

Prüfbericht - Nr.: 02422680 001
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Test Report No.:
Page 1 of 13

Auftraggeber: **Delphi Electronics Systems (Formerly, Delphi Delco Electronics Systems)**
Client:
M/S CTCIE
Kokomo ,
Indiana,
U.S.A

Gegenstand der Prüfung: **W408 Immobilizer**

Test item:

Bezeichnung: **28285151** **Serien-Nr.:** **Engineering**
Identification: *Serial No.*

Wareneingangs-Nr.: **1403011690** **Eingangsdatum:** **2010-09-30**
Receipt No.: *Date of receipt:*

Prüfort: **Refer page 4 of 13 for test facilities**
Testing location:

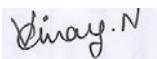
Prüfgrundlage: **FCC Part 15, Subpart C**
Test specification:

Prüfergebnis: **Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).**
Test Result: *The test item passed the test specification(s).*

Prüflaboratorium: **TÜV Rheinland (India) Pvt. Ltd.**
Testing Laboratory:
 Alpha Tower, Sigma Soft Tech Park, #7, Whitefield Main Road,
 Varthur Kodi, Bangalore – 560066, India

geprüft / tested by: **kontrolliert / reviewed by:**

2010-10-19 Mr. Vinay N



2010-10-19 Mr. Kalyan Varma



Datum Date	Name/Stellung Name/Position	Unterschrift Signature	Datum Date	Name/Stellung Name/Position	Unterschrift Signature
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Sonstiges /Other Aspects: **FCC ID: L2C0046TR**

Abkürzungen: **P(pass) = entspricht Prüfgrundlage**
F(fail) = entspricht nicht Prüfgrundlage
N/A = nicht anwendbar
N/T = nicht getestet

Abbreviations: **P(pass) = passed**
F(fail) = failed
N/A = not applicable
N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.

This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

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Test Result Summary

Clause	Test Item	Result
FCC 15.215 (c)	Occupied Bandwidth	NA
FCC 15.209	Spurious Radiated Emissions	Pass

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List of Test and Measurement Instruments

SAMEER-Center for Electromagnetics, Chennai

List of Test and Measurements

Equipment	Manufacturer	Type	S/N	Calibration Due Date
EMI Receiver	Rohde & Schwarz	ESIB26	100070	24.04.2011
Loop Antenna	ETS Lingdren	6507	1484	17.10.2010
Ultra Log Antenna	Rohde & Schwarz	HL562	100100	16.04.2012

Testing Facilities

- 1) SAMEER-Center for Electromagnetics
C.I.T.Campus, Taramani,
2nd Main Road, Chennai – 600113
India

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General Product Information

Product Function and Intended Use

RFID lock system used in Cars.

Ratings and System Details

Operating Frequency	125 kHz
Number of Channels	One
Channel Size	12.50 kHz
Data rate	0.004 Mbps
Modulation Technique	Ask
Number of Antennas	One
Supply Voltage	12 V DC

Test Conditions:

Voltage: 12 V DC Battery Supply

Environmental conditions

Temperature: +23 ° C

RH: 62%

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Operation Descriptions

The immobilizer system consists of:

- Immobilizer ECU (integrated with instrument cluster) with Coil/Antenna and illumination ring
- Transponder of Sokymat make.

As the transponder needs specified field strength, the antenna coil will be fixed axially with the key lock. The Immobilizer Control Unit is integrated with instrument cluster. The Engine Control Module (ECM) communicates with immobilizer over HS-CAN.

Procedure for Code Authentication:

- Immo wakes-up on Ignition transitioning to ON.
- Immo authenticates SC and TxP in the Key
- Immo and ECM start authentication

The communication between the instrument cluster and the transponder is conducted through a proprietary algorithm. The authentication status is indicated through immobilizer telltale in the instrument cluster.

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Test Set-up and Operation Mode

Principle of Configuration Selection

Emission: The test was performed under continuous transmit mode to obtain the maximum emissions.

