



**ELECTRO MAGNETIC TEST, INC.**

1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

*FCC PART 15, SUBPART B CLASS B  
and  
FCC PART 15, SUBPART C  
TEST REPORT*

*for*


*the*

**RF KEYBOARD**

**MODELS: Y-RE20 & Y-RF21**

Prepared for

LOGITECH, INC.  
6505 KAISER DRIVE  
FREMONT, CALIFORNIA 94555-3615

Prepared by:   
DOUG MOON

Approved by:   
KEVIN BOTHMANN

ELECTRO MAGNETIC TEST, INC.  
1547 PLYMOUTH STREET  
MOUNTAIN VIEW , CALIFORNIA 94043  
(650) 965-4000

DATE: MAY 29, 2001

	REPORT BODY	APPENDICES			TOTAL
		A	B	C	
PAGES	16	36	4	4	<b>60</b>

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**LIST OF APPENDICES**

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### **GENERAL REPORT SUMMARY**

This electromagnetic emission test report is generated by Electro Magnetic Test Inc., which is an independent testing and consulting firm. The test report is based on testing performed by Electro Magnetic Test personnel according to the measurement procedure described in the test specification given below and in the "Test Procedures" section of this report.

The measurement data and conclusions appearing herein relate only to the sample tested and this report may not be reproduced in any form unless done so in full.

Associated with the data in this report is a  $\pm 2$ dB measurement uncertainty.

This report must not be used to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Electro Magnetic Test, Inc. is approved to perform EMI/EMC testing by the following agencies:

<b>COUNTRY</b>	<b>AGENCY</b>	<b>LAB APPROVAL #</b>
USA	Federal Communications Commission (FCC)	*
USA	National Voluntary Lab Accreditation Program (NVLAP)	200147-0
Canada	Industry Canada	IC 2804
Japan	Voluntary Control Council For Interference (VCCI)	See Below
	Open Field Test Site Registration Number	R-589
	Conducted Emissions Test Site Registration Number	C-604
Taiwan	Bureau Of Standards, Metrology and Inspection (BSMI)	SL2-IN-E-1024
Australia / New Zealand	Australian Communications Authority (AUSTEL)	*
European Community	TUV Rheinland (EMC for the European Community)	*

\*These agencies do not issue a lab approval number to test labs.



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### **GENERAL REPORT SUMMARY (CONTINUED)**

Device Tested: RF Keyboard  
 Models: Y-RE20 & Y-RF21  
 S/N: 032

Product Description: The EUT is a wireless keyboard to be used with a personal computer. The EUT consists of a transmitter inside a keyboard which communicates with a receiver that connects to the PS/2 keyboard port on a personal computer. Y-RE20 is the unit with the most features. Y-RF21 is the same as Y-RE20 with the scroll wheel removed and a different volume control knob.

Modifications: The EUT was not modified during the testing.

Manufacturer: Logitech, Inc.  
 6505 Kaiser Drive  
 Fremont, California 94555-3615

Test Date(s): May 16 and 18, 2001

Test Specifications: EMI requirements  
 FCC Title 47, Part 15 Subpart B, Class B  
 Test Procedure: ANSI C63.4: 1992.

Test Deviations: The test procedure was not deviated from during the testing.

### **SUMMARY OF TEST RESULTS**

<b>TEST</b>	<b>DESCRIPTION</b>	<b>RESULTS</b>
1	Conducted RF Emissions, 450 kHz - 30 MHz.	Complies with the <b>Class B</b> limits of FCC Title 47, Part 15 Subpart B.
2	Radiated RF Emissions, 26.96 MHz - 27.28 MHz.	Complies with the limits of FCC Title 47, Part 15 Subpart C. (Section 15.227)
3	Radiated RF Emissions, 30 MHz - 1000 MHz.	Complies with the <b>Class B</b> limits of FCC Title 47, Part 15 Subpart B.

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**1. PURPOSE**

This document is a qualification test report based on the Electromagnetic Interference (EMI) tests performed on the RF Keyboard Models: Y-RE20 & Y-RF21. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4: 1992. The tests were performed in order to determine whether the electromagnetic emissions from the equipment under test, referred to as EUT hereafter, are within the **Class B** specification limits defined in FCC Title 47, Part 15, Subpart B. The EUT was also tested to determine if the electromagnetic emissions were within the limits defined in FCC Title 47, Subpart C, Section 15.227.



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## 2. ADMINISTRATIVE DATA

### 2.1 Location of Testing

The EMI tests described herein were performed at the test facility of Electro Magnetic Test, 1547 Plymouth Street, Mountain View, California 94043.

### 2.2 Traceability Statement

The calibration certificates of all test equipment used during the test are on file at the location of the test. The measurement results in this report and the calibration of the test equipment are traceable to the National Institute of Standards and Technology (NIST).

### 2.3 Cognizant Personnel

#### Logitech, Inc.

Bharat Shah Agency/Reliability Engineer

#### Electro Magnetic Test, Inc.

Michael Fennell Test Technician  
 Doug Moon Test Technician  
 Kevin Bothmann Lab Manager

### 2.4 Date Test Sample was Received

The test sample was received on May 15, 2001.

### 2.5 Disposition of the Test Sample

The test sample has not been returned at this time.

### 2.6 Abbreviations and Acronyms

The following abbreviations and acronyms may be used in this document.

RF	Radio Frequency
EMI	Electromagnetic Interference
EUT	Equipment Under Test
P/N	Part Number
S/N	Serial Number
HP	Hewlett Packard
ITE	Information Technology Equipment
CML	Corrected Meter Limit
LISN	Line Impedance Stabilization Network
CISPR	International Special Committee On Radio Interference
FCC	Federal Communications Commission

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**3. APPLICABLE DOCUMENTS**

The following documents are referenced or used in the preparation of this EMI Test Report.

