

FCC Part 15.227 Emissions Test Report
for
Logitech
on the
Wireless RF Mouse
Model: M-RR63 & M-RM63
FCC ID: DZL201385

Test Report #: 20400502
Date of Report: February 24, 2001

Job #: J20040050
Date of Test: February 13, 2001

Total No of Pages Contained in this Report: 25 Data Sheets



NVLAP Laboratory Code: 200201-0

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<i>David Chernomordik</i>	David Chernomordik, Ph.D. EMC Site Manager

Review Date: 4/02/01

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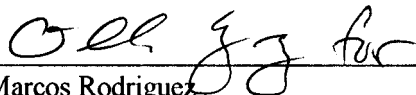
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Logitech, Model No. M-RR63 & M-RM63
FCC ID: DZL201385

Date of Test: February 13, 2001

.0 Summary of Tests**MODEL: M-RR63 & M-RM63**
FCC ID: DZL201385

TEST	REFERENCE	RESULTS
Field Strength on the fundamental frequency	15.227(a)	Passed
Out of Band Radiated Emission	15.227(b)	Passed
AC Conducted Emission	15.207	Passed
Antenna Requirement	15.203	Passed



Marcos Rodriguez
Test EngineerDate: 4/2/01

David Chernomordik, Ph.D.,
EMC Site ManagerDate: 4/2/01

Logitech, Model No. M-RR63 & M-RM63
FCC ID: DZL201385

Date of Test: February 13, 2001

2.0 General Description**2.1 Product Description****Overview of the EUT**

Applicant	Logitech 6505 Kaiser Dr., Fremont, CA 94555 USA
Trade Name & Model No.	Logitech M-RR63 & M-RM63
FCC Identifier	DZL201385
Use of product	The EUT is a computer mouse for personal computing applications. The primary purpose of the product is to track planer movements of the user's hand on a desk and send them to a computer. Several buttons also allow to generate content specific events. The M-RR63 and M-RM63 are identical except that the M-RR63 has two channels for transmitting and the M-RM63 has only one channel.
Frequency Range (MHz)	27.045 MHz – 27.195 MHz
Radiated Power (ERP)	200 nW (-37 dBm)
Antenna Requirement	The EUT uses a permanently connected antenna.
Manufacturer name & address	Logitech 6505 Kaiser Dr., Fremont, CA 94555 USA

2.2 Related Submittal(s) Grants

This is an Application for Certification of a low power transmitter. Two transmitters are included in this Application.

A separate DoC test report was issued to show compliance with the FCC Part 15, Subpart B Requirements.

2.3 Test Methodology

Both AC mains line-conducted and radiated emissions measurements were performed according to the procedures in ANSI C63.4 (1992). Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Data Sheet**" of this Application. All other measurements were made in accordance with the procedures in part 2 of CFR 47.

2.4 Test Facility

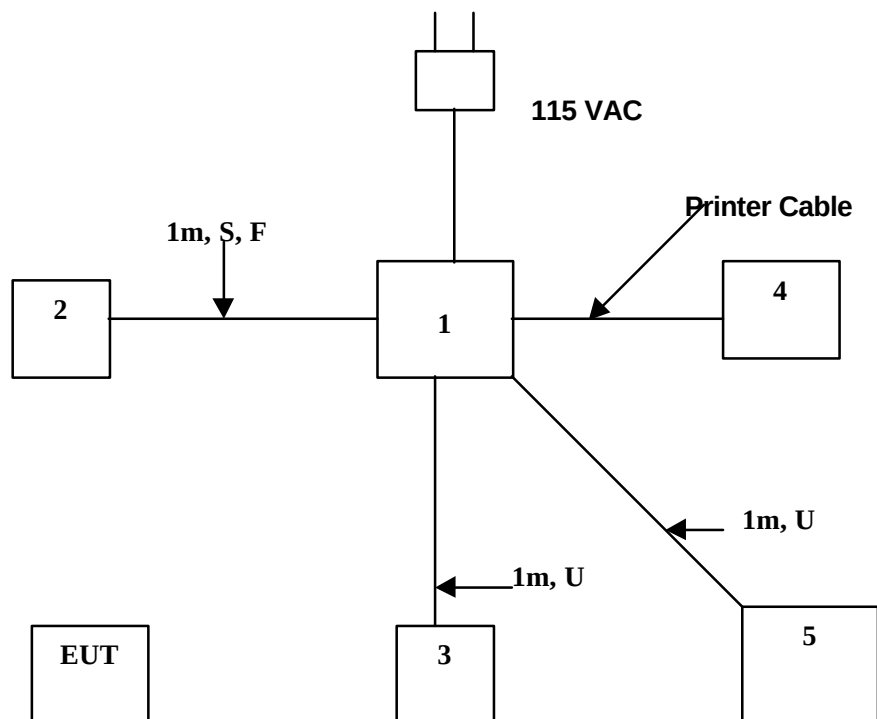
The test site and conducted measurement facility used to collect the radiated data is located at Menlo Park, California, Site 1. This test facility and site measurement data have been fully placed on file with the FCC.

3.0 System Test Configuration

3.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	Computer	Dell	MMS	1HY3F
2	Monitor	HP	D5258A	DK73795774
3	Keyboard	Logitech	N/A	N/A
4	Printer	HP	Deskjet 340	N/A
5	Modem	Best Data	Smart One Virgo	505PX72729

3.2 Block Diagram of Test Setup



* = EUT

** = No ferrites on video cable

S = Shielded;

U = Unshielded

F = With Ferrite

3.3 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For radiated emission measurements, the EUT is attached to a cardboard box or a non-conductive platform (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

This application is for two models M-R63 and MRR63. The two models are identical except that the MR-63 is a one channel unit with a carrier frequency of 27.045 MHz and the MRR-63 is a two channel unit with a carrier frequency of 27.045 as well as 27.195 MHz. Since the frequency range in between channels of the units is less than 1 MHz, only one channel was tested. The model M-RR63 operating at 27.045 MHz was tested.

