



**TEST REPORT CONCERNING THE COMPLIANCE OF
A WIRELESS MOUSE (27 MHz),
BRAND LOGITECH, MODEL M-RAA93,
WITH 47 CFR PART 15 (2003-07-22).**

FCC listed : 90828
Industry Canada : IC3501
VCCI registered : R-1518, C-1598

TNO Electronic Products & Services (EPS) B.V.
P.O. Box 15
9822 ZG Niekerk (NL)
Smidshornerweg 18
9822 TL Niekerk (NL)

Telephone: +31 594 505005
Telefax: +31 594 504804

E-mail: info@eps.tno.nl



Test specification(s): 47 CFR Part 15 (2003-07-22)
Description of EUT: Wireless mouse
Manufacturer: Logitech Europe S.A.
Brand mark: Logitech
Model: M-RAA93
FCC ID: DZL 201705

MEASUREMENT/TECHNICAL REPORT

LOGITECH

Model: M-RAA93

FCC ID: DZL 201705

September 3, 2003

This report concerns:	Original grant/certification	Class 2 change	Verification
Equipment type:	Wireless mouse		
Deferred grant requested per 47 CFR 0.457(d)(1)(ii) ?	Yes	No	
Report prepared by:	Name	: H. J. Pieters	
	Company name	: TNO Electronic Products & Services (EPS) B.V.	
	Address	: Smidshornerweg 18	
	Postal code/city	: 9822 ZG Niekerk	
	Mailing address	: P.O. Box 15	
	Postal code/city	: 9822 TL Niekerk	
	Country	: The Netherlands	
	Telephone number	: + 31 594 505 005	
	Telefax number	: + 31 594 504 804	
	E-mail	: info@eps.tno.nl	

The data taken for this test and report herein was done in accordance with 47 CFR Part 15 and the measurement procedures of ANSI C63.4-1992. TNO Electronic Products & Services (EPS) B.V. at Niekerk, The Netherlands, certifies that the data is accurate and contains a true representation of the emission profile of the Equipment Under Test (EUT) on the date of the test as noted in the test report. I have reviewed the test report and find it to be an accurate description of the test(s) performed and the EUT so tested.

Date: September 3, 2003

Signature:

P. A. J. M. Robben, B.Sc.E.E.
TNO Electronic Products & Services (EPS) B.V.



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Description of test item

Test item : Wireless mouse
Manufacturer : Logitech Europa S.A.
Brand mark : Logitech
Model : M-RAA93
Serial number(s) : PB2(WW)-263
Revision : not applicable
Receipt number : 1
Receipt date : September 3, 2003

Applicant information

Applicant's representative : Mr. Wouters
Company : Telefication b.v.
Address : Edisonstraat 12a
Postal code : 6902 PK
City : Zevenaar
PO-box : -
Postal code : 7140 AA
City : Groenlo
Country : The Netherlands
Telephone number : +31 (0)316 583180
Telefax number : +31 (0)316 583189

Test(s) performed

Location : Niekerk
Test(s) started : September 2, 2003
Test(s) completed : September 2, 2003
Purpose of test(s) : Type approval / certification
Test specification(s) : 47 CFR Part 15 (2003-07-22)

Test engineer : H.J. Pieters

Report written by : H.J. Pieters

Project leader: : P. A. J. M. Robben, B.Sc.E.E.

This report is in conformity with NEN-EN-ISO/IEC 17025: 2000.

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The test results relate only to the item(s) tested.



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1 General information.

1.1 Product description.

1.1.1 Introduction.

The wireless mouse, brand Logitech, model M-RAA93, is designed to operate in the frequency band 26.96 MHz to 27.28 MHz, as specified by the Federal Communications Commission in the USA.

1.1.2 Operating frequency.

The operating frequency of the wireless mouse, brand Logitech, model M-RAA93 is 27.04 MHz.

1.1.3 Operating principles.

During the tests the wireless mouse, brand Logitech, model M-RAA93, was set up to function in accordance with the manufacturer's instructions.

1.2 Related submittal(s) and/or Grant(s).

Not applicable.

1.3 Tested system details.

Details and an overview of the system and all of its components, as it has been tested, may be found in table 1 below. FCC ID's are stated in this overview where applicable.

Description	Manufacturer	Model number	Serial number	FCC ID	Cable descriptions
Wireless mouse	Logitech Europe S.A.	M-RAA93	PB2(WW)-263	DZL 201705	None.

Table 1 - Tested system details overview.



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1.4 Test methodology.

The test methodology used is based on the requirements of 47 CFR Part 15 (2003-07-22), sections 15.227, 15.205 and 15.209.

The test methods, which have been used, are based on ANSI C63.4: 1992.

