

## TEST REPORT

An Accredited Technical Test Executed under the Danish Accreditation Scheme

### Prøvningsrapport

for akkrediteret prøvning i henhold til Dansk Akkrediterings Ordning

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Side

No. of annexes 4  
Antal bilag

<b>Test-report No</b> <i>Prøvningsrapport Nr.</i>	UPRR020023-01	<b>Our reference</b> <i>Vor reference</i>	Martin Arndt	<b>Copy No</b> <i>Eksemplar Nr.</i>	1
<b>Equipment</b> <i>Udstyr</i>	Remote control for toy				
<b>Manufacture</b> <i>Fabrikat</i>	LEGO Systems A/S				
<b>Type</b> <i>Type</i>	44278				
<b>Serial No</b> <i>Serie Nr.</i>	-	<b>Equipment received</b> <i>Udstyr modtaget</i>	04.04.2002		

<b>Client</b> <i>Rekvirent</i>	LEGO Systems A/S				
<b>Address</b> <i>Adresse</i>	Åstvej 1				
<b>Postal code</b> <i>Post Nr.</i>	DK-7190	<b>City</b> <i>By</i>	Billund	<b>Country</b> <i>Land</i>	Danmark

<b>The testing has been carried out in accordance with</b> <i>Prøvningen er udført i henhold til</i>	FCC Part 15C.Clause 15.227 and 15.209.				
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<b>Remarks</b> <i>Bemærkninger</i>	All the tested parameters fulfil the requirements				
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<b>Date and signature</b> <i>Dato og underskrift</i>	13. May. 2002	
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Martin Bülow Arndt  
B.Sc.(E.E.)

**The test result is only valid for the equipment tested.**  
*Prøvningsresultatet gælder kun for det afprøvede udstyr.*

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Telelaboratoriet  
TDC Mobil A/S  
Telegade 2  
DK 2630 Taastrup

Tel. +45 43 34 55 01  
Fax +45 43 71 59 02

E-mail: [info@telelaboratoriet.dk](mailto:info@telelaboratoriet.dk)

Web-site: <http://www.telelaboratoriet.dk>

TDC Mobil A/S CVR-nr 2583 7061 Taastrup

Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.

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**Annexes:**

- 1 – 2 : RF emissions / Radiated emission (Pre-scan + Final)
- 3 – 4 : Photos of test set-up

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## 1. Test Specification and Methods

**Purpose of Test:** The tests are performed in order to demonstrate compliance with the FCC requirements for intentional transmitters operating in the freq. range 26,96 – 27,28MHz.

### Test Specifications:

#### Limits:

- [1] **CFR 47 Part 15: 2001**, Code of Federal Regulation 47 (Telecommunication), Part 15 (Radio Frequency Devices), Subpart C (Intentional Radiators)  
Clause 15.227 and 15.209

### Methods and Procedures:

The Test methods and procedures are defined in the following standard(s) (for undated references the latest edition applies):

- [2] **ANSI C63.4 : 2000**, American National Standard for Methods of Measurement of Radio-Noise Emissions form Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

## 2. Location of Test Site

Test are performed at the test site of Tele Danmark A/S (Telelaboratoriet) at the address:

Tele Danmark A/S (Telelaboratoriet)  
Telegade 2  
DK-2630 Taastrup  
Denmark

This site is listed at the FCC under the Registration Number 92797 since December 19, 2001.

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### 3. EUT Description

#### 3.1. General

The EUT is a single channel RF remote control operating at 27,145 MHz band. The device contains a code switch. This switch enables a change the information send to the receiver to operate the different functions which makes the operation of 3 remote toys at the same time possible. The code switch does not change the RF channel frequency.

Model : Racers  
Type : 44278

Manufacture : LEGO Systems A/S  
Åstvej 1  
DK-7190 Billund  
Denmark

#### 3.2. Technical specifications

Frequency : 27,145 MHz  
Number of channels : 1 (simplex)  
Type of modulation : AM  
TX power (EIRP) : 10dBm / 10 mW  
Antenna type : Internal  
Antenna gain (rated): -  
Power supply : 9 VDC  
Type of equipment : Short Range Device  
Temperature range : -10 – +55 deg. C.

