Intertek Testing Services
ETL SEMKO

ITS

FCC Part 15.227 Test Report
for
Logitech
on the
**Cordless Trackball Mouse
Model: T-RA17**

Test Report #: 20207272
Date of Report: August 2, 2000

Job #: J20020727
Date of Test: July 27, 2000

Total No. of Pages Contained in this Report: __12__ + data pages

NVLAP®

Lab Code 200201-0

FCC Part 15.249 Tx Cert, Ver 3/00

Intertek Testing Services NA, Inc.
1365 Adams Court, Menlo Park, CA 94025
Telephone 650-463-2900   Fax 650-463-2910   Home Page www.etlsemko.com

Table of Contents

1.0   Summary of Test Results

MODEL: T-RA17

TEST	REFERENCE	RESULTS
Radiated Emission	15.227	Complies
Conducted Emission	15.207	Not Applicable*
Antenna Requirement	15.203	Complies

*EUT is battery operated

Test Engineer: _____   Date: ___8/16/00___
Suresh Kondapalli
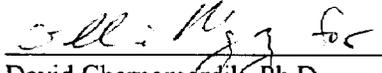
EMC Site Manager: _____   Date: ___8/16/00___
David Chernomordik, Ph.D.

2.0   General Description

2.1   Product Description

The EUT transfers data to a receiver hooked to a PC at 27.045 MHz. Data is FSK modulated.

2.2   Related Submittal(s) Grants

This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application. This specific report details the emission characteristics of transmitter.

The FCC ID for the receiver associated with this transmitter is not labeled. The receivers are subject to the notification authorization process. A notification report has been prepared for the receiver.

2.3   Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

2.4   Test Facility

The open area test site used to collect the radiated data was Site 2. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

3.3   System Test Configuration

3.3.1   Support Equipment

Item #	Description	Model No.	Serial No.
1	Dell Dimension	T-450	2478075
2	HP monitor	D5258A	DK73795774
3	Logitech Keyboard	SK2500	SCC81621515
4	HP Printer	Desk Jet 340	N/A
5	Best Data VI 90Modem	Smart One	565PX72729
6	Logitech Receiver	-	-

3.3.2   Block Diagram of Test Setup
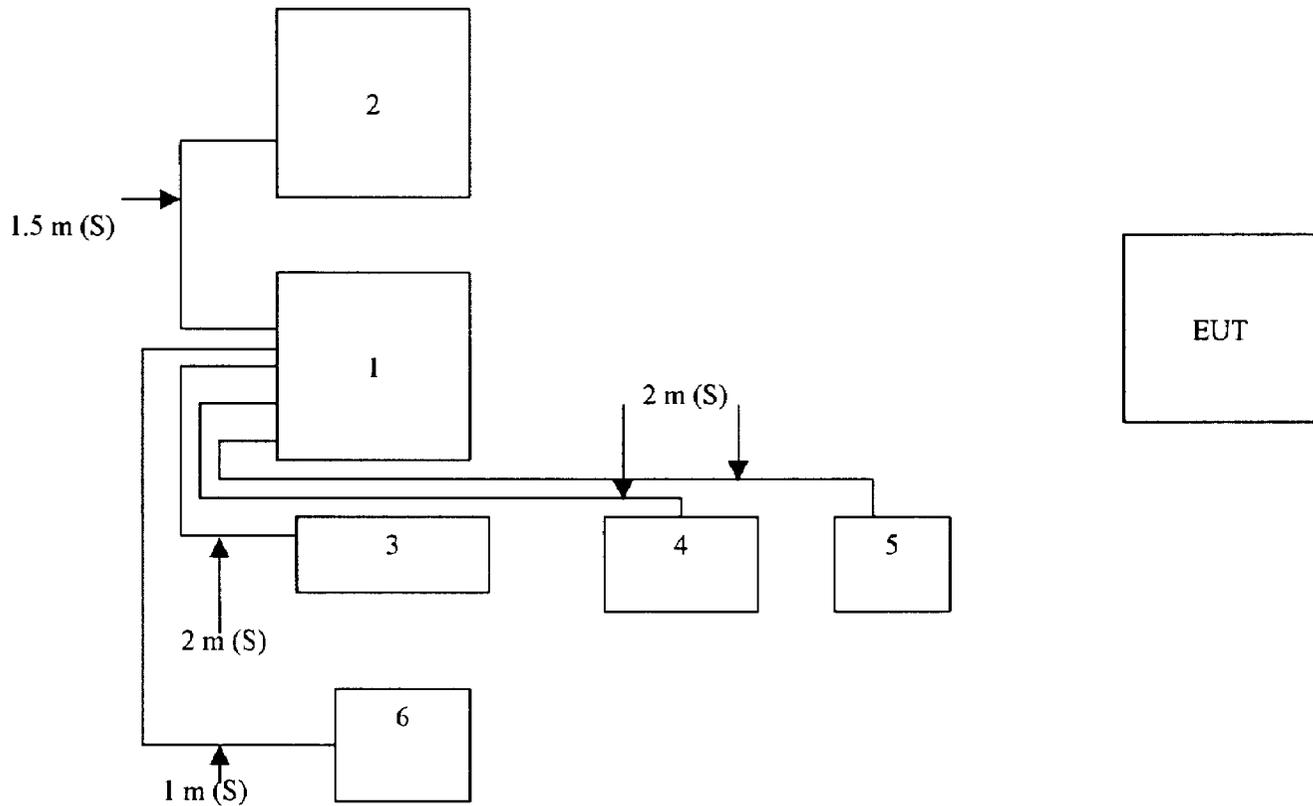
* = EUT	S = Shielded;	F = With Ferrite
** = No ferrites on video cable	U = Unshielded	