3.4 Software Exercise Program

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.5 Mode of Operation during Test

The EUT was set to continuously transmit data to the receiver by simulating continuous movement of the mouse.

3.6 Modifications Required for Compliance

The following modifications were installed during compliance testing in order to bring the product into compliance (Please note that this list does not include changes made specifically by Logitech prior to compliance testing):

No modifications were made by Intertek Testing Services.

4.0 Measurement Results

AC line conducted emission measurements were performed from 0.45 MHz to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for frequencies 30 MHz to 1000 MHz, 1 MHz for frequencies above 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.

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 μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

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 μ V/m

RR = RA - AG in dB μ V

LF = CF + AF in dB

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

$$RA = 52.0 \text{ dB}\mu\text{V}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

4.1 Radiated Emission test results
FCC Rule 15.227

Notes:

1. See attached data sheets for details.
2. Emissions below 30 MHz are measured at 3 meters distance with a loop antenna. The antenna was rotated for maximum emissions.
3. To avoid making measurements in the near field in the frequency range of 30 MHz – 1000 MHz, the measurements were made at 10 meters distance, which is more accurate than at 3 meters distance.
4. The extrapolation method used for measurements made at 10 meters distance in the frequency range of 30 MHz – 1000 MHz is explained: The 3 meter limits were reduced by a correction factor of 10.5 dB to account for the measurement distance of 10 meters. The equation used for the 10.5 dB correction factor is: $20 \log(D/3)$, where D is the test distance of 10 meters.
5. Attached are plots for both channels of the two channel model. The attenuation at the bandedge frequencies is at least 47 dB which is at least 7 dB higher than the difference between the limits at the fundamental and the spurious emission frequency.
6. Attached are bandwidth plots for both units to demonstrate they are identical.
7. Radiated emission from digital parts is also included.

Logitech, Model No. M-RR63 & M-RM63
FCC ID: DZL201385

Date of Test: February 13, 2001

Emissions Measured with Loop Antenna for Fundamental Transmitting Frequency

Job No.:		J20040050								
Company:		Logitech								
Model:		M-RR63								
Test Mode:		Tx								
Engineer:		Ollie Moyrong								
Date:		April_1_2001								
FCC Part 15 Class B Radiated Emissions										
Frequency	Antenna	Antenna	Reading	Antenna	Preamp	Correction	Cable	Corrected	Limit	Margin
	Location	Polariz.		Factor		Factor	Loss	Reading	At 3.0 m	
(MHz)	(m)	(H/V)	(dBuV)	(dB/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)
27.0	3.0	V	41.7	16.3	0.0	0.0	0.5	58.5	80.0	-21.5
Notes:	Negative signs (-) in the Margin column signify levels below the limit.									
	Measurement made with Peak Detector									