### 4. Deviations or Exclusions from the Test Specifications

Emission measurements in the range below 30MHz (27 – 30 MHz) are made with both a Biconical antenna according to clause 8.2.3 in ANSI 64.3:2000 and a calibrated loop antenna according to clause 8.2.1 in ANSI 64.3:2000.

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## 5. Tests and test conditions

### 5.1. EUT ports to be examined

Following port was examined during the tests:

1. Enclosure port

### 5.2. Operation of the EUT

During the radiated emission testing the EUT controls were activated to generate a constant RF transmission at 27,145MHz.  
An internal battery (9V alkaline cell) powered EUT during testing.

### 5.3. Limits and frequency ranges used

#### 5.3.1. Enclosure port measurements (TX mode)

Compliance is checked according to §15.209 general limits and § 15.227 covering radio transmitters using the 26,96 – 27,28 MHz band.

According to [1] §15.33 (a)(1), spurious and RF emission is measured up to the 10. harmonic of the maximum TX channel frequency e.g. 270MHz. Additionally the digital parts in the EUT, operating at 3,58MHz, must be investigated up to 1000MHz according to [1]§15.33 (a)(4). This give a total measuring range of 27 MHz to 1000 MHz.

## 6. Measurements, Examinations and Derived Results

### General Comments

The measurement uncertainties stated below are calculated according with the requirements of the Danish Institute of Fundamental Metrology.

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**6.1. Test results, Emission**

**6.1.1. §15.227 – RF emissions / §15.209 (a) – Radiated emission**

The maximum radiated emission that is produced by the EUT is measured in an fully anechoic room in 1-meter distance (Pre-scan) and the 6 most critical emission components is re-measured on a 3 meter OATS (final measurement).

**Measurement uncertainty:**

Field strength: **-4.2/+3.4 dB** (k = 2)

**Measurement results:**

The plots of the pre-scan are shown in annex 1. Results shown below are maximised values, measured on a 3-meter OATS. Signal 1a are measured according to ANSI 64.3:2000 §8.2.1. Signal 1b–12 are measured according to ANSI 64.3:2000 §8.2.3.

Signal	Measurement settings		Measured values Peak		Measured values QP		Measured values Avg.	
	Freq. [MHz]	Meas. BW	Peak [dBuV/m]	Peak [uV/m]	QP [dBuV/m]	QP [uV/m]	Avg [dBuV/m]	Avg [uV/m]
1a	27.145	120 kHz	73,45	4704,35	-		35,35	58,54
1b	27.145	120 kHz	-	-	-	-	35,28	58,07
2	54.3	120 kHz	35,4	58,88	29,58	30,13	-	-
3	81.4	120 kHz	29,6	30,20	25,99	19,93	-	-
4	108.6	120 kHz	27,2	22,91	23,43	14,84	-	-
5	135.7	120 kHz	32,4	41,69	31,54	37,76	-	-
6	162.9	120 kHz	34,2	51,29	25,76	19,41	-	-
7	190.0	120 kHz	31,3	36,73	24,6	16,98	-	-
8	217.2	120 kHz	29,2	28,84	24,57	16,92	-	-
9	244.3	120 kHz	29,1	28,51	29,11	28,54	-	-
10	407.2	120 kHz	37,2	72,44	33,43	46,94	-	-
11	624.3	120 kHz	44,9	175,79	42,87	139,16	-	-
12	787.2	120 kHz	38,1	80,35	31,81	38,95	-	-

**Limit:**

Level of the fundamental (signal 1a @ 27,145 MHz) measured with an average detector must be less than 10.000 uV @ 3 meter and all other emission must comply with the general limits in §15.209. Peak of fundamental must be lower than peak of harmonic.

**Conclusion: The EUT complies with the given limits.**

**Test performed by: MBAR Date: 09. April +10 May 2002**

Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.