Radiated emission tests above 30 MHz were performed at a measurement distance of 3 meters. Below 30 MHz the radiated emission tests were carried out at measurement distances of 3 and 10 meters. The test results regarding the radiated emission tests on frequencies below 30 MHz have been extrapolated in order to determine the field strength of the measured values at measurement distances of 30 and 300 meters (as required by 47 CFR Part 15).

The receivers are switching automatically to the right bandwidth in accordance with CISPR 16. This is implemented in the receiver. The antenna factors are programmed in the test receiver. The receiver automatically calculates the appropriate correction factor for the utilized antenna and also the appropriate antenna factor for the cable loss. The total correction is automatically added to the measured value.

1.5 Test facility.

The Federal Communications Commission has reviewed the technical characteristics of the test facilities at TNO Electronic Products & Services (EPS) B.V., located in Niekerk, 9822 TL Smidshornerweg 18, The Netherlands, and has found these test facilities to be in compliance with the requirements of 47 CFR Part 15, section 2.948, per October 23, 2000.

The description of the test facilities has been filed at the Office of the Federal Communications Commission under registration number 90828. The facility has been added to the list of laboratories performing these test services for the public on a fee basis.

The list of all public test facilities is available on the Internet at <http://www.fcc.gov>.

1.6 Product labeling.

In accordance with 47 CFR Part 15.19 (a)(3) the following text shall be placed on a label, which is attached to the EUT:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

In accordance with 47 CFR Part 2.925 (a)(1), the FCC ID shall be placed on a label, which is attached to the EUT.

For further details about the labeling requirements (size, legibility, etc.) as set by the Federal Communications Commission see 47 CFR Part 15.19 (a)(3), 47 CFR Part 15.19 (b)(2), 47 CFR Part 15.19 (b)(4), 47 CFR Part 2.925 and 47 CFR Part 2.926.



2 System test configuration.

2.1 Justification.

The system was configured for testing in continuous transmitting. During all tests the EUT was set up to function in accordance with the manufacturer's instructions.

The justification and manipulation of cables and equipment in order to simulate a worst-case behaviour of the test setup has been carried out as prescribed in ANSI C63.4: 1992.

2.2 EUT mode of operation.

Radiated measurements were carried out when the system was active and was generating a continuous transmitting signal.

2.3 Special accessories.

No special accessories are used and/or needed to achieve compliance with the appropriate sections of 47 CFR Part 15.

2.4 Equipment modifications.

No modifications have been made to the equipment in order to achieve compliance with the appropriate sections of 47 CFR Part 15.

2.5 Configuration of the tested system.

Unit title	:	Wireless mouse
Model number	:	M-RAA93
Part number	:	PB2(WW)-263
FCC ID	:	DZL 201705
Frequency range	:	-
Description/details	:	See section 1.1 of this test report
Power supply	:	+3 Volts DC (Battery powered)
Clock Oscillator(s)	:	-
Cabinet & Screening	:	Not applicable
Interface Cable(s)	:	Not applicable
Method of screening	:	Not applicable
Method of grounding	:	Not applicable
Operating configuration	:	See section 1.3 of this test report



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2.6 Block diagram of the EUT.

The block diagram is available in the technical documentation package as an addendum to this test report.

2.7 Schematics of the EUT.

The schematics are available in the technical documentation package as an addendum to this test report.

2.8 Partlist of the EUT.

The partlist is available in the technical documentation package as an addendum to this test report.



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3 Radiated emission data.

3.1 Radiated field strength measurements (frequency range of 30-1000 MHz, E-field).

Frequency (MHz)	Measurement results dB(μV)/m @ 3 meters Quasi-peak		Limits dB(μV)/m @ 3 meters Quasi-peak	Margin (dB) Quasi-peak		Result
	Vertical	Horizontal		Vertical	Horizontal	
30 – 88	< 10.0	< 10.0	40.0	-	-	PASS
88 – 175.8	< 10.0	< 10.0	43.5	-	-	PASS
175.8 (X-position)	22.6	15.7	43.5	-20.9	-27.8	PASS
175.8 (Y-position)	14.9	25.5	43.5	-28.6	-18.0	PASS
175.8 (Z-position)	19.0	25.0	43.5	-24.5	-18.5	PASS
175.8 – 216	< 10.0	< 10.0	43.5	-	-	PASS
216 – 960	< 10.0	< 10.0	46.0	-	-	PASS
960 – 1000	< 10.0	< 10.0	54.0	-	-	PASS

Table 2

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.205 and 15.209, with the EUT operating in continuous transmit mode on 27 MHz, are depicted in table 2.

Note: - Field strength values of radiated emissions at frequencies not listed in table 2 are more than 20 dB below the applicable limit.

Test engineer

Signature

Name : H. J. Pieters

Date : September 3, 2003



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3.2 Radiated field strength measurements (frequency range of 0.009-30 MHz, H-field).