Harmonics of Fundamental

Logitech, Model No. M-RR63 & M-RM63
FCC ID: DZL201385

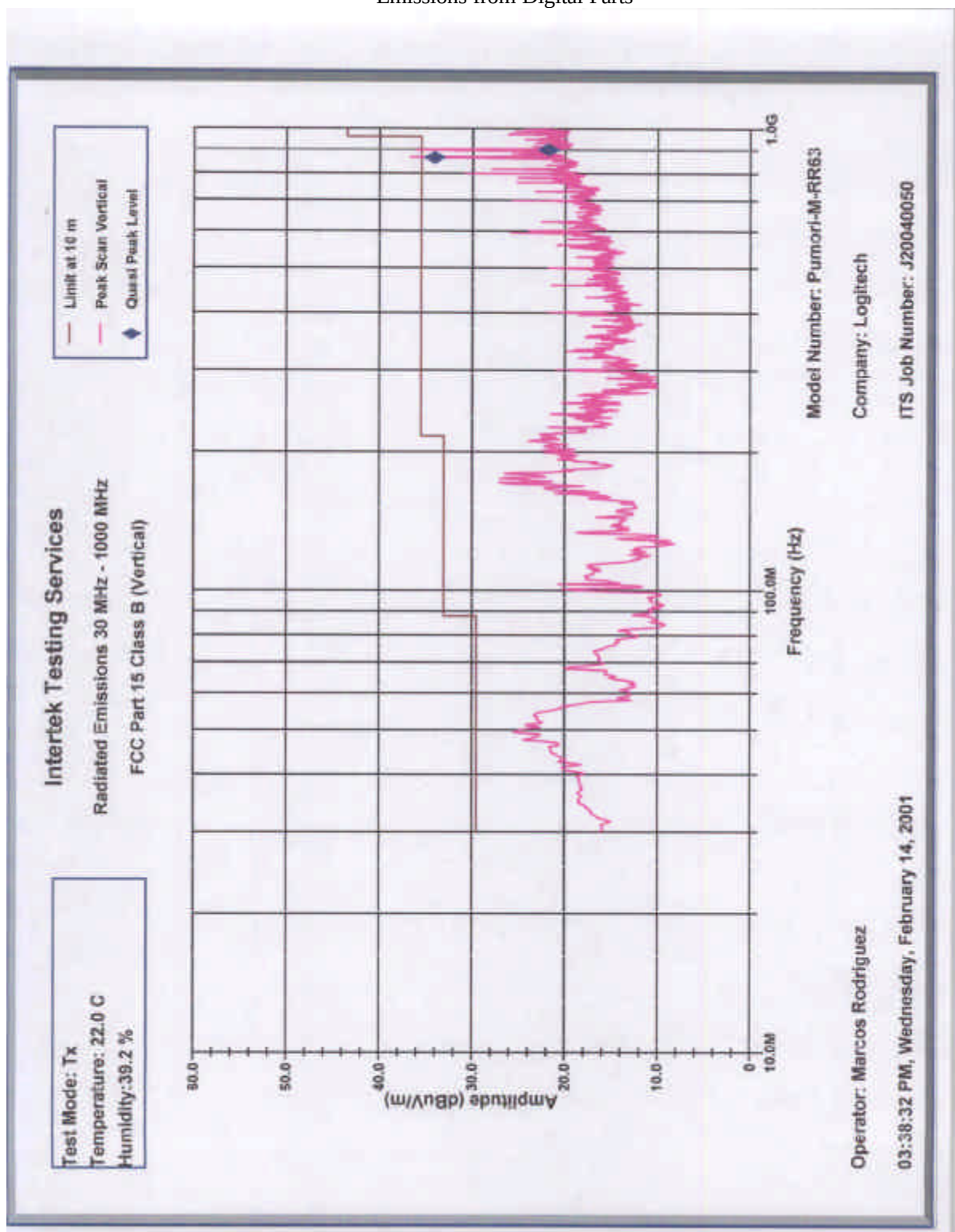
Date of Test: February 13, 2001

[illegible]

Intertek Testing Services							
Radiated Emissions 30 MHz - 1000 MHz							
FCC Part 15 Class B (QP-Vertical)							
Operator: Marcos Rodriguez							
09:31:32 AM, Monday, March 12, 2001							
Frequency MHz	1 QP Level (dBuV/m)	2 Limit@10m (dBuV/m)	3 QP Margin (dB)	4 Raw (dBuV)	5 Antenna (dB)	6 Cable (dB)	7 Preamp (dB)
54.074 MHz	18.1	29.5	-11.4	42.8	4.0	0.6	32.3
81.1295 MHz	13.7	29.5	-15.8	34.5	7.7	1.0	32.5
108.195 MHz	11.6	33.0	-21.4	33.9	6.2	1.3	32.7
135.2365 MHz	6.8	33.0	-26.2	28.1	7.0	1.5	32.8
162.2785 MHz	11.7	33.0	-21.3	30.3	8.7	1.6	31.8
189.3305 MHz	12.1	33.0	-20.9	29.6	9.8	1.6	31.9
216.424 MHz	16.0	35.5	-19.5	33.3	11.5	1.8	33.6
243.4185 MHz	17.8	35.5	-17.7	34.5	12.0	2.0	33.7
270.439 MHz	11.6	35.5	-23.9	27.3	12.9	2.1	33.7
297.4695 MHz	8.1	35.5	-27.4	22.6	13.5	2.1	33.2
Test Mode: Tx							
Temperature: 22.0 C							
Humidity: 39.2 %							