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## 7. List of instruments

### Radiated emission (Prescan):

Test receiver	R&S ESMI	17654
Antenna 1 (20 –300MHz)	Schwarzbeck VHA	14117
Antenna 2 (300-1000MHz)	Schwarzbeck UHALP	16066

### Radiated emission (Final):

Test receiver	R&S ESVP	17654
Antenna 1 (below 30MHz)	R&S HFH2-Z2	20290
Antenna 2 (30 –300MHz)	Schwarzbeck VHA	17095
Antenna 3 (300-1000MHz)	Schwarzbeck UHALP	17380

### Support Equipment:

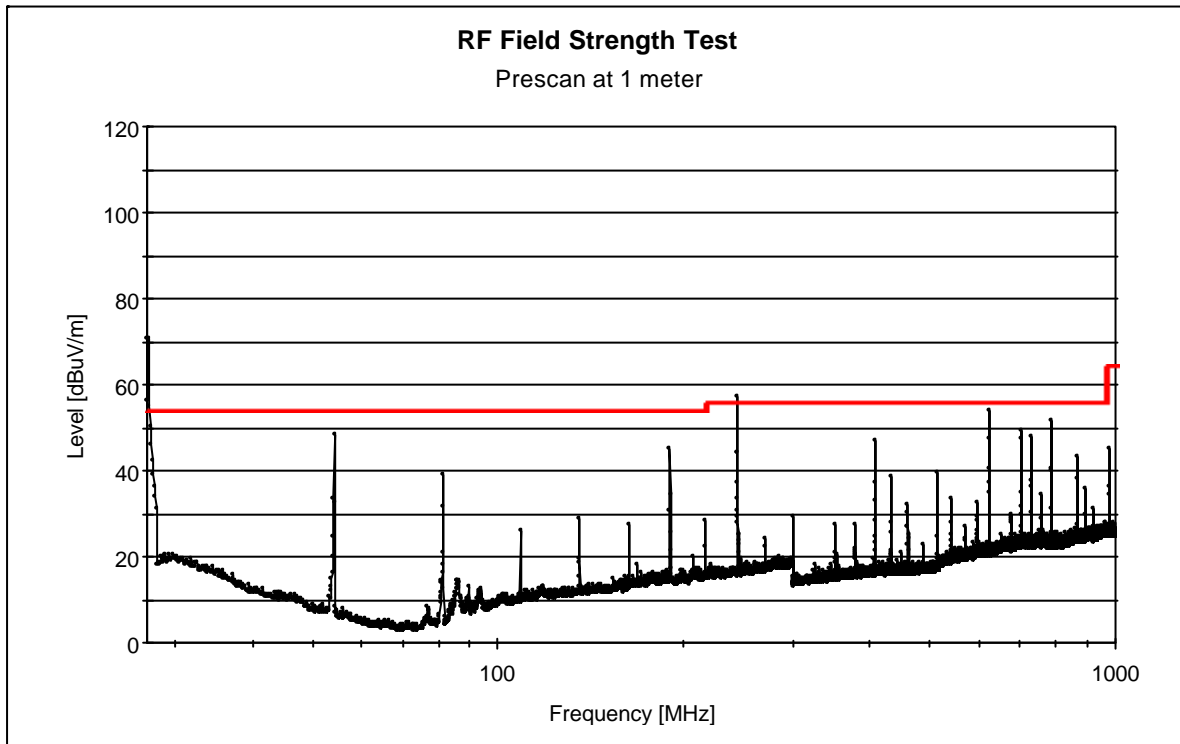
None

**Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.**

**RF Field Emission:**

**Manufacturer:** LEGO Systemt A/S  
**Equipment under Test:** RACERS remote for toy  
**Type No.:** 44278  
**Operating condition:** Active  
**Test specification:** FCC 15.227

**Comments:** Prescan



**Sweep Settings:**

**Test Receiver:** Rohde & Schwarz ESVP  
**Start frequency [MHz]:** 27  
**Stop frequency [MHz]:** 1000  
**Step frequency [%]:** 100  
**Demodulation:** AM  
**Preamplifier:** 10 dB  
**Detector:** Peak  
**IF Bandwidth:** 120 kHz  
**Measure Time [sec]:** 0.005