Frequency (MHz)	Measurement results dB μ V Quasi-peak		Antenna factor dB	Cable loss dB	Measurement results dB(μ V)/m Quasi-peak (calculated)	Limits Part 15.209 dB(μ V)/m (calculated)
	3 meters	10 meters				
0.009 - 0.490	<10.0	n.a.	19	1	< 10.0	48.5 – 13.8 (300 m)
0.490 - 1.705	<10.0	n.a.	19	1	< 10.0	33.8 - 22.9 (30 m)
1.705 – 27.04	<10.0	n.a.	19	1	< 10.0	29.5 (30 m)
27.04 (X-position)	31.4	11.4	19	1	< 10.0	29.5 (30 m)
27.04 (Y-position)	20.2	6.0	19	1	< 10.0	29.5 (30 m)
27.04 (Z-position)	31.3	11.3	19	1	< 10.0	29.5 (30 m)
27.05 - 30.00	<10.0	n.a.	19	1	<10.0	29.5 (30 m)

Table 3

The results of the radiated emission tests, carried out in accordance with 47 CFR Part 15, sections 15.205 and 15.209, with the EUT operating in continuous transmit mode on 27.04 MHz, are depicted in table 3.

- Notes:**
- A total work out of the calculated measurement result can be found in the Appendix 1.
 - Frequency range:
 - 9-90 kHz Average detector used during measurements
 - 110-490 kHz Average detector used during measurements
 - 26.96-27.28 MHz Average detector used during measurements
 - The radiated field strengths were measured at a distance of 3 and 10 meters. Measured field strengths at a distance of 10 meters were already below the limit of 30/300 meters
 - n.a. indicates that no field strength values could be measured on the listed frequencies or in the listed frequency range
 - Field strength values of radiated emissions at frequencies not listed in table 3 are more than 20 dB below the applicable limit

Test engineer

Signature :

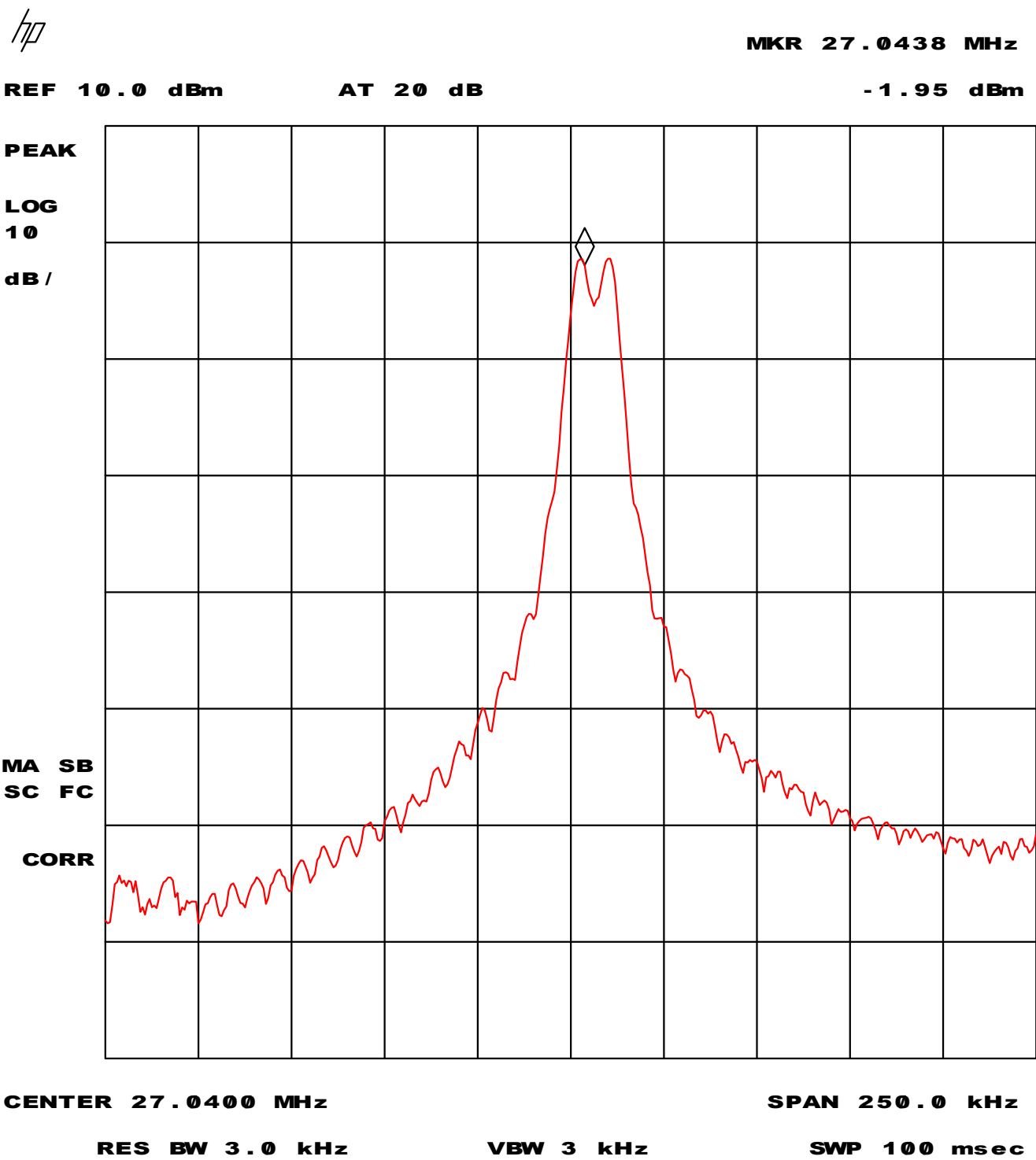
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4 Plot of emission bandwidth of carrier signal.