Model Number: Pumorl-M-RR63
 ITS Job Number: J20040050
 Company: Logitech

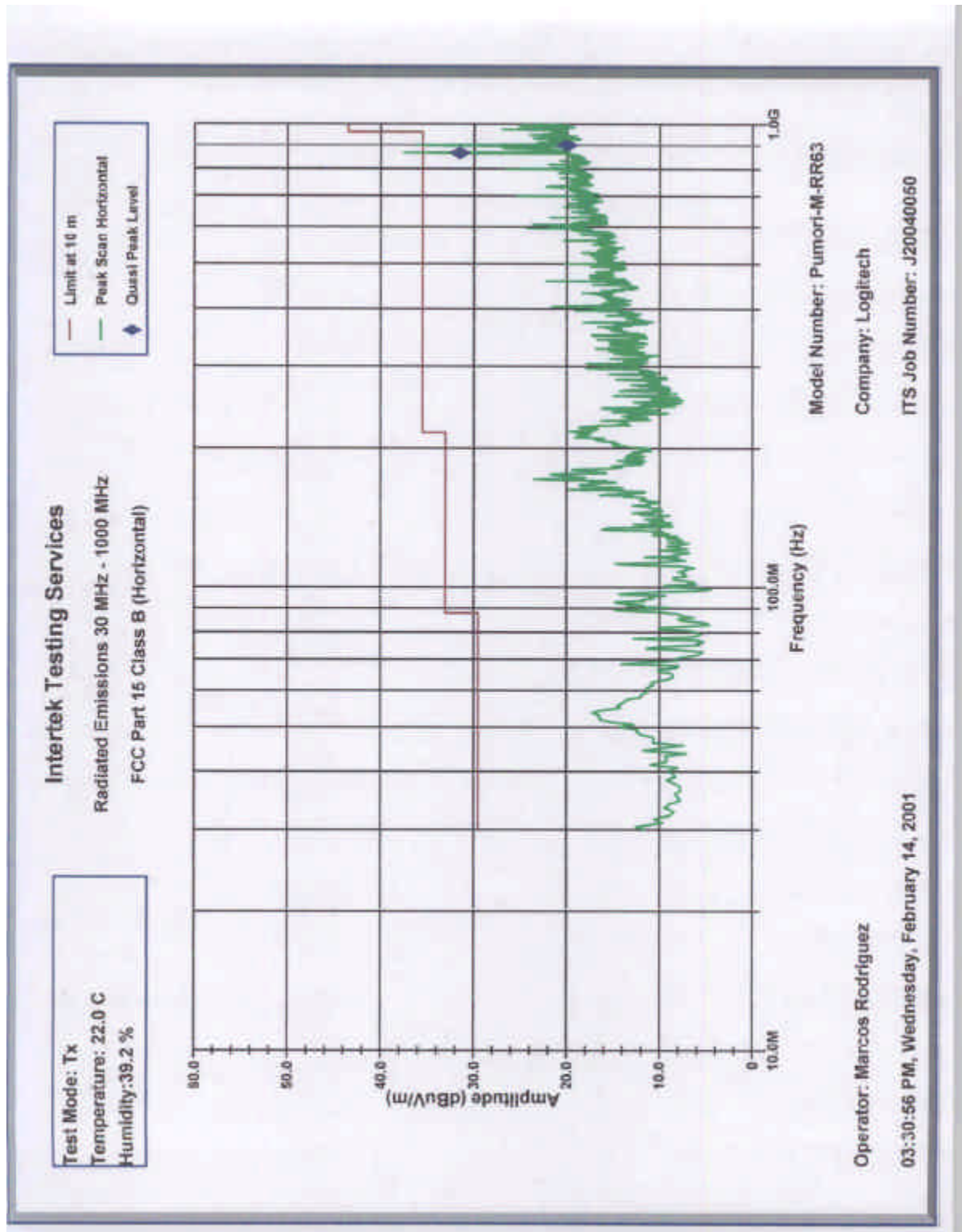
Emissions from Digital Parts



Emissions from Digital Parts

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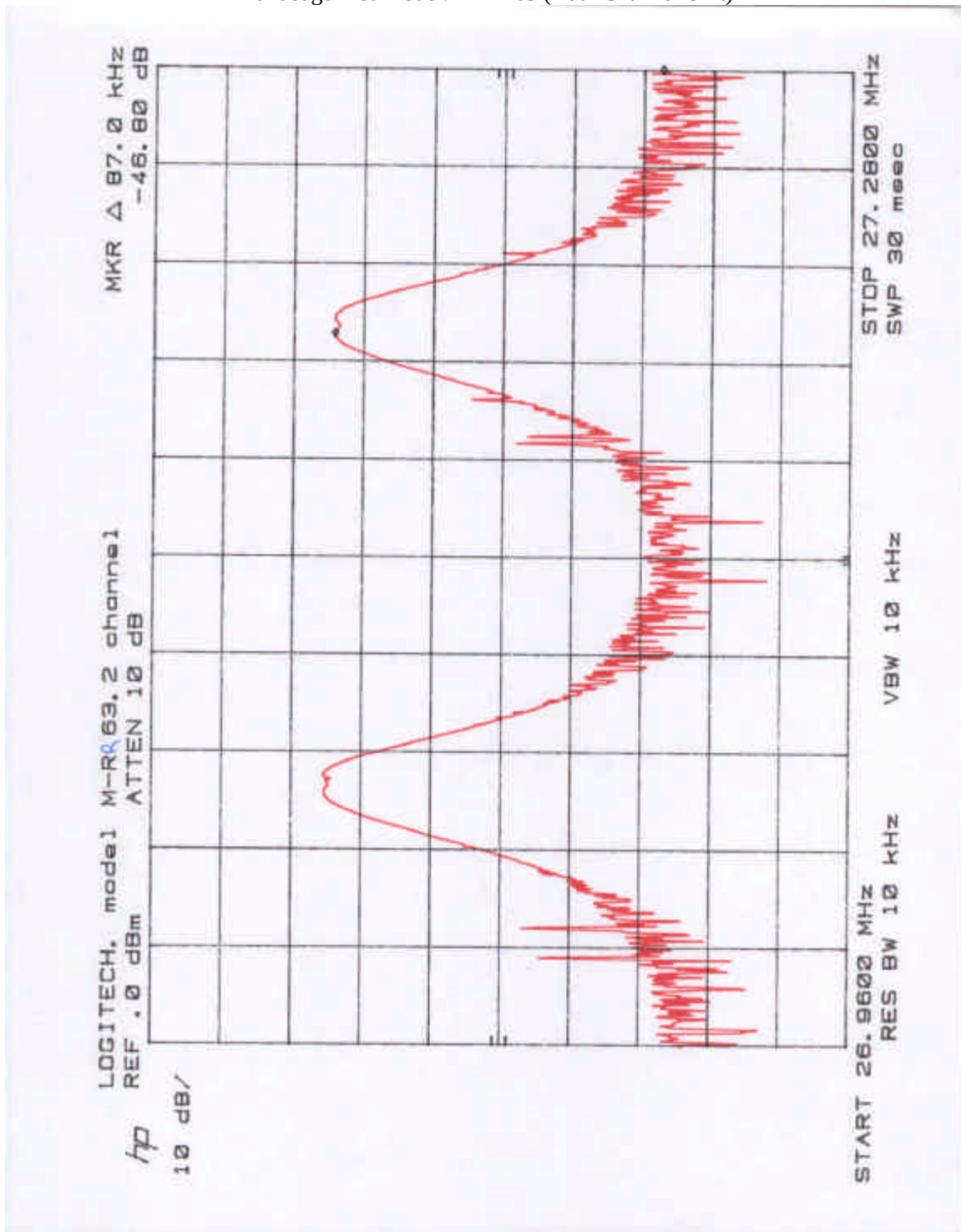
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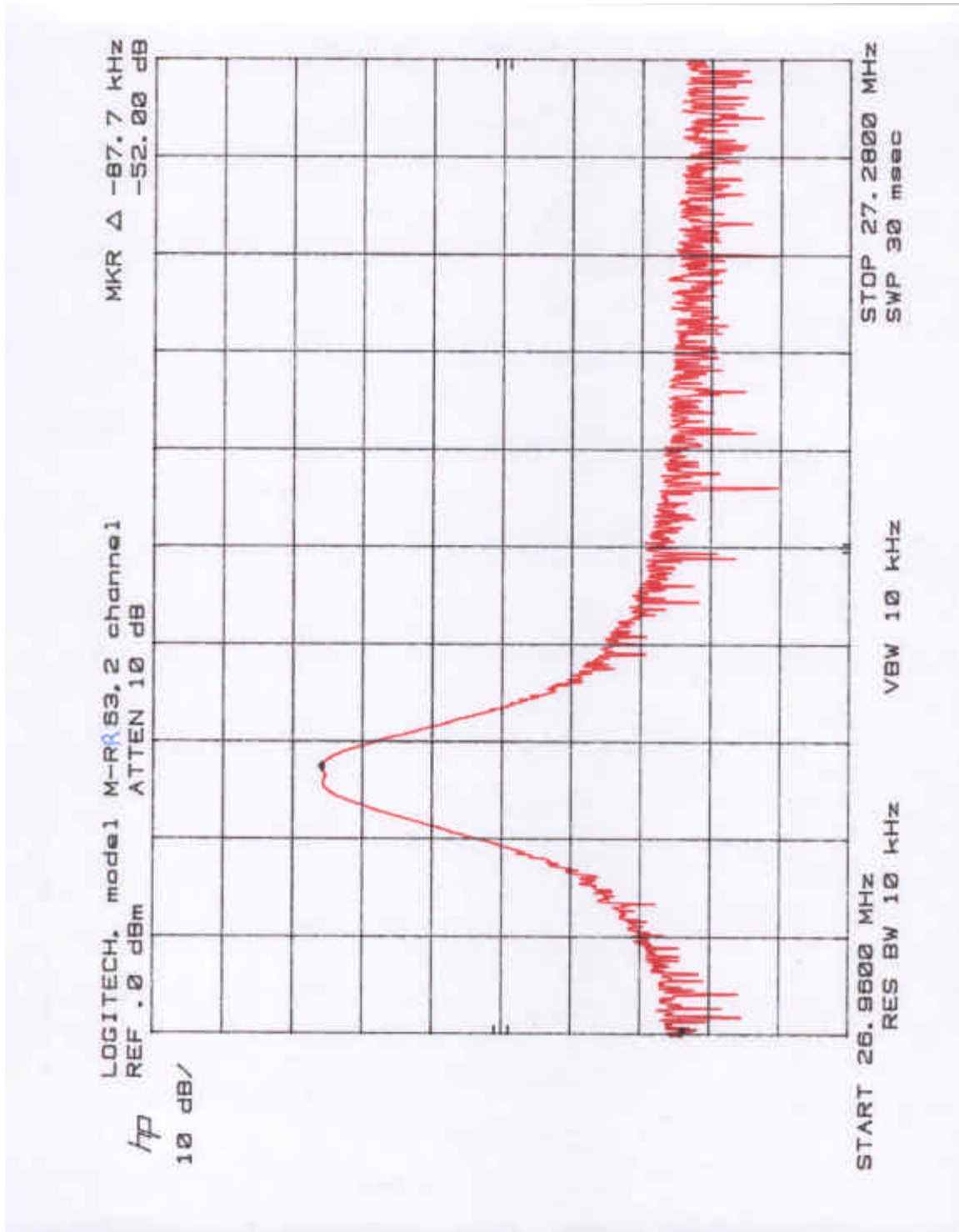
Emissions from Digital Parts

