

# 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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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>Fabrikkat</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>	10. April 2002	
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**The test result is only valid for the equipment tested.**  
*Prøvningsresultatet gælder kun for det afprøvede udstyr.*

Martin Bülow Arndt  
B.Sc.(E.E.)

**The test report shall not be reproduced except in full without the written permission of Telelaboratoriet, and no part shall be quoted out of context**  
*Prøvningsrapporten må kun gengives i uddrag, såfremt Telelaboratoriet skriftligt har godkendt dette.*

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.

Model : Racers  
Type : 44278

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

#### 3.2. Technical specifications

Frequency : 27,128 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 a Biconical antenna according to clause 8.2.3 in ANSI 64.3:2000. The Biconical antenna has AF calibration values starting at 20MHz.

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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, spurious and RF emission is measured up to the 10. harmonic of the maximum TX channel frequency. This give a measuring range of 27 MHz to 270 (1000) MHz as the TX channel is at 27,145MHz.

## 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 is shown in annex 1. Results of the final measurement on 3-meter OATS are shown in annex 2. The measured worst case emission levels are listed below.

Signal	Measurement settings		Measured values AVG		Measured values QP	
	Freq. [MHz]	Meas. BW	AVG [dBuV/m]	AVG [uV/m]	QP [dBuV/m]	QP [uV/m]
1	27.145	120 kHz	35.28	58,07	-	
2	54.3	120 kHz	-		29.58	30,13
3	81.4	120 kHz	-		25.99	19,93
4	108.6	120 kHz	-		23.43	14,84
5	135.7	120 kHz	-		31.54	37,76
6	162.9	120 kHz	-		25.76	19,41
7	190.0	120 kHz	-		24.6	16,98
8	217.2	120 kHz	-		24.57	16,92
9	244.3	120 kHz	-		29.11	28,54
10	407.2	120 kHz	-		33.43	46,94
11	624.3	120 kHz	-		42.87	139,16
12	787.2	120 kHz	-		31.81	38,95

**Limit:**

Level of the fundamental (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.

**Conclusion:**

**The EUT complies with the given limit.**

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## 7. List of instruments

### Radiated emission (Prescan):

Test receiver	R&S ESMI	17654
Antenna 1	Schwarzbeck VHA	14117
Antenna 2	Schwarzbeck UHALP	16066

### Radiated emission (Final):

Test receiver (<1GHz)	R&S ESVP	17654
Antenna 1	Schwarzbeck VHA	17095
Antenna 2	Schwarzbeck UHALP	17380