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5 List of utilized test equipment.

Inventory number	Description	Brand	Type
12471	Biconical antenna 20MHz-200MHz	EATON	94455-1
12473	Log-per antenna 200-1000MHz	EATON	96005
12476	Antenna mast	EMCO	TR3
12477	Antenna mast 1-4 mtr	Poelstra	--
12482	Loop antenna	EMCO	6507
12483	Guidehorn	EMCO	3115
12484	Guidehorn	EMCO	3115
12488	Guidehorn 18 - 26.5 GHz	EMCO	RA42-K-F-4B-C
12533	Signalgenerator	MARCONI	2032
12559	Digital storage oscilloscope	Le Croy	9310M
12561	DC Power Supply 20A/70V	DELTA	SM7020D
12567	Plotter	HP	7440A
12605	calibrated dipole 28MHz-1GHz	Emco	3121c
12608	HF milliwattmeter	Hewlett Packard	HP435a
12609	Power sensor 10MHz-18GHz	Hewlett Packard	HP8481A
12636	Polyester chamber	Polyforce	--
12640	Temperature chamber	Heraeus	VEM03/500
13664	Spectrum analyzer	HP	HP8593E
13078	Preamplifier 0.1 GHz - 12 GHz	Miteq	AMF-3D-001120-35-14p
13452	Digital multi meter	HP	34401A
13526	Signalgenerator 20 GHz	Hewlett & Packard	83620A
13594	Preamplifier 10 GHz - 25 GHz	Miteq	AMF-6D-100250-10p
13886	Open Area testsite	Comtest	--
14051	Anechoic room	Comtest	--
14450	2.4 GHz bandrejectfilter	BSC	XN-1783
15633	Biconilog Testantenna	Chase	CBL 6111B
15667	Measuring receiver	R&S	ESCS 30
99045	DC Power Supply 3A/30V	DELTA	E030/3
99055	Non-conducting support	NMi	--
99061	Non-conducting support 150cm	NMi	--
99068	Detector N-F/BNC-F	Radiall	R451576000
99069	Cable 5m RG214	NMi	--
99071	Cable 10m RG214	NMi	--
99076	Bandpassfilter 4 - 10 GHz	Reactel	7AS-7G-6G-511
99077	Regulating trafo	RFT	LTS006
99112	Tripod	Chase	--
99136	Bandpassfilter 10 - 26.5 GHz	Reactel	9HS-10G/26.5G-S11



Appendix 1

Calculated measurements results radiated field strength, H-Field

General Formula:

d_1 = short distance

d_2 = long distance

$$(d_1/d_2)^n = H_{d2}/H_{d1}$$

$$n \log(d_1/d_2) = \log(H_{d2}/H_{d1})$$

Measured field strength at 27.04 MHz:

(Z-position measurements results)

$$H_{3m} = 31.4 \text{ dB}\mu\text{V/m} = 37.15 \text{ }\mu\text{V/m}$$

$$H_{10m} = 11.4 \text{ dB}\mu\text{V/m} = 3.71 \text{ }\mu\text{V/m}$$

$$n = \log(H_{d2}/H_{d1}) / \log(d_1/d_2)$$

$$n = \log(3.71/37.15) / \log(3/10)$$

$$n = 1.91$$

Calculated field strength at 27.04 MHz (10m --> 300m):

$$H_{300m} = H_{d2}$$

$$n \log(d_1/d_2) = \log(H_{d2}/H_{d1}) \Rightarrow 2 \log(10/300) = \log(H_{d2} / 3.71)$$

$$H_{300} = 0.0041 \text{ }\mu\text{V} = -47.74 \text{ dB}\mu\text{V/m}$$