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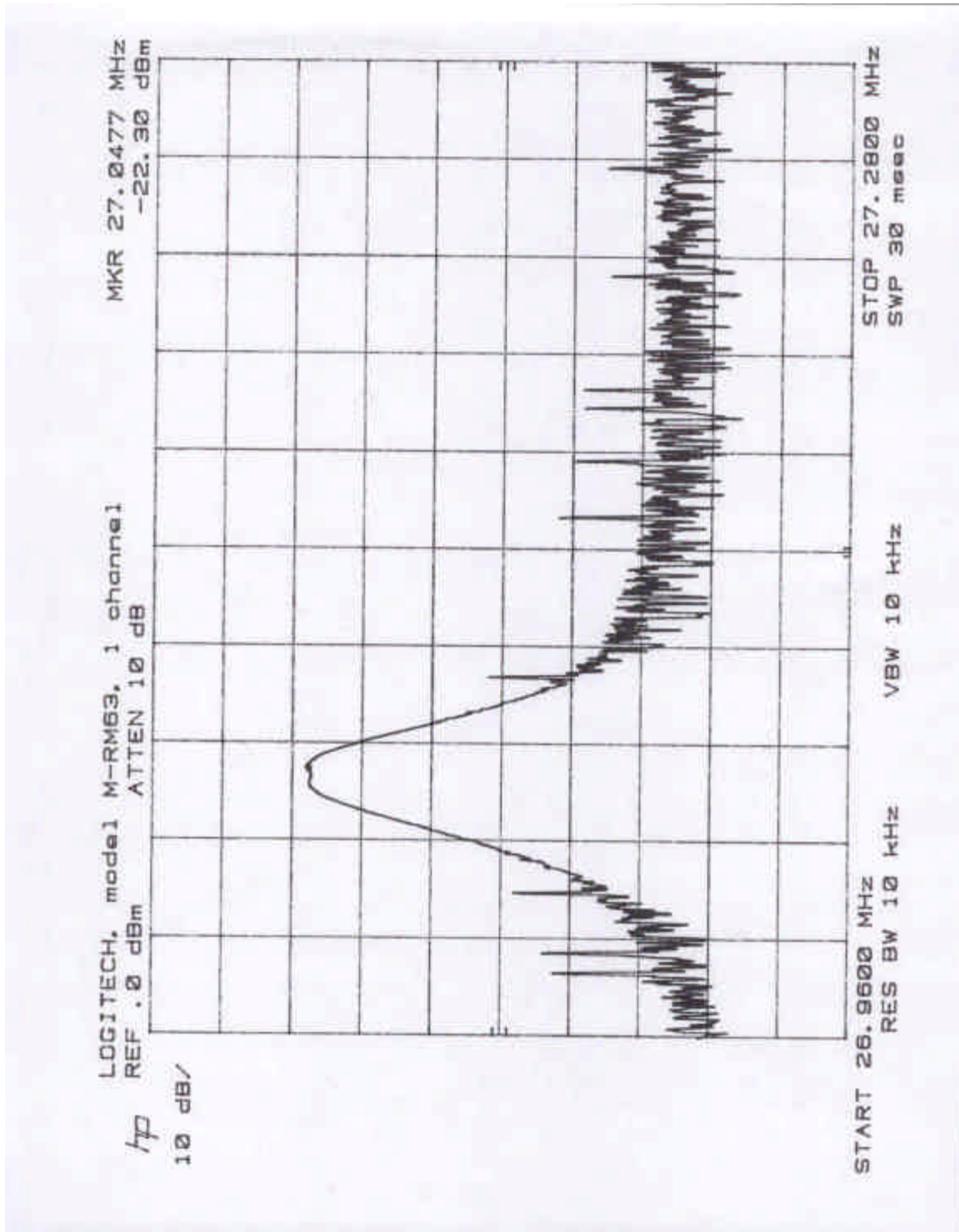
Bandedge Plot Model: M-RR63 (Dual Channel Unit)