Test Operation and Test Software

- NA

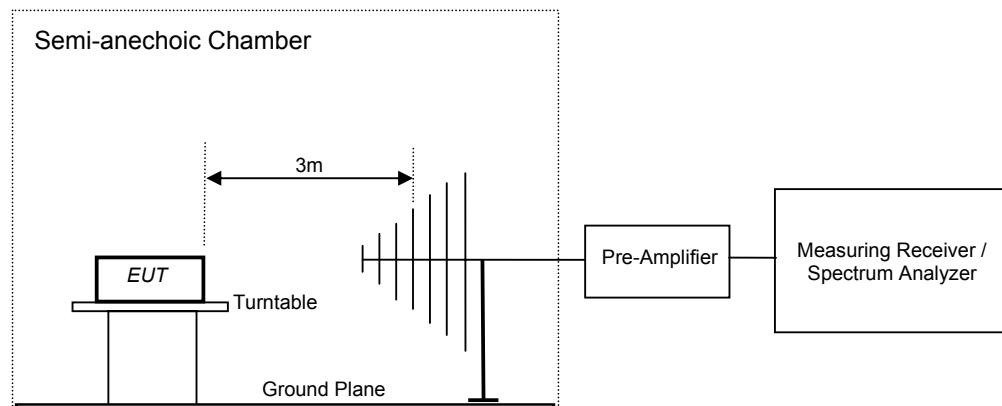
Special Accessories and Auxiliary Equipment

- NA

Test Methodology

Radiated Emission Test

The radiated emission measurement was performed according to the procedures in ANSI C63.4-2003. The equipment under test (EUT) was placed at the middle of the 80 cm high turntable, and the EUT is 3 meters far from the measuring antenna. The turntable was rotated 360° for obtaining the maximum emission. The height of the measuring antennas was scanned between 1m and 4m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Repeat the measurement steps until the maximum emissions were obtained. The measurement above 1000MHz was performed by horn antenna. The measurement below 30MHz was performed by loop antenna. The EUT was rotated around the X-, Y-, and Z-Axis and the results from worst case axis are recorded.



Test Results

Occupied Bandwidth Measurement

Section 15.215 (c)

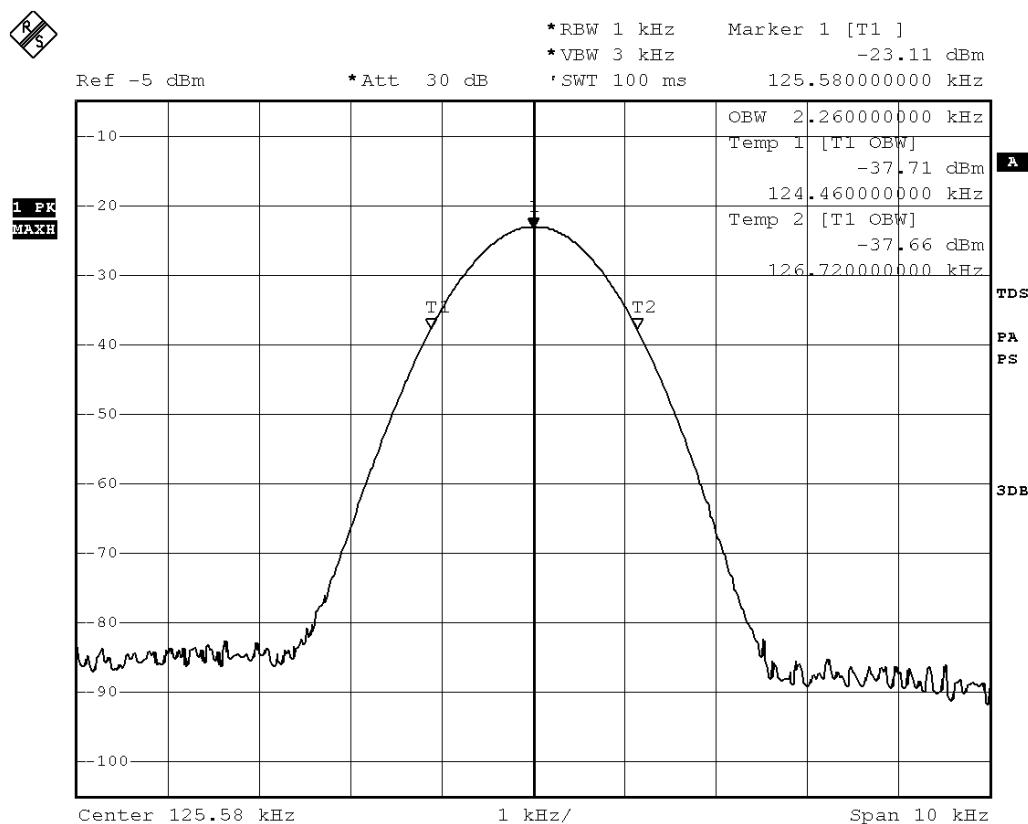
Measurement procedure

The 99% occupied bandwidth was measured with the spectrum analyzer span set to fully display the emission and approximately 20dB below the peak level. The RBW was to ~ 1% to 3% of the approximate emission width. The trace was set to max hold with a peak detector active. The occupied bandwidth measurement function of the analyzer was used for the 99% bandwidth