3.4   Equipment Modification

Any modifications installed before testing by Logitech will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

3.5   Additions, deviations and exclusions from standards

No additions, exclusions or deviations to the standard were made.

4.0   Emission Results

AC line conducted emission measurements were not performed as EUT is battery operated.

Radiated emission measurements were performed from 30 MHz to 1000 MHz.   Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.   All measurements were performed with peak detection unless otherwise specified.

4.1   Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

where   FS = Field Strength in dB(µV/m)
        RA = Receiver Amplitude (including preamplifier) in dB(µV)
        CF = Cable Attenuation Factor in dB
        AF = Antenna Factor in dB/m
        AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

$$FS = RR + LF$$

where   FS = Field Strength in dB(µV/m)
        RR = RA - AG in dB(µV)
        LF = CF + AF in dB

Assume a receiver reading of 52.0 dB(µV) is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB(µV/m). This value in dB□V/m was converted to its corresponding level in µV/m.

RA = 52.0 dB(µV)   AF = 7.4 dB/m
RR = 23.0 dB(µV)   CF = 1.6 dB
LF = 9.0 dB   AG = 29.0 dB

FS = RR + LF
FS = 23 + 9 = 32 dB(µV/m)

Level in µV/m = Common Antilogarithm {[32 dB(µV/m)]/20} = 39.8 µV/m

4.2   Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	Passed by 10.2 dB at 54.08 MHz

Note: a)   All emissions not reported are at least 20 dB below the limits

Radiated Emissions Test
Data

Company:	Logitec		Model #:	TrackmanFX		Standard	FCC § 15B	
EUT:	Cordless Trackman Fx		S/N #:	PQP1-002		Limits	2	
Project #:	J20020727		Test Date:	July 27, 2000		Test Distance	3	meters
Test Mode:	Normal		Engineer:	Suresh Kondapalli		Duty Relaxation	0	dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	9	0	0	5	0	0	5	0	0	0
Model:	EMCO 3104	None	None	CDI P950	None	None	NPS665	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(µV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(µV/m)	dB(µV/m)	dB
27.04	68.9	Peak	0	0	V							
54.08	33.8	Peak	9	5	V	11.9	18.5	0.7	0.0	27.9	40.0	-12.1
81.12	39.9	Peak	9	5	V	7.8	18.8	0.9	0.0	29.8	40.0	-10.2
108.16	32.5	Peak	9	5	V	12.7	19.0	1.0	0.0	27.2	43.5	-16.3
135.20	35.8	Peak	9	5	V	12.5	19.1	1.2	0.0	30.4	43.5	-13.1
162.24	31.8	Peak	9	5	V	15.5	18.1	1.3	0.0	30.5	43.5	-13.0
189.28	29.8	Peak	9	5	V	17.4	18.3	1.4	0.0	30.3	43.5	-13.2
216.32	28.9	Peak	9	5	V	16.3	19.5	1.5	0.0	27.2	46.0	-18.8
243.36	27.1	Peak	9	5	V	17.0	19.6	1.7	0.0	26.2	46.0	-19.8
247.40	26.7	Peak	9	5	V	17.3	19.6	1.7	0.0	26.1	46.0	-19.9

Notes:	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only)
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emissions
Test Data

Company:	Logitec Inc		Model #:	trackman FX	Standard_	FCC § 15.227
EUT:	Cord less Track man		S/N #:	PQP1-002	Limits_	4
Project #:	J2002072 7		Test Date:	July 27,2000	Test Distance_	3 meters
Test Mode:	Normal		Engine er:	Suresh kondapalli	Duty Relaxation	0 dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	9	0	0	5	0	0	5	0	0	0
Model:	EMCO 3104	None	None	CDI_P95 0	None	None	NPS665	None	None	None

| Frequency MHz	Reading dB(µV)	Detector P/A/Q	Ant. #	Amp. #	Ant. Pol. H/V	Ant. Factor dB(1/m)	Pre-Amp dB	Insert. Loss dB	D. C. F. dB	Net dB(µV/m)	Limit @3m dB(µV/m)	Margin dB
27.045	68.9	Peak	9	5	V	13.9	18.2	0.2	0.0	64.8	80.0	-15.2