<b>SPEC</b>	<b>TITLE</b>
FCC Title 47, Part 15, Subpart B.	FCC Rules - Radio frequency devices (including digital devices).
FCC Title 47, Part 15, Subpart C.	FCC Rules – Radio frequency devices (intentional radiators) (Section 15.227)
ANSI C63.4 1992	Methods of measurement of radio-noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.



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**4. DESCRIPTION OF TEST CONFIGURATION****4.1 Description of Test Configuration - EMI**

The host computer was connected to the receiver, USB keyboard, mouse, monitor, monitor's microphone, external modem, and printer via its keyboard, USB, mouse, video, microphone, serial, and parallel ports, respectively. The printer was connected to its AC power adapter via its power input port. During the testing process, the EUT was communicating with the receiver. The EUT was continuously sending "H" characters to the receiver, and the characters were displayed on the monitor.

Both models Y-RE20 and Y-RF21 were tested for radiated as well as conducted emissions. These units were tested separately. Please see the data for each unit located in Appendix A. Y-RE20 is the unit with the most features. Y-RF21 is the same as Y-RE20 with the scroll wheel removed and a different volume control knob. Both models had very similar emission characteristics.

The EUT has two channels of operation. Channel 1 is 27.095 MHz and channel 2 is 27.145 MHz. Both channels were tested for the fundamental frequency and found to be nearly identical. Since the two channels have nearly identical emission levels and the bandwidth between them is less than 1 MHz, channel 2 was used for the rest of the testing.

The EUT is battery powered, but the conducted emissions test was performed on the host computer with the receiver connected to insure that communication with the EUT will not cause the computer to be out of compliance.

It was determined that the emissions were at their highest level when the EUT was operating in the above configuration. The cables were moved to maximize the emissions. The final conducted as well as radiated data was taken in this mode of operation. All initial investigations were performed with the EMI receiver in manual mode scanning the frequency range continuously. The cables were bundled and routed as shown in the photographs in Appendix A.

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**4.1.1 Cable Construction and Termination**Cable #1

This is a 5 foot foil shielded cable connecting the computer to the receiver. It has a 6 pin mini DIN metallic connector at the computer end, and is hardwired into the receiver. The cable was bundled to a length of 4 feet. The shield of the cable was grounded to the chassis via the connector.

Cable #2

This is a 6 foot braid and foil shielded cable connecting the computer to the USB keyboard. It has a USB metallic connector with a factory installed ferrite bead at the computer end, and is hardwired into the keyboard. The shield of the cable was grounded to the chassis via the connector.

Cable #3

This is a 6 foot foil shielded cable connecting the computer to the mouse. It has a USB metallic connector with a USB to 6 pin mini DIN adapter at the computer end, and is hardwired into the mouse. The shield of the cable was grounded to the chassis via the connector.

Cable #4

This is a 5 foot braid and foil shielded cable connecting the computer to the monitor. It has a high density DB-15 pin metallic connector with a factory installed ferrite bead at the computer end, and is hardwired into the monitor. The cable was bundled to a length of 3.5 feet. The shield of the cable was grounded to the chassis via the connector.

Cable #5

This is a 1 foot braid shielded cable connecting the computer to cable #4 (monitor). It has a 1/8 inch stereo jack at the computer end, and is hardwired into cable #4. The shield of the cable was grounded to the chassis via the connector.

Cable #6

This is a 6 foot foil shielded cable connecting the computer to the external modem. It has a DB-9 pin metallic connector at the computer end, and has a DB-25 pin metallic connector at the external modem end. The cable was bundled to a length of 4 feet. The shield of the cable was grounded to the chassis via the connectors.

Cable #7

This is a 6 foot foil shielded cable connecting the computer to the printer. It has a DB-25 pin metallic connector at the computer end, and has a 36 pin Centronics metallic connector at the printer end. The shield of the cable was grounded to the chassis via the connectors.

Cable #8

This is a 6 foot unshielded cable connecting the printer to its AC power adapter. It has a 1/4 inch round metallic connector at the printer end, and is hardwired into the power adapter. The cable was bundled to a length of 4 feet.


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**5. LISTS OF EUT, ACCESSORIES AND TEST EQUIPMENT**
**5.1 EUT and Accessory List**

<b>EQUIPMENT TYPE</b>	<b>MANU-FACTURER</b>	<b>MODEL</b>	<b>SERIAL NUMBER</b>	<b>FCC ID</b>
RF KEYBOARD (EUT)	LOGITECH, INC.	Y-RE20	032	DZL211498
RF KEYBOARD (EUT)	LOGITECH, INC.	Y-RF21	028	DZL211498
RECEIVER	LOGITECH, INC.	C-BC7	N/A	DoC
MOUSE	LOGITECH, INC.	M-BD58	LZC10652832	DoC
KEYBOARD	GATEWAY	N/A	N/A	N/A
COMPUTER	DELL	MMS	1H43F	DoC
MONITOR	HEWLETT PACKARD	D5258A	DK73795774	C5F7NFCMC1516X
EXTERNAL MODEM	BEST DATA	56SPX	56SPX72729	DoC
PRINTER	HEWLETT PACKARD	C2655-60015	SG69K111KR	B94C2655X
PRINTER AC POWER ADAPTER	HEWLETT PACKARD	0950-2435	N/A	N/A