**Antenna and Cable Factors:**

**Antenna factor Low range:** 1m Bikonisk VHA9103 M14117  
**Antenna factor High range:** 1m Logperiodisk UHALP9107 M16066  
**Cable factor:** Lille skærnkabine kabel 1+2

**Test Program and Version:**

**Title:** RF Field Emission  
**Program:** RFFIELDEMISSION  
**Program Path:** T:\EMC-DATA\EMC PROGRAMMER\RFFIELDEMISSION  
**Version:** 1.5.0

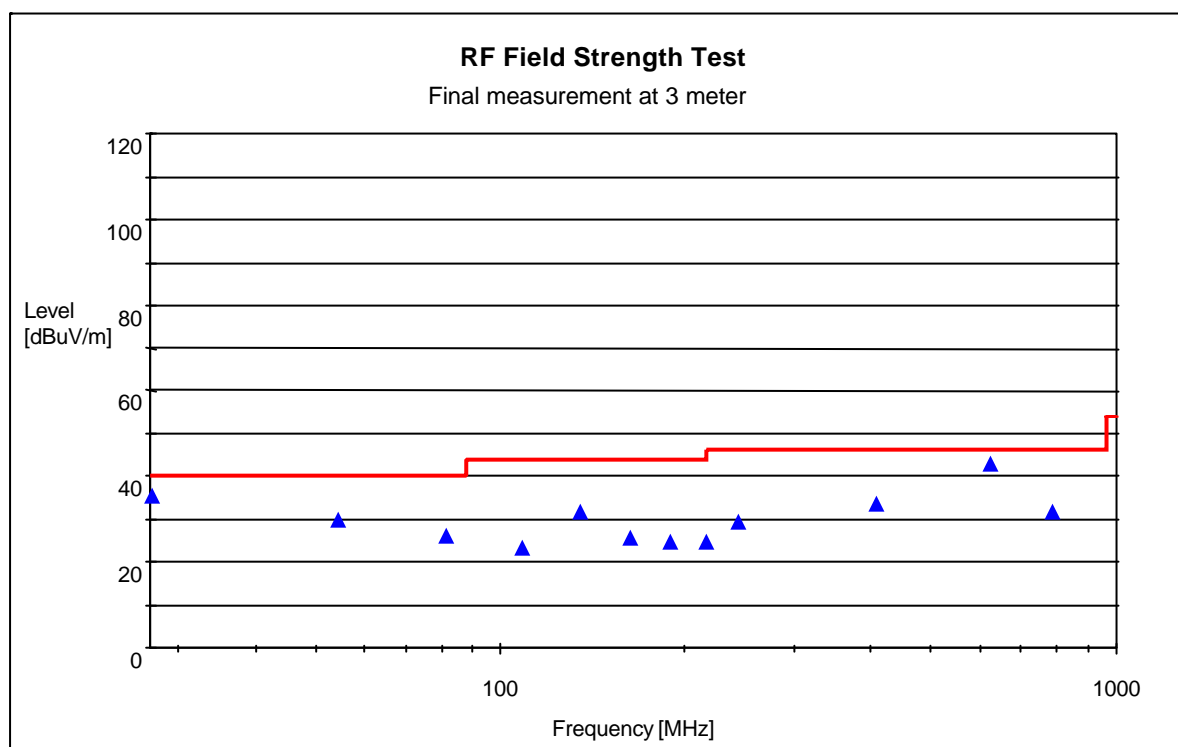


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**RF Field Emission:**

**Manufacturer:** LEGO Systemt A/S  
**Equipment under Test:** RACERS remote for toy  
**Type No.:** 44278  
**Operating condition:** Activ  
**Test specification:** FCC 15.227