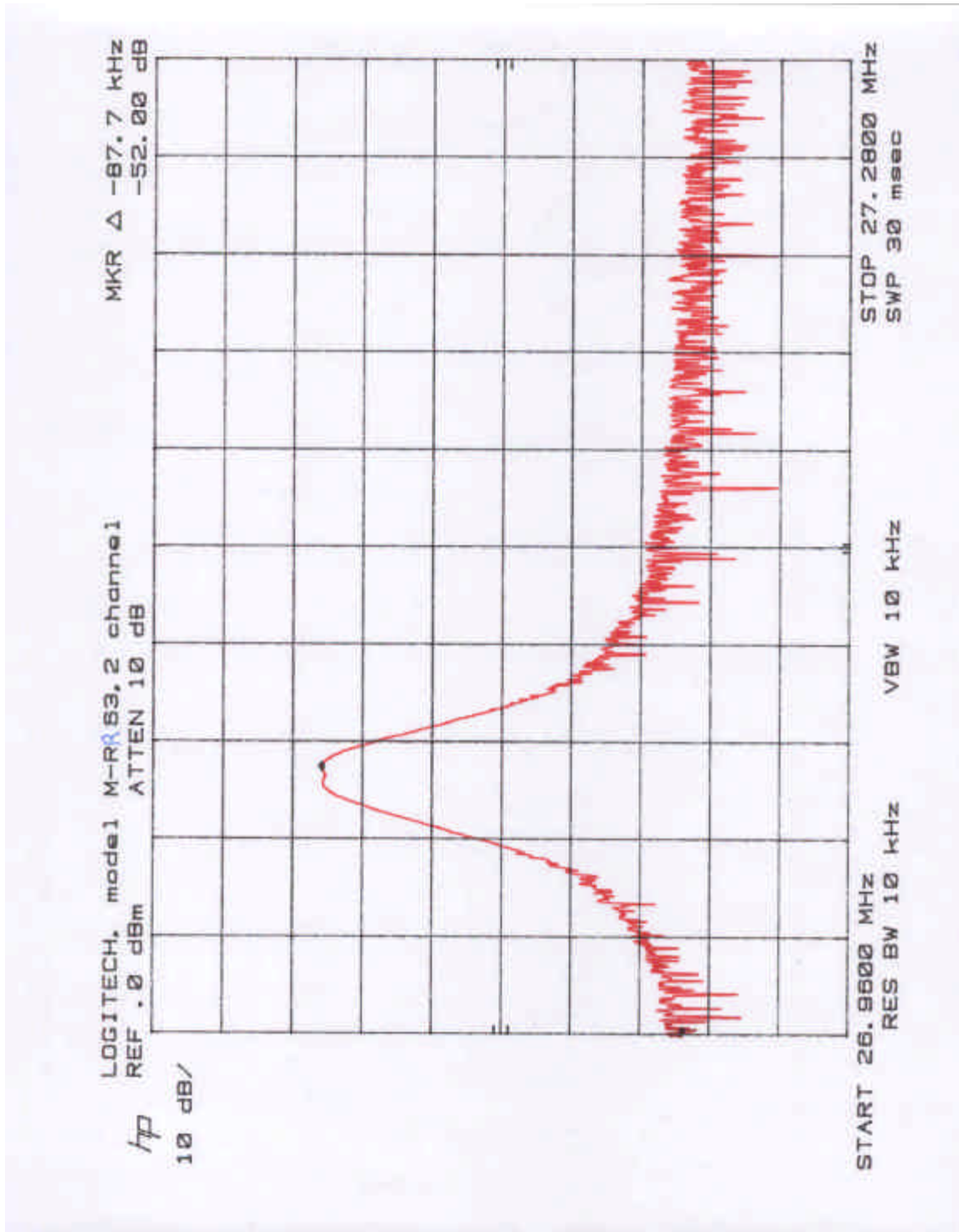
Bandedge Plot Model: M-RR63 (Dual Channel Unit)



Bandwidth Plot Model: M-RM63 (Single Channel Unit)