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**5.2 EMI Test Equipment**

<b>EQUIPMENT TYPE</b>	<b>MANUFACTURER</b>	<b>MODEL NUMBER</b>	<b>SERIAL NUMBER</b>	<b>CAL. DATE</b>	<b>CAL. CYCLE</b>
Spectrum Analyzer	Hewlett Packard	8566B	3013A07296	July 31, 2000	1 Year
RF Preselector	Hewlett Packard	85685A	3010A01157	November 3, 2000	1 Year
Quasi-Peak Adapter	Hewlett Packard	85650	2521A00584	July 31, 2000	1 Year
Preamplifier	Com Power	PA-102	1482	March 1, 2001	1 Year
RF Attenuator	Mini-Circuits	CAT-10	Asset #1000	December 6, 2000	1 Year
LISN	Com Power	LI-200	12012	April 24, 2000	1 Year
LISN	Com Power	LI-200	12214	April 24, 2000	1 Year
LISN	Com Power	LI-200	1767	April 24, 2000	1 Year
LISN	Com Power	LI-200	1768	April 24, 2000	1 Year
Loop Antenna	Com Power	AL-130	25308	March 21, 2001	1 Year
Biconical Antenna	Com Power	AB-100	01557	November 11, 2000	1 Year
Log Periodic Antenna	Com Power	AL-100	16037	November 11, 2000	1 Year
Antenna Mast	Com Power	AM-400	N/A	N/A	N/A
Turntable	Com Power	TT-100	N/A	N/A	N/A
Computer	Compaq	Series 3284	X637BBS20212	N/A	N/A
Printer	Epson	P930A	3HR1398903	N/A	N/A
Plotter	Hewlett Packard	7470A	2308A96499	N/A	N/A



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6. **TEST SITE DESCRIPTION**

6.1 **Test Facility Description**

Please refer to section 7.1.1 and 7.1.2 of this report for EMI test location.

6.2 **EUT Mounting, Bonding and Grounding**

The EUT was mounted on a 1.0 by 1.5 meter non-conductive table 0.8 meters above the ground plane.

The EUT was not grounded.

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**7. TEST PROCEDURES**

The following sections describe the test methods and the specifications for the tests.

**7.1 RF Emissions****7.1.1 Conducted Emissions Test**

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A quasi-peak adapter. The data was collected with the spectrum analyzer in the peak detect mode with the "Max Hold" feature activated. The quasi-peak detector was used only where indicated in the data sheets. A 10 dB attenuation pad was used for the protection of the spectrum analyzer input stage, and the spectrum analyzer offset was adjusted accordingly to read the actual data measured. The LISN output was read by the HP 8566B spectrum analyzer. The output of the second LISN was terminated by a 50 ohm termination. The effective measurement bandwidth used for the conducted emissions test was 9 kHz.

Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The EUT was powered through the LISN, which was bonded to the ground plane. The LISN power was filtered and the filter was bonded to the ground plane. The EUT was set up with the minimum distances from any conductive surfaces as specified in ANSI C63.4: 1992. The excess power cord was wrapped in a figure eight pattern to form a bundle not exceeding 0.4 meters in length.

The initial test data was taken in manual mode while scanning the frequency ranges of 0.45 MHz to 1.6 MHz, 1.6 MHz to 5 MHz and 5 MHz to 30 MHz. The conducted emissions from the EUT were maximized for operating mode as well as cable and peripheral placement. Once a predominant frequency (within 12 dB of the limit) was found, it was more closely examined with the spectrum analyzer span adjusted to 1 MHz.

The final data was collected under program control by the HP 85869PC software in several overlapping sweeps by running the spectrum analyzer at a minimum scan rate of 10 seconds per octave.

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**7.1.2 Radiated Emissions Test**

The HP 8566B spectrum analyzer was used as a measuring meter along with the HP 85650A quasi-peak adapter. The Com Power Preamplifier PA-102 was used to increase the sensitivity of the instrument. The spectrum analyzer was used in the peak detect mode with the "Max Hold" feature activated. In this mode, the spectrum analyzer records the highest measured reading over all the sweeps. The HP 85650A quasi-peak adapter was used only for those readings which are marked accordingly on the data sheets. The effective measurement bandwidth used for the radiated emissions test was 10 kHz from 26.96 MHz to 27.28 MHz and 120 kHz from 30 MHz to 1000 MHz.

Broadband loop, biconical and log periodic antennas were used as transducers during the measurement. The loop antenna was used from 26.96 MHz to 27.28 MHz, the biconical antenna was used from 30 MHz to 300 MHz, and the log periodic antenna was used from 300 MHz to 1 GHz. The frequency spans were wide (30 MHz to 88 MHz, 88 MHz to 216 MHz, 216 to 300 MHz and 300 MHz to 1 GHz) during preliminary investigations. The final data was taken with a frequency span of 1 MHz. Furthermore, the frequency span was reduced during the preliminary investigations as deemed necessary.

The open field test site of Electro Magnetic Test, Inc. was used for radiated emission testing. This test site is set up according to ANSI C63.4: 1992. Please see section 6.2 of this report for mounting, bonding and grounding of the EUT. The turntable supporting the EUT is remote controlled using a motor. The turntable permits EUT rotation of 360 degrees in order to maximize emissions. Also, the antenna mast allows height variation of the antenna from 1 meter to 4 meters. Data was collected in the worst case (highest emission) configuration of the EUT. At each reading, the EUT was rotated 360 degrees and the antenna height was varied from 1 to 4 meters (for E field radiated field strength).

The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT. The EUT was tested at a 3 meter test distance to obtain final test data.

Calculation Of Radiated Emission Test Data:

Amplitude - Gain + Antenna Factor + Cable Loss = Corrected Amplitude

Corrected Amplitude - Limit = Margin



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8.

**CONCLUSIONS**

The RF Keyboard Models: Y-RE20 & Y-RF21 meets all of the **Class B** requirements of the FCC Title 47, Part 15, Subpart B and FCC Title 47, Subpart C, Section 15.227.