Measurement Result

Centre Frequency (kHz)	Occupied Bandwidth (kHz)
125.0	02.26

Measurement Plot



Spurious Radiated Emissions
Section 15.209
Result
Pass

Test Specification	FCC Part 15 Section , 15.209
Test Method	ANSI C63.4-2003
Supply Voltage	12V DC
Measuring Frequency Range	125 kHz (Lowest internal oscillator frequency) – 1 GHz (Up to 10 th harmonic of the highest fundamental frequency)
Measuring Distance	3m
Requirement	To comply as per limits stated below

Test result:
Spurious emission results for frequency range 9 kHz to 30 MHz

Antenna Polarization	Spurious Emission (kHz)	Field Strength (dB μ A/m)	Field Strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
Parallel	11.80	16.89	68.39	126.16	-57.77
	125.80	28.97	80.47	105.61	-25.14
Perpendicular	11.80	16.92	68.42	126.16	-57.74
	125.80	24.92	76.42	105.61	-29.19

Spurious emission results for frequency range 30 MHz to 1 GHz

Antenna Polarization	Frequency (MHz)	Field Strength (Quasi Peak) (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Verdict
V	128.28	25.77	43.50	-17.73	Pass
	148.24	24.62	46.00	-21.38	Pass
H	64.00	22.68	40.00	-17.32	Pass
	75.20	21.65	40.00	-18.35	Pass
	125.32	25.66	43.50	-17.84	Pass
	143.44	28.64	43.50	-14.86	Pass

Limit for Radiated Emission of Section 15.209:

Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m) at 3m range
0.009 – 0.490	2400/F(kHz) (300m range)	48.50 – 13.80 (300m range)*
0.490 – 1.705	24000/F(kHz) (30m range)	33.80 – 23.00 (30m range)*
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
Above 960	500	54.0