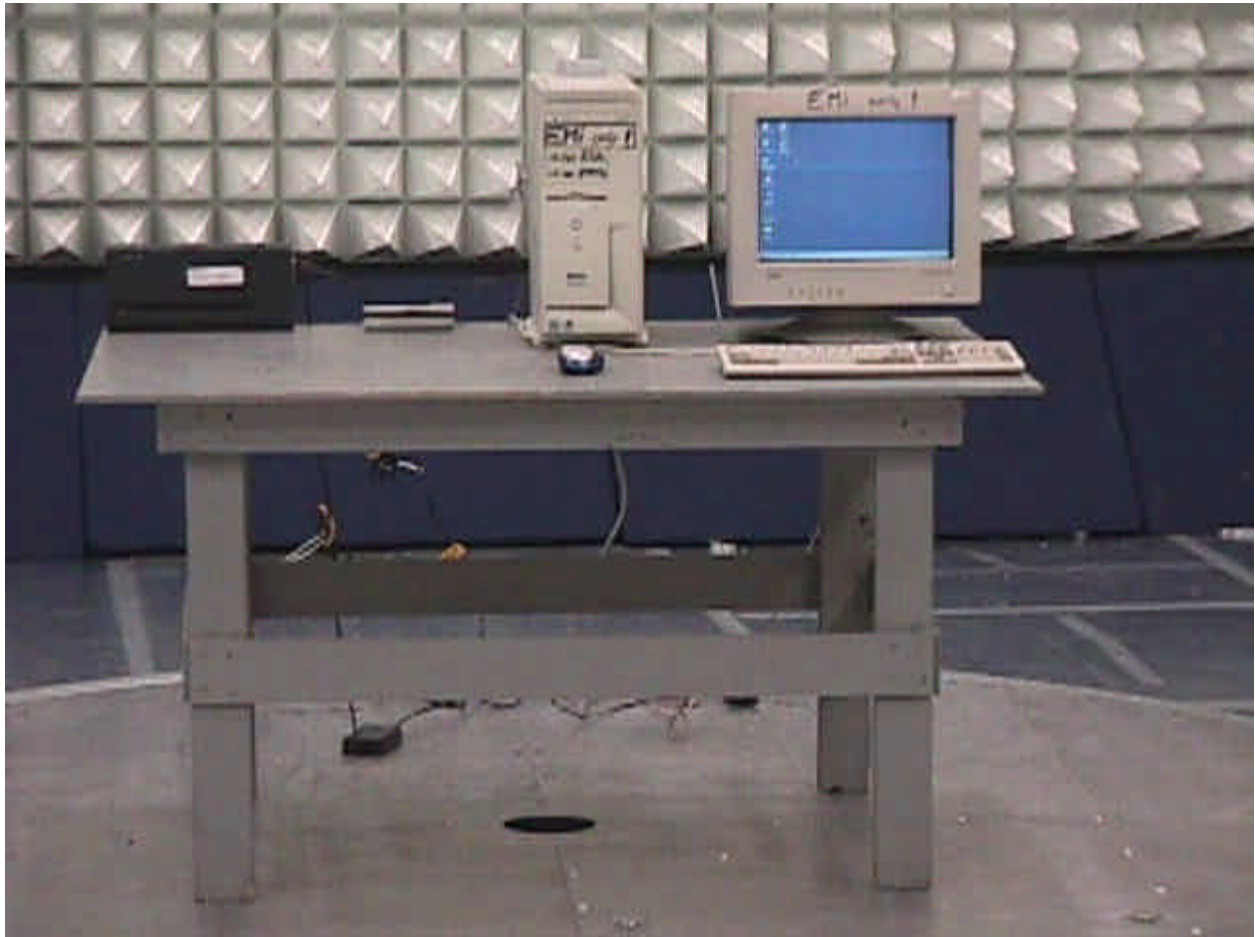


Bandwidth Plot Model:M-RR63 (Dual Channel Unit)



4.2 Radiated Emission Configuration Photograph

Radiated Emission Test Setup

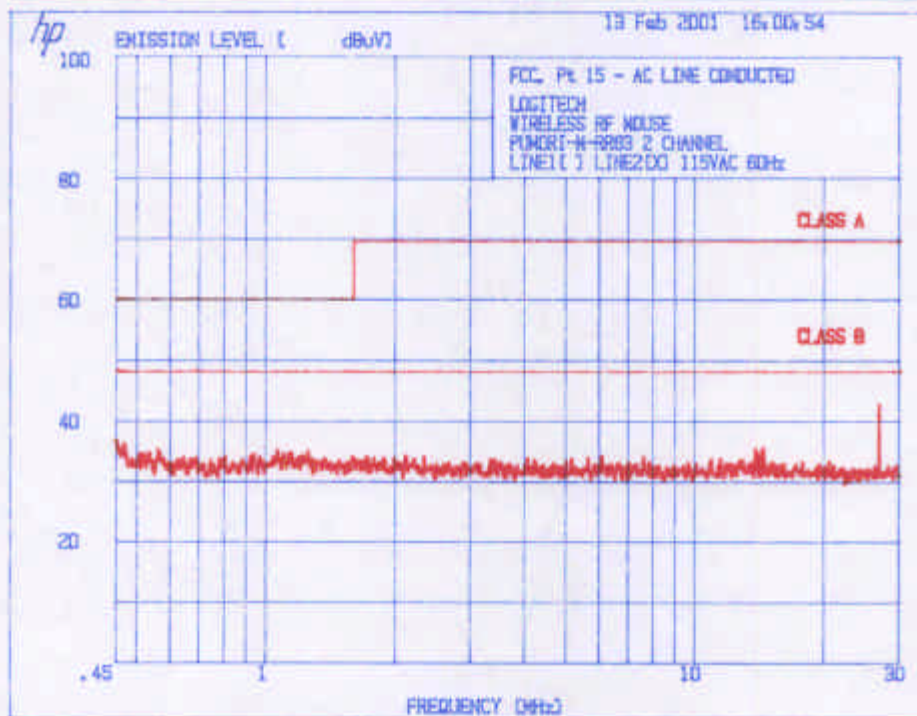
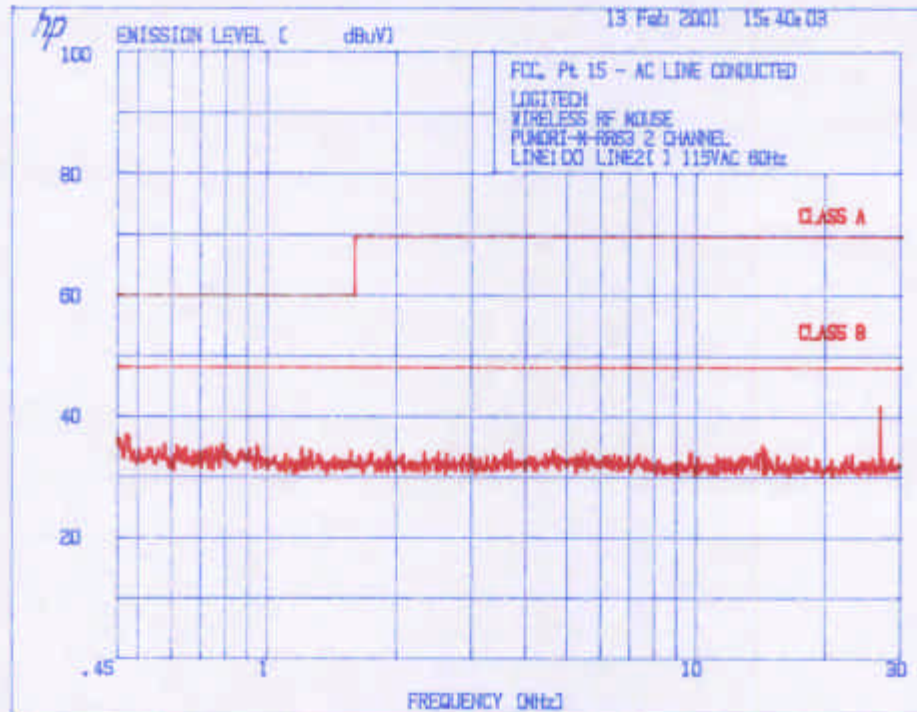