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**APPENDIX A**

***RADIATED AND CONDUCTED EMISSIONS  
DATA SHEETS***



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***RADIATED AND CONDUCTED EMISSIONS  
DATA SHEETS  
MODEL: Y-RE20***

Electro Magnetic Test, Inc.  
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Radiated Emissions Test Data

Purpose of Test:  QUALIFICATION  ENGINEERING  MANUFACTURING AUDIT  
FCC Class B Test Date: 05-18-01  
Company Name: LOGITECH  
EUT Model Number: Y-RE20  
EUT Serial Number: 032  
EUT Description: RF KEYBOARD

Test Setup Configuration

EUT Clock Speeds:

EUT Power Cords:  SHIELDED  NOT SHIELDED  
EUT tested at:  LOW SPEED  HIGH SPEED  
EUT is:  IN COMPLIANCE  OUT OF COMPLIANCE with FCC Class B.

EUT Modifications during this test:  
 MODIFIED  NOT MODIFIED

Modifications: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NOTE: A formal report on passing data will be generated when required.  
Design, debug and consultation services are available at all times.

Test Engineer: MICHAEL FENNELL

Electro Magnetic Test, Inc.

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FCC Class B Test Date: 05-18-01  
 Company Name: LOGITECH  
 EUT Model Number: Y-RE20  
 EUT Description: RF KEYBOARD

RADIATED EMISSION TEST RESULTS

Freq	Ampl	M	P	A	Ht	Dist	Ori	Gain	ACor	CCor	DCor	CorAmp	Limit	Margin	Flags
MHz	dBuV	-	-	-	m	m	deg	dB	dBuV/m	dB	dB	dBuV/m	dBuV/m	dB	FH---

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THE FOLLOWING READINGS ARE FOR THE TRANSMITTER PORTION OF THE EUT (FCC PART 15.227)  
 (FIELD STRENGTH OF FUNDAMENTAL EMISSIONS)

VERTICAL POLARIZATION

-FUNDAMENTAL, CHANNEL 1															
27.093	54.0	P	V	M	1.0	3.0	45	0.0	5.5	0.9	0.0	60.4	80.0	-19.6	-----
-FUNDAMENTAL, CHANNEL 2															
27.144	54.0	P	V	M	1.0	3.0	45	0.0	5.5	0.9	0.0	60.4	80.0	-19.6	-----

HORIZONTAL POLARIZATION

-FUNDAMENTAL, CHANNEL 1															
27.098	50.1	P	H	M	1.0	3.0	180	0.0	5.5	0.9	0.0	56.5	80.0	-23.5	-----
-FUNDAMENTAL, CHANNEL 2															
27.144	49.8	P	H	M	1.0	3.0	135	0.0	5.5	0.9	0.0	56.2	80.0	-23.8	-----

THE FOLLOWING READINGS ARE FOR THE TRANSMITTER PORTION OF THE EUT (FCC PART 15.209)  
 (FIELD STRENGTH OF HARMONICS AND SPURIOUS EMISSIONS)

SINCE CHANNEL 1 AND CHANNEL 2 HAVE NEARLY IDENTICAL READINGS, THE FOLLOWING READINGS WERE TAKEN WITH THE EUT TRANSMITTING ON CHANNEL 2.

VERTICAL POLARIZATION

-2nd HARMONIC-															
54.290	40.3	P	V	B	1.0	3.0	0	21.8	10.7	1.3	0.0	30.5	40.0	-9.5	-----
-3rd HARMONIC-															
81.432	40.7	P	V	B	1.0	3.0	90	21.8	9.3	1.7	0.0	29.9	40.0	-10.1	-----
-4th HARMONIC-															
108.579	37.3	P	V	B	1.0	3.0	225	21.7	10.1	1.9	0.0	27.6	43.5	-15.9	-----
-5th HARMONIC-															
135.729	35.7	P	V	B	1.0	3.0	225	21.7	11.7	2.0	0.0	27.7	43.5	-15.8	-----
-6th HARMONIC-															
162.866	32.8	P	V	B	1.0	3.0	180	21.8	13.6	2.2	0.0	26.8	43.5	-16.7	-----
-7th HARMONIC-															
190.007	35.7	P	V	B	1.5	3.0	135	21.7	15.4	2.4	0.0	31.8	43.5	-11.7	-----
-8th HARMONIC-															
217.159	29.9	P	V	B	1.0	3.0	270	21.7	16.7	2.6	0.0	27.5	46.0	-18.5	-----
-9th HARMONIC-															
244.298	31.0	P	V	B	1.0	3.0	45	21.6	18.1	2.7	0.0	30.2	46.0	-15.8	-----
-10th HARMONIC-															
271.445	26.3	P	V	B	1.0	3.0	45	21.5	20.3	2.8	0.0	27.9	46.0	-18.1	-----

HORIZONTAL POLARIZATION

-2nd HARMONIC-															
54.290	38.6	P	H	B	1.0	3.0	45	21.8	10.7	1.3	0.0	28.8	40.0	-11.2	-----
-3rd HARMONIC-															
81.435	36.4	P	H	B	1.0	3.0	315	21.8	9.3	1.7	0.0	25.6	40.0	-14.4	-----

-4th HARMONIC-	108.580	40.3	P H B	1.0	3.0	315	21.7	10.1	1.9	0.0	30.6	43.5	-12.9	-----
-5th HARMONIC-	135.725	39.0	P H B	1.0	3.0	315	21.7	11.7	2.0	0.0	31.0	43.5	-12.5	-----
-6th HARMONIC-	162.870	33.3	P H B	1.0	3.0	315	21.8	13.6	2.2	0.0	27.3	43.5	-16.2	-----
-7th HARMONIC-	190.015	35.6	P H B	1.5	3.0	0	21.7	15.4	2.4	0.0	31.7	43.5	-11.8	-----
-8th HARMONIC-	217.160	31.9	P H B	1.5	3.0	270	21.7	16.7	2.6	0.0	29.5	46.0	-16.5	-----
-9th HARMONIC-	244.296	31.8	P H B	2.0	3.0	45	21.6	18.1	2.7	0.0	31.0	46.0	-15.0	-----
-10th HARMONIC-	271.445	29.9	P H B	1.0	3.0	270	21.5	20.3	2.8	0.0	31.5	46.0	-14.5	-----

