receiver	Meb Messelektronik Berlin	SMV-41	-	September 14, 1999

indicates EMI Test Equipment used.

*All measurement equipment is traceable to national standard.

APPENDIX

Test Data

Radiated emissions for 10KHz30MHz A 1 - A 4

Radiated emissions for 30MHz1GHz A 5 - A 6

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