**Comments:** Final measurement at 3 meter distance



**Final Measurement:**

Frequency [MHz]	Level [dBuV/m]	Detector	Bandwidth	Meastime [sec]	Preamp
27.1	35.28	Average	120 kHz	1	10 dB
54.3	29.58	CISPR	120 kHz	1	10 dB
81.4	25.99	CISPR	120 kHz	1	10 dB
108.6	23.43	CISPR	120 kHz	1	10 dB
135.7	31.54	CISPR	120 kHz	1	10 dB
162.9	25.76	CISPR	120 kHz	1	10 dB
190.0	24.6	CISPR	120 kHz	1	10 dB
217.2	24.57	CISPR	120 kHz	1	10 dB
244.3	29.11	CISPR	120 kHz	1	10 dB
407.2	33.43	CISPR	120 kHz	1	10 dB
624.3	42.87	CISPR	120 kHz	1	10 dB
787.2	31.81	CISPR	120 kHz	1	10 dB

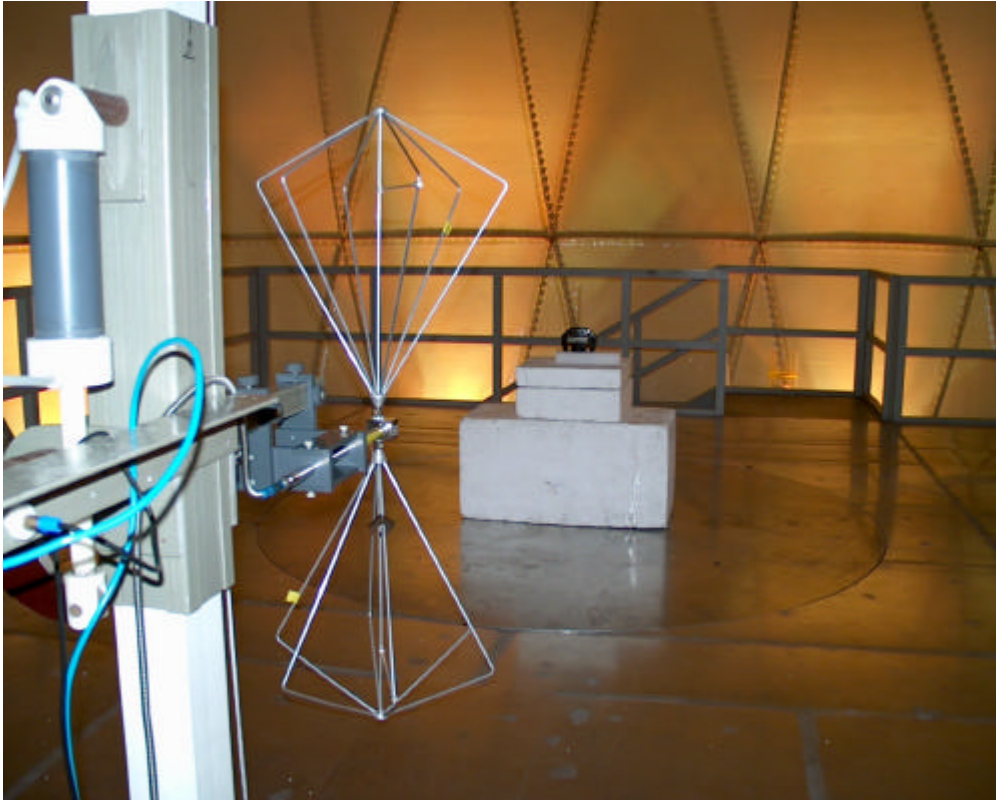
**Antenna and Cable Factors:**

**Antenna factor Low range:** 3m Bikonisk VHA9103 M17095 Ref. ant.  
**Antenna factor High range:** 3m Logperiodisk UHALP9107 M17380  
**Cable factor:** 3m OATS cable



**Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.**

**Photo of test set-up at 3 meter OATS (1)**



**Photo of test set-up at 3 meter OATS (2)**





**Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.**

**Photo of test set-up at 3 meter OATS (3) - Below 30 MHz**



**Photo of test set-up at 3 meter OATS (4) – Below 30MHz**