THE FOLLOWING READINGS ARE SPURIOUS EMISSIONS (30-1000MHz)

VERTICAL POLARIZATION

64.506	44.9	P V B	1.5	3.0	225	21.7	10.4	1.5	0.0	35.1	40.0	-4.9	-----
134.624	35.4	P V B	1.0	3.0	180	21.7	11.6	2.0	0.0	27.3	43.5	-16.2	-----
140.219	38.0	P V B	1.0	3.0	180	21.8	12.0	2.0	0.0	30.2	43.5	-13.3	-----
157.046	41.0	P V B	1.0	3.0	180	21.8	13.2	2.2	0.0	34.6	43.5	-8.9	-----
159.836	37.3	P V B	1.0	3.0	180	21.8	13.4	2.2	0.0	31.1	43.5	-12.4	-----
168.263	34.5	P V B	1.0	3.0	0	21.8	13.9	2.2	0.0	28.8	43.5	-14.7	-----
171.056	41.4	P V B	1.0	3.0	225	21.8	14.1	2.3	0.0	36.0	43.5	-7.5	-----
173.871	39.0	P V B	1.0	3.0	225	21.8	14.3	2.3	0.0	33.8	43.5	-9.7	-----
213.117	37.4	P V B	1.0	3.0	225	21.7	16.6	2.6	0.0	34.9	43.5	-8.6	-----
235.562	33.1	P V B	1.0	3.0	90	21.7	17.6	2.6	0.0	31.6	46.0	-14.4	-----
238.367	36.8	P V B	1.0	3.0	90	21.7	17.7	2.7	0.0	35.5	46.0	-10.5	-----
241.181	35.9	P V B	1.0	3.0	90	21.7	17.9	2.7	0.0	34.8	46.0	-11.2	-----
308.470	38.7	P V L	1.0	3.0	180	21.7	15.4	3.0	0.0	35.4	46.0	-10.6	-----
311.314	34.0	P V L	1.0	3.0	180	21.7	15.4	3.0	0.0	30.7	46.0	-15.3	-----
314.095	36.4	P V L	1.0	3.0	180	21.7	15.3	3.0	0.0	33.0	46.0	-13.0	-----
316.895	34.5	P V L	1.0	3.0	180	21.7	15.2	3.0	0.0	31.0	46.0	-15.0	-----
342.141	29.4	P V L	1.0	3.0	90	21.8	14.7	3.2	0.0	25.5	46.0	-20.5	-----
358.954	31.3	P V L	1.0	3.0	135	21.7	14.7	3.3	0.0	27.6	46.0	-18.4	-----
448.703	30.1	P V L	2.0	3.0	180	21.4	17.7	3.6	0.0	30.0	46.0	-16.0	-----

HORIZONTAL POLARIZATION

64.525	35.9	P H B	3.0	3.0	180	21.7	10.4	1.5	0.0	26.1	40.0	-13.9	-----
134.624	32.4	P H B	3.5	3.0	180	21.7	11.6	2.0	0.0	24.3	43.5	-19.2	-----
138.646	37.4	P H B	2.5	3.0	225	21.8	11.9	2.0	0.0	29.5	43.5	-14.0	-----
141.729	37.4	P H B	2.5	3.0	225	21.8	12.1	2.0	0.0	29.7	43.5	-13.8	-----
157.268	37.4	P H B	2.0	3.0	180	21.8	13.2	2.2	0.0	31.0	43.5	-12.5	-----
161.145	39.6	P H B	2.5	3.0	225	21.8	13.5	2.2	0.0	33.5	43.5	-10.0	-----
165.038	39.7	P H B	3.0	3.0	90	21.8	13.7	2.2	0.0	33.8	43.5	-9.7	-----
166.974	41.9	P H B	2.0	3.0	270	21.8	13.9	2.2	0.0	36.2	43.5	-7.3	-----
168.908	38.6	P H B	3.0	3.0	225	21.8	14.0	2.3	0.0	33.1	43.5	-10.4	-----
170.852	38.9	P H B	2.0	3.0	270	21.8	14.1	2.3	0.0	33.5	43.5	-10.0	-----
180.562	36.6	P H B	1.5	3.0	225	21.8	14.8	2.3	0.0	31.9	43.5	-11.6	-----
182.506	38.6	P H B	2.0	3.0	225	21.7	14.9	2.4	0.0	34.2	43.5	-9.3	-----
217.449	47.8	P H B	1.5	3.0	270	21.7	16.7	2.6	0.0	45.4	46.0	-0.6	-----
217.449	45.3	Q H B	1.5	3.0	270	21.7	16.7	2.6	0.0	42.9	46.0	-3.1	-----
238.804	46.5	P H B	1.5	3.0	270	21.7	17.8	2.7	0.0	45.3	46.0	-0.7	-----
238.804	43.8	Q H B	1.5	3.0	270	21.7	17.8	2.7	0.0	42.6	46.0	-3.4	-----
308.470	35.0	P H L	1.5	3.0	90	21.7	15.4	3.0	0.0	31.7	46.0	-14.3	-----
311.314	33.2	P H L	1.0	3.0	270	21.7	15.4	3.0	0.0	29.9	46.0	-16.1	-----
314.095	39.4	P H L	1.0	3.0	180	21.7	15.3	3.0	0.0	36.0	46.0	-10.0	-----
316.895	38.8	P H L	1.0	3.0	180	21.7	15.2	3.0	0.0	35.3	46.0	-10.7	-----