Notes:	
	a) D.C.F.:Distance Correction Factor
	b) Insert. Loss (dB) = Cable A + Cable B + Cable C
	c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).
	d) Negative signs (-) in Margin column signify levels below the limits.
	e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

11:59:56 JUL 28. 2000
LOGITEC TRACKMANFX

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 32.0 kHz
-36.03 dB

LOG REF 67.0 dBµV
10
dB/
ATN
10 dB

VA SB
SC FC
CORR
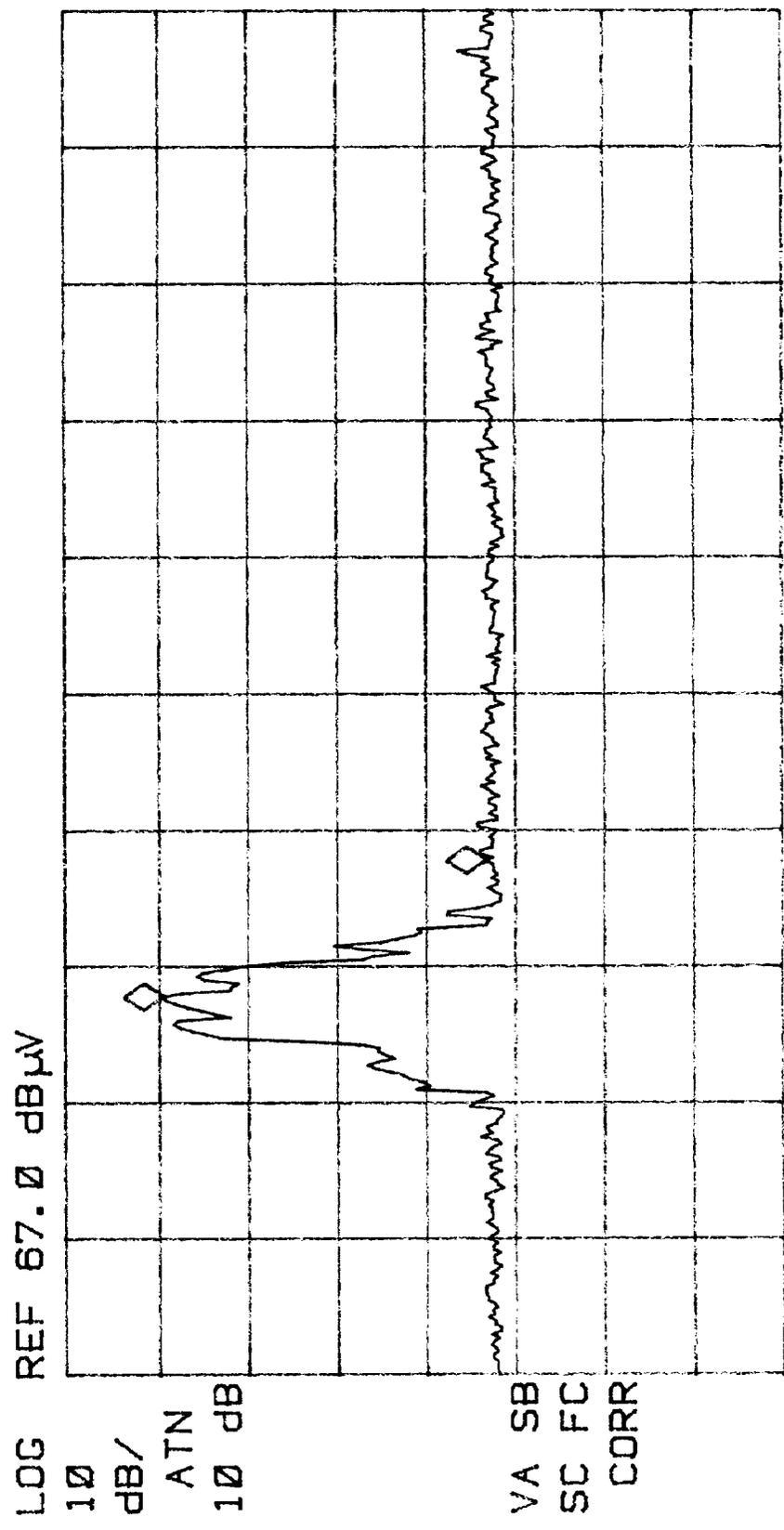
START 26.9600 MHz   STOP 27.2800 MHz
IF BW 9.0 kHz   #AVG BW 10 kHz   SWP 33.3 msec

4.3   Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	Not Applicable. EUT is battery operated.

Note: a)   A complete scan from 0.45 - 30 MHz was made.

5.0   Antenna Requirement

X	The transmitter uses a permanently connected antenna.
	The antenna is affixed to the EUT using a unique connector which allows for replacement of a broken antenna, but does NOT use a standard antenna jack or electrical connector.
	The EUT requires professional installation. Please refer to the attached documentation for details).

6.0   Document History

Revision/Job Number	Date	Change
1.0 / J20020727	8/2/00	Original document