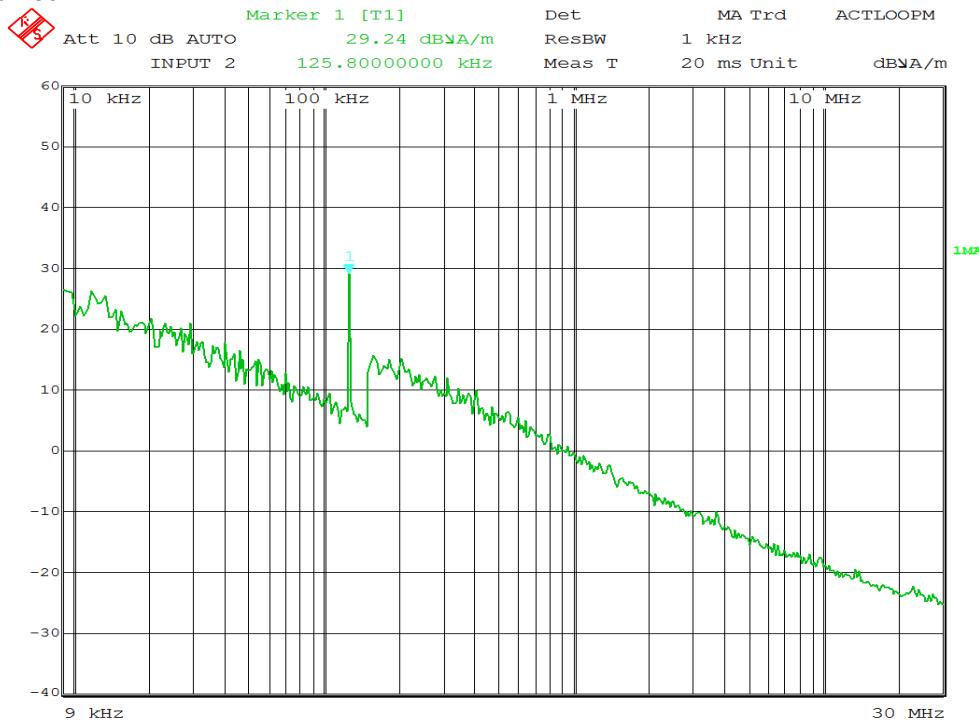
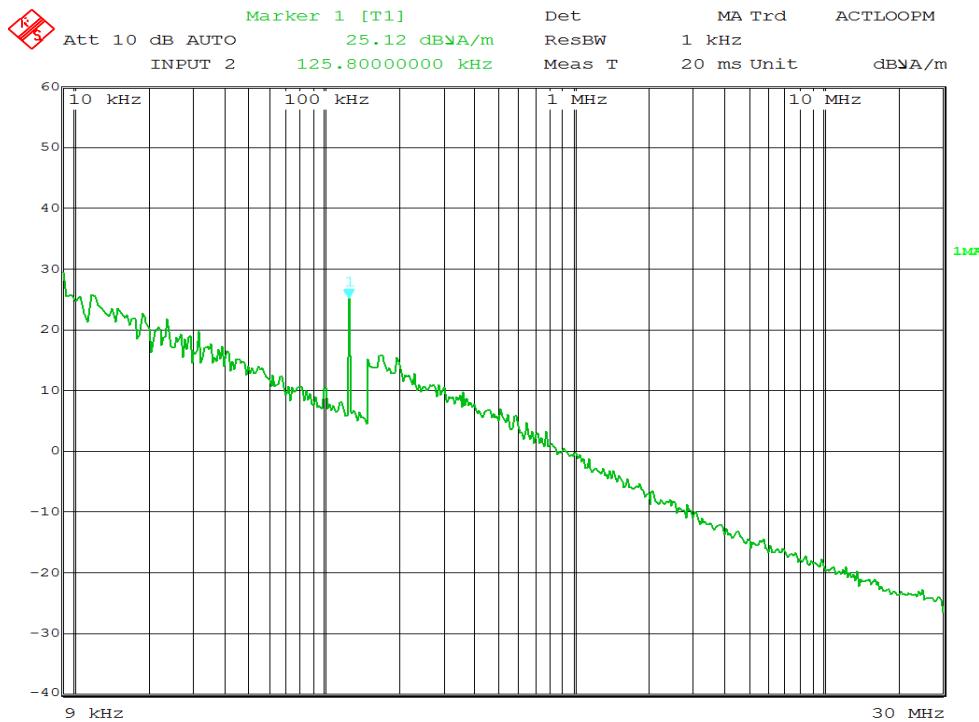
Remark: * Distance Correction for Measurements below 30 MHz – Part 15.31

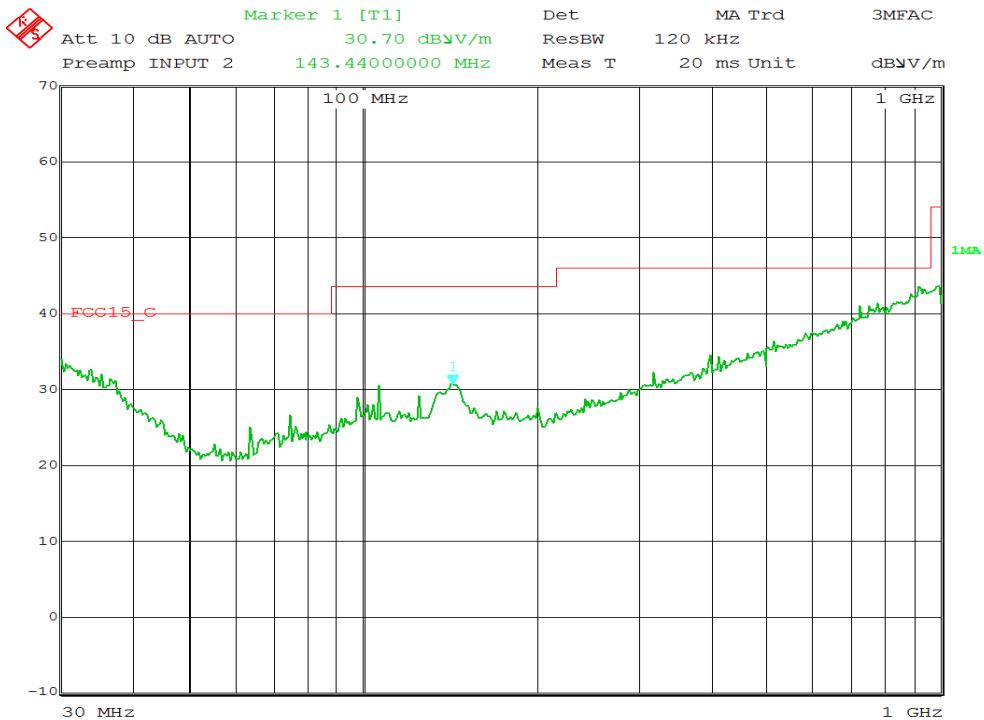
Radiated measurements were performed at a distance closer than 300 meters and 30m as required, according to Part 15.209. Therefore a correction factor was applied to account for propagation loss at the specified distance. The propagation loss was determined by using the square of an inverse linear distance extrapolation factor (40dB/decade) according to 15.31. A sample calculation of the distance correction factor is shown below for limits expressed at a 300m measurement distance and a 30m measurement distance.