342.134	34.8	P H L	1.0	3.0	45	21.8	14.7	3.2	0.0	30.9	46.0	-15.1	-----
358.952	38.4	P H L	1.0	3.0	180	21.7	14.7	3.3	0.0	34.7	46.0	-11.3	-----
448.710	30.2	P H L	1.0	3.0	45	21.4	17.7	3.6	0.0	30.1	46.0	-15.9	-----

THE FOLLOWING READINGS ARE FOR THE DIGITAL DEVICE PORTION OF THE EUT  
 FCC PART 15.109 (30-1000MHz)

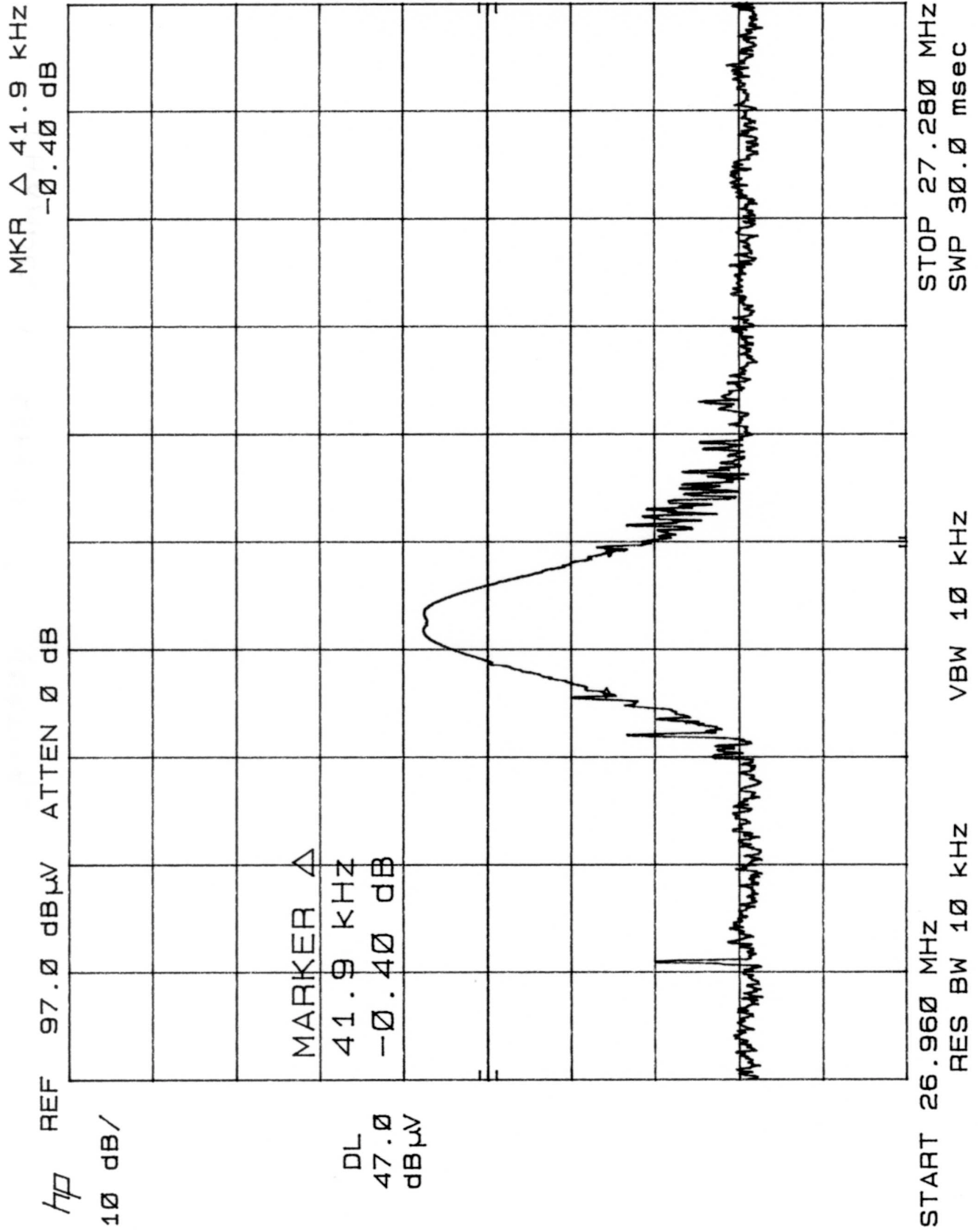
VERTICAL POLARIZATION

39.955	37.9	P V B	1.0	3.0	225	21.9	10.5	1.3	0.0	27.8	40.0	-12.2	-----
41.452	42.6	P V B	1.0	3.0	225	21.9	10.6	1.3	0.0	32.6	40.0	-7.4	-----
45.660	40.7	P V B	1.0	3.0	135	21.8	10.7	1.3	0.0	30.9	40.0	-9.1	-----
52.535	47.7	P V B	1.0	3.0	90	21.8	10.8	1.3	0.0	38.0	40.0	-2.0	-----
52.541	44.5	Q V B	1.0	3.0	90	21.8	10.8	1.3	0.0	34.8	40.0	-5.2	-----
61.701	44.8	P V B	1.0	3.0	225	21.7	10.4	1.4	0.0	34.9	40.0	-5.1	-----
70.131	44.2	P V B	1.0	3.0	180	21.7	10.2	1.6	0.0	34.3	40.0	-5.7	-----
115.630	36.8	P V B	1.0	3.0	45	21.7	10.5	1.9	0.0	27.5	43.5	-16.0	-----
133.270	40.2	P V B	1.0	3.0	180	21.7	11.5	2.0	0.0	32.0	43.5	-11.5	-----
144.027	35.1	P V B	1.0	3.0	135	21.8	12.3	2.1	0.0	27.7	43.5	-15.8	-----
145.835	37.2	P V B	1.0	3.0	180	21.8	12.4	2.1	0.0	29.9	43.5	-13.6	-----
148.635	33.5	P V B	1.0	3.0	180	21.8	12.6	2.1	0.0	26.4	43.5	-17.1	-----
164.720	37.2	P V B	1.5	3.0	315	21.8	13.7	2.2	0.0	31.3	43.5	-12.2	-----