### Support Equipment:

None

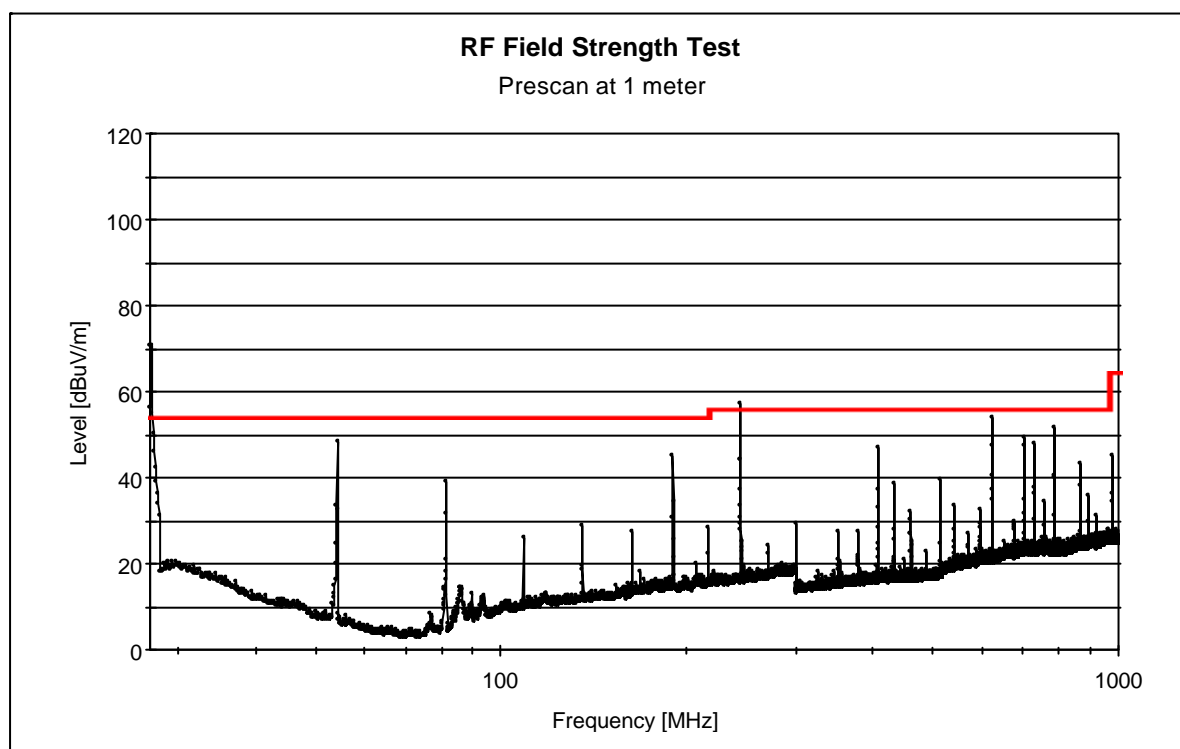


**Title: Test on LEGO, RACERS remote control for toy, to FCC Part 15C clause 15.227.**

**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

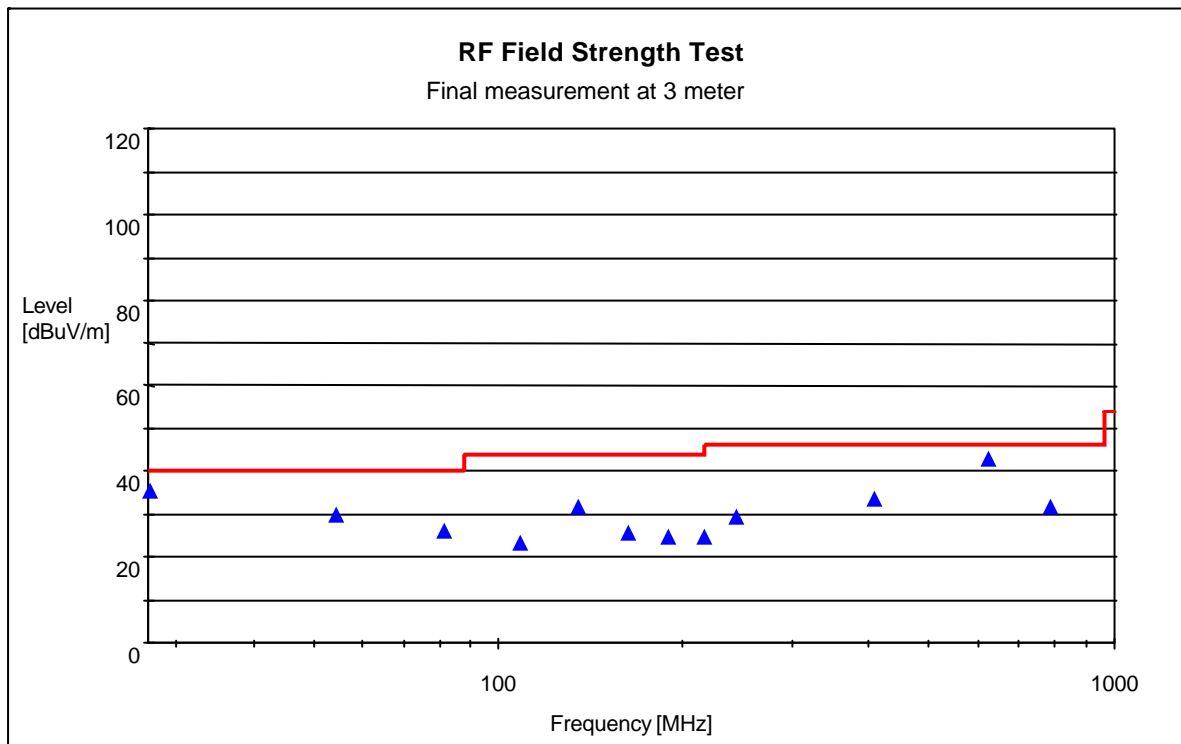