$$\begin{aligned}
 \text{Distance correction factor (300m Specified Test Distance)} &= 40 * \log (\text{Test Distance}/300) \\
 &= 40 * \log (3/300) \\
 &= -80 \text{ dB}
 \end{aligned}$$

$$\begin{aligned}
 \text{Distance correction factor (30m Specified Test Distance)} &= 40 * \log (\text{Test Distance}/30) \\
 &= 40 * \log (3/30) \\
 &= -40 \text{ dB}
 \end{aligned}$$

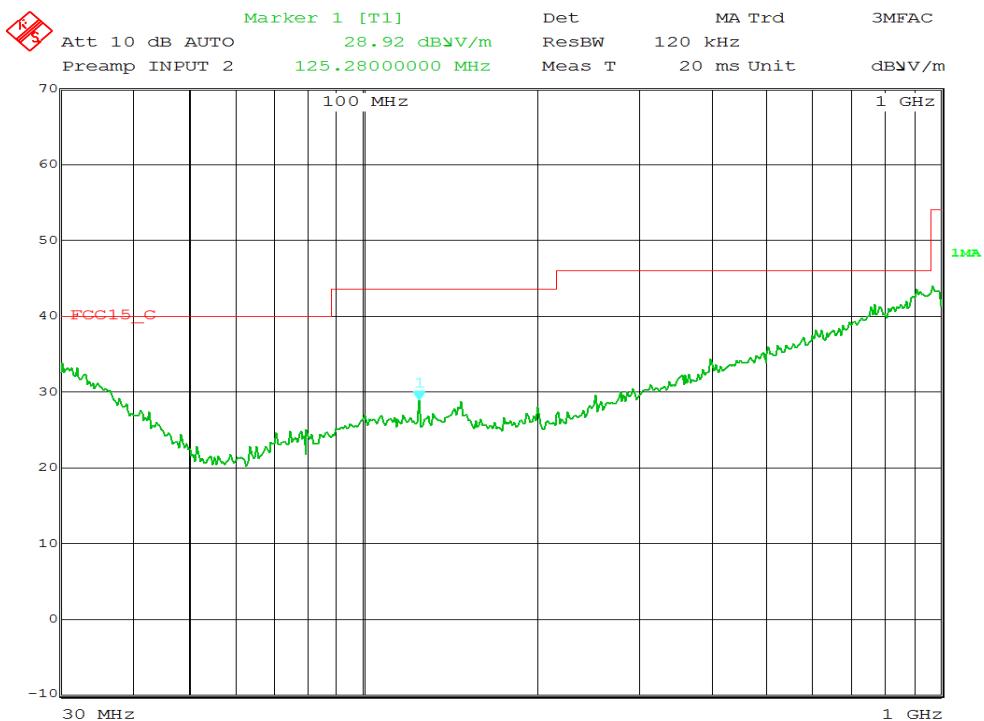
The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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9 kHz to 30 MHz
Parallel Polarization

9 kHz to 30 MHz
Perpendicular Polarization



30 MHz to 1 GHz

Horizontal Polarization



30 MHz to 1 GHz

Vertical Polarization