169.787	36.0	P V B	1.0	3.0	225	21.8	14.0	2.3	0.0	30.5	43.5	-13.0	-----
215.942	36.0	P V B	2.5	3.0	180	21.7	16.7	2.6	0.0	33.6	43.5	-9.9	-----
232.755	38.1	P V B	1.0	3.0	45	21.7	17.4	2.6	0.0	36.4	46.0	-9.6	-----
246.792	35.3	P V B	1.0	3.0	90	21.6	18.2	2.7	0.0	34.6	46.0	-11.4	-----
300.012	35.0	P V L	1.0	3.0	45	21.7	15.6	2.9	0.0	31.8	46.0	-14.2	-----
312.007	32.8	P V L	1.0	3.0	0	21.7	15.3	3.0	0.0	29.4	46.0	-16.6	-----
319.996	30.1	P V L	1.0	3.0	45	21.7	15.2	3.0	0.0	26.6	46.0	-19.4	-----
336.023	36.6	P V L	1.0	3.0	135	21.8	14.8	3.1	0.0	32.7	46.0	-13.3	-----
347.742	32.5	P V L	1.0	3.0	45	21.8	14.5	3.2	0.0	28.4	46.0	-17.6	-----
360.000	34.4	P V L	1.0	3.0	45	21.7	14.7	3.3	0.0	30.7	46.0	-15.3	-----
384.017	42.2	P V L	1.0	3.0	270	21.5	15.3	3.4	0.0	39.4	46.0	-6.6	-----
432.028	29.5	P V L	1.0	3.0	315	21.4	17.0	3.6	0.0	28.7	46.0	-17.3	-----
458.465	30.4	P V L	1.0	3.0	180	21.4	17.7	3.7	0.0	30.4	46.0	-15.6	-----
480.008	29.9	P V L	1.0	3.0	315	21.5	17.5	3.8	0.0	29.7	46.0	-16.3	-----
499.004	37.8	P V L	1.0	3.0	45	21.5	17.3	3.9	0.0	37.5	46.0	-8.5	-----
528.084	30.9	P V L	1.0	3.0	45	21.5	18.3	4.0	0.0	31.7	46.0	-14.3	-----
576.030	31.2	P V L	2.0	3.0	270	21.3	19.7	4.2	0.0	33.8	46.0	-12.2	-----
672.022	30.6	P V L	1.0	3.0	315	21.0	20.2	4.7	0.0	34.5	46.0	-11.5	-----

HORIZONTAL POLARIZATION

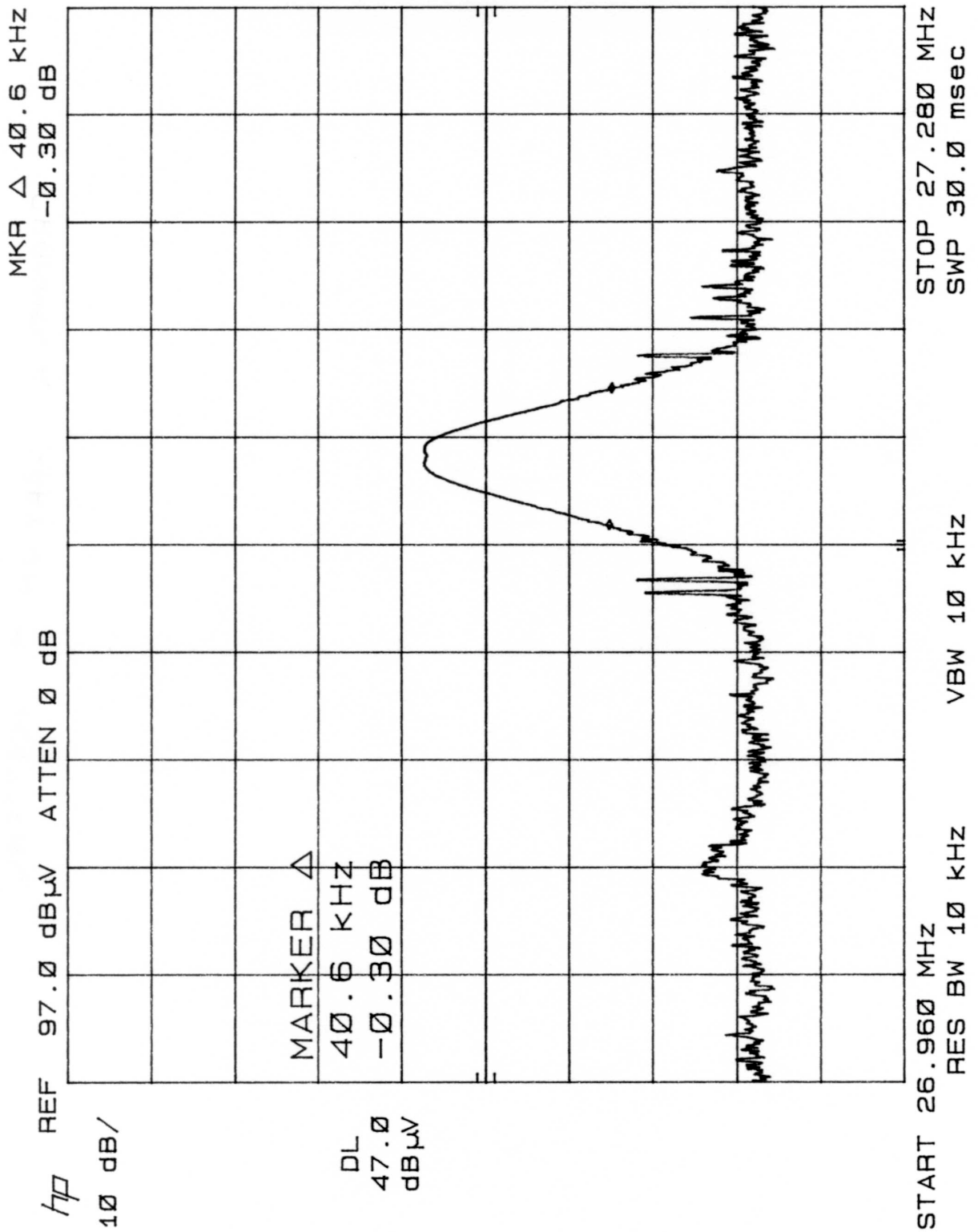
33.294	44.9	P H B	1.0	3.0	225	21.8	12.2	1.2	0.0	36.5	40.0	-3.5	-----
40.222	42.5	P H B	1.5	3.0	180	21.9	10.5	1.3	0.0	32.4	40.0	-7.6	-----
45.622	34.8	P H B	1.0	3.0	0	21.8	10.7	1.3	0.0	25.0	40.0	-15.0	-----
52.189	40.2	P H B	2.0	3.0	180	21.8	10.8	1.3	0.0	30.5	40.0	-9.5	-----
60.297	39.2	P H B	3.0	3.0	315	21.7	10.5	1.4	0.0	29.4	40.0	-10.6	-----
61.727	34.7	P H B	3.0	3.0	270	21.7	10.4	1.4	0.0	24.8	40.0	-15.2	-----
70.150	40.0	P H B	3.0	3.0	90	21.7	10.2	1.6	0.0	30.1	40.0	-9.9	-----
118.700	41.0	P H B	2.5	3.0	270	21.7	10.6	1.9	0.0	31.8	43.5	-11.7	-----
133.264	38.8	P H B	3.0	3.0	225	21.7	11.5	2.0	0.0	30.6	43.5	-12.9	-----
143.667	36.6	P H B	3.0	3.0	225	21.8	12.2	2.0	0.0	29.0	43.5	-14.5	-----
144.007	35.7	P H B	3.0	3.0	225	21.8	12.3	2.1	0.0	28.3	43.5	-15.2	-----
156.732	39.2	P H B	2.0	3.0	90	21.8	13.2	2.2	0.0	32.8	43.5	-10.7	-----
159.746	39.2	P H B	2.5	3.0	90	21.8	13.4	2.2	0.0	33.0	43.5	-10.5	-----
164.717	35.1	P H B	3.0	3.0	270	21.8	13.7	2.2	0.0	29.2	43.5	-14.3	-----
168.786	36.8	P H B	3.0	3.0	90	21.8	14.0	2.3	0.0	31.3	43.5	-12.2	-----
300.012	37.5	P H L	1.5	3.0	315	21.7	15.6	2.9	0.0	34.3	46.0	-11.7	-----

312.007	37.9	P H L	1.5	3.0	180	21.7	15.3	3.0	0.0	34.5	46.0	-11.5	-----
319.996	35.5	P H L	1.5	3.0	45	21.7	15.2	3.0	0.0	32.0	46.0	-14.0	-----
336.023	41.6	P H L	1.0	3.0	315	21.8	14.8	3.1	0.0	37.7	46.0	-8.3	-----
347.735	38.6	P H L	1.0	3.0	45	21.8	14.5	3.2	0.0	34.5	46.0	-11.5	-----
360.007	38.7	P H L	1.0	3.0	180	21.7	14.7	3.3	0.0	35.0	46.0	-11.0	-----
384.024	44.1	P H L	1.0	3.0	225	21.5	15.3	3.4	0.0	41.3	46.0	-4.7	-----
432.035	34.6	P H L	1.0	3.0	45	21.4	17.0	3.6	0.0	33.8	46.0	-12.2	-----
458.484	29.7	P H L	1.0	3.0	315	21.4	17.7	3.7	0.0	29.7	46.0	-16.3	-----
480.010	36.1	P H L	1.0	3.0	45	21.5	17.5	3.8	0.0	35.9	46.0	-10.1	-----
499.006	33.7	P H L	1.0	3.0	135	21.5	17.3	3.9	0.0	33.4	46.0	-12.6	-----
528.071	32.2	P H L	1.0	3.0	180	21.5	18.3	4.0	0.0	33.0	46.0	-13.0	-----
576.018	30.7	P H L	1.0	3.0	0	21.3	19.7	4.2	0.0	33.3	46.0	-12.7	-----
672.010	32.3	P H L	1.0	3.0	135	21.0	20.2	4.7	0.0	36.2	46.0	-9.8	-----



**MODEL: Y-RE20 - CHANNEL 1**  
**PLOT SHOWING BANDWIDTH OF FUNDAMENTAL FREQUENCY**





MODEL: Y-RE20 - CHANNEL 2  
PLOT SHOWING BANDWIDTH OF FUNDAMENTAL FREQUENCY



***ELECTRO MAGNETIC TEST, INC.***

1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

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**FRONT VIEW**

LOGITECH, INC.  
RF KEYBOARD  
MODEL: Y-RE20

FCC CLASS B - RADIATED EMISSIONS – 5-16-01 & 5-18-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



***ELECTRO MAGNETIC TEST, INC.***

1547 Plymouth Street, Mountain View, CA 94043 Tel: (650) 965-4000 Fax: (650) 965-3000

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**REAR VIEW**