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**RF Field Emission:**

**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

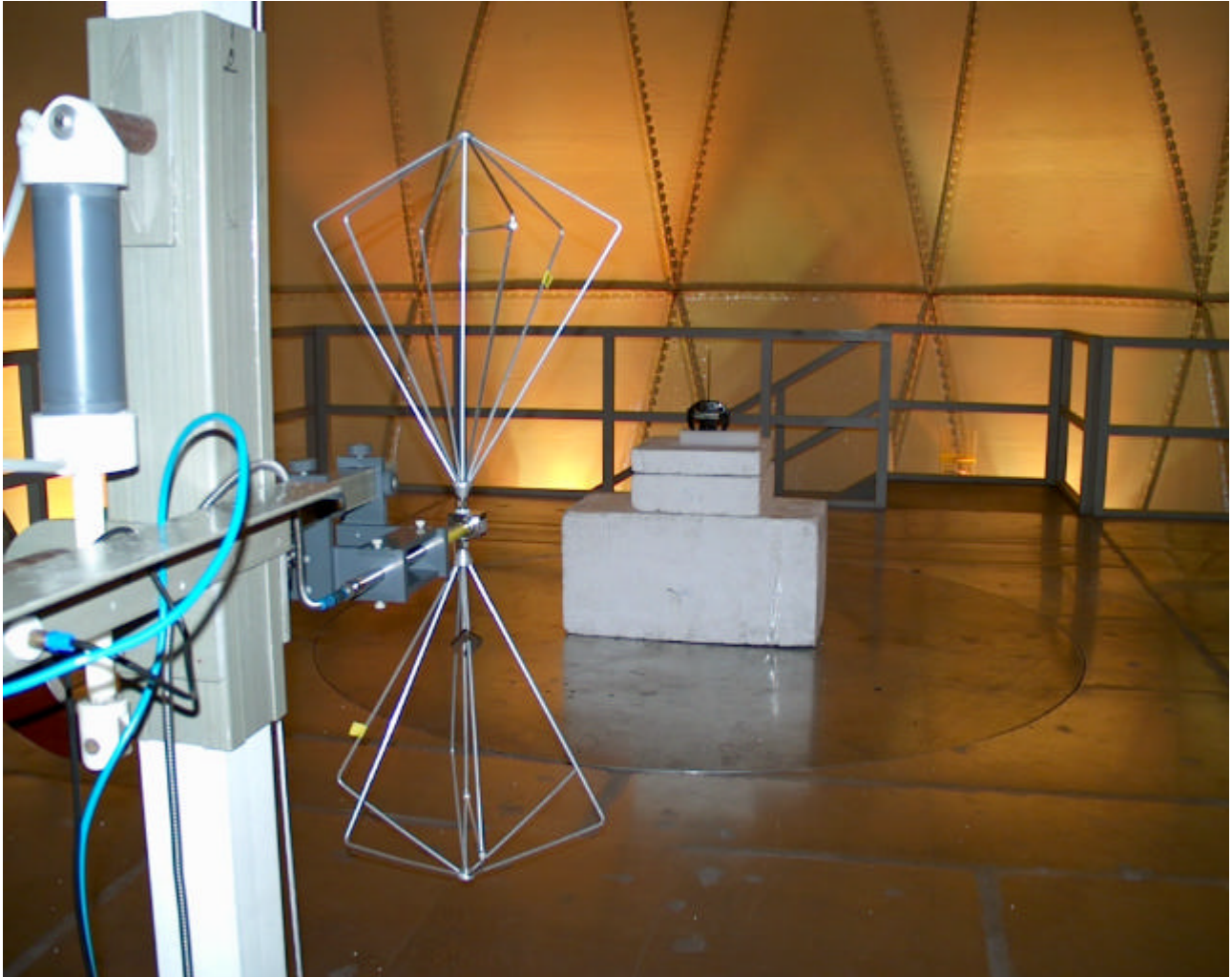
**Antenna and Cable Factors:**

**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)**





**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 (2)**