Logitech, Model No. M-RR63 & M-RM63
FCC ID: DZL201385

Date of Test: February 13, 2001

4.3 AC Line Conducted Emission test results
FCC Rule 15.207

[X] Test data attached



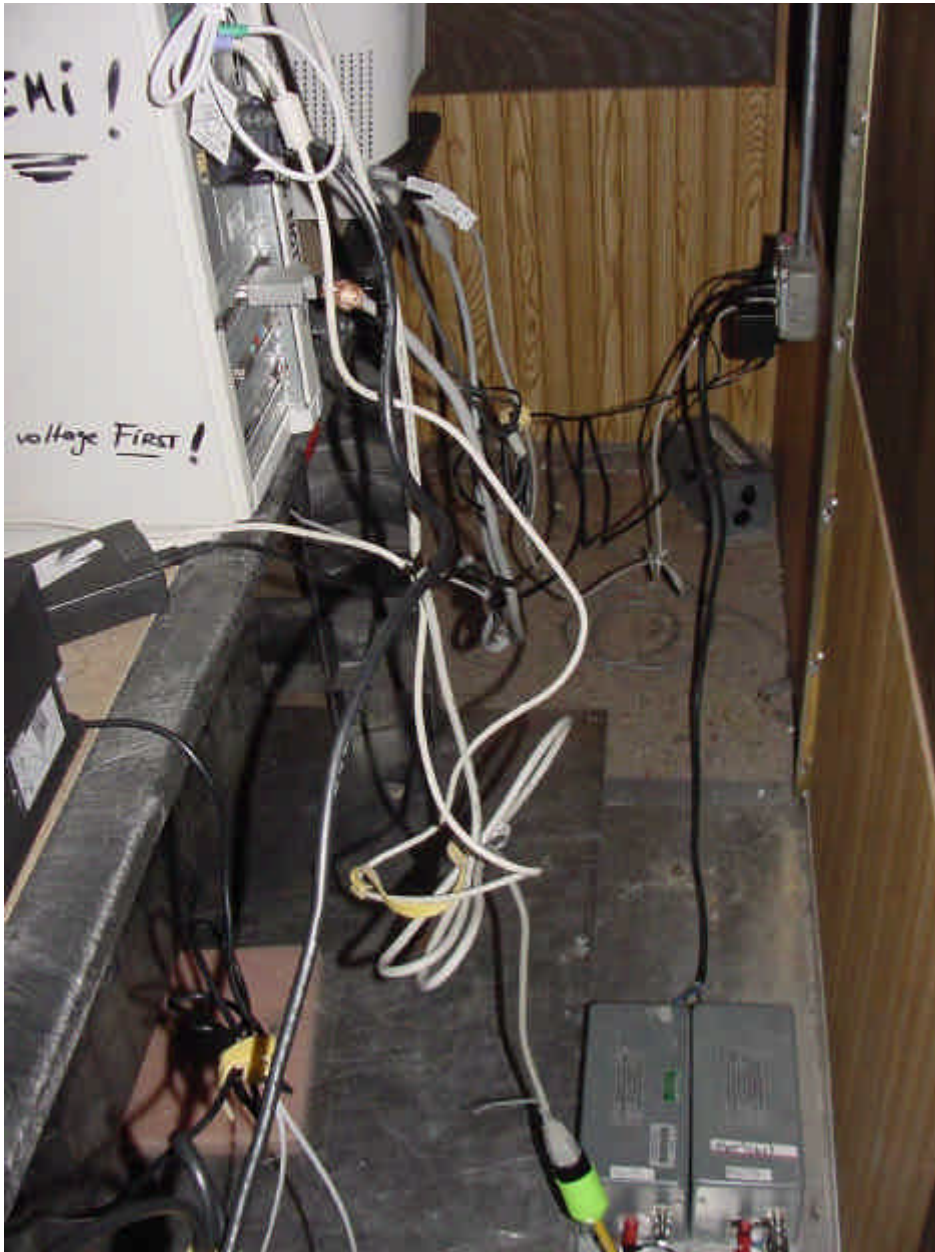
4.4 AC Line Conducted Configuration Photograph

Line-Conducted Emission Test Setup



4.4 AC Line Conducted Configuration Photograph Continued

Line-Conducted Emission Test Setup



5.0 Document History

Revision/ Job Number	Writer Initials	Date	Change
1.0 / J20040050	SS	February 24, 2001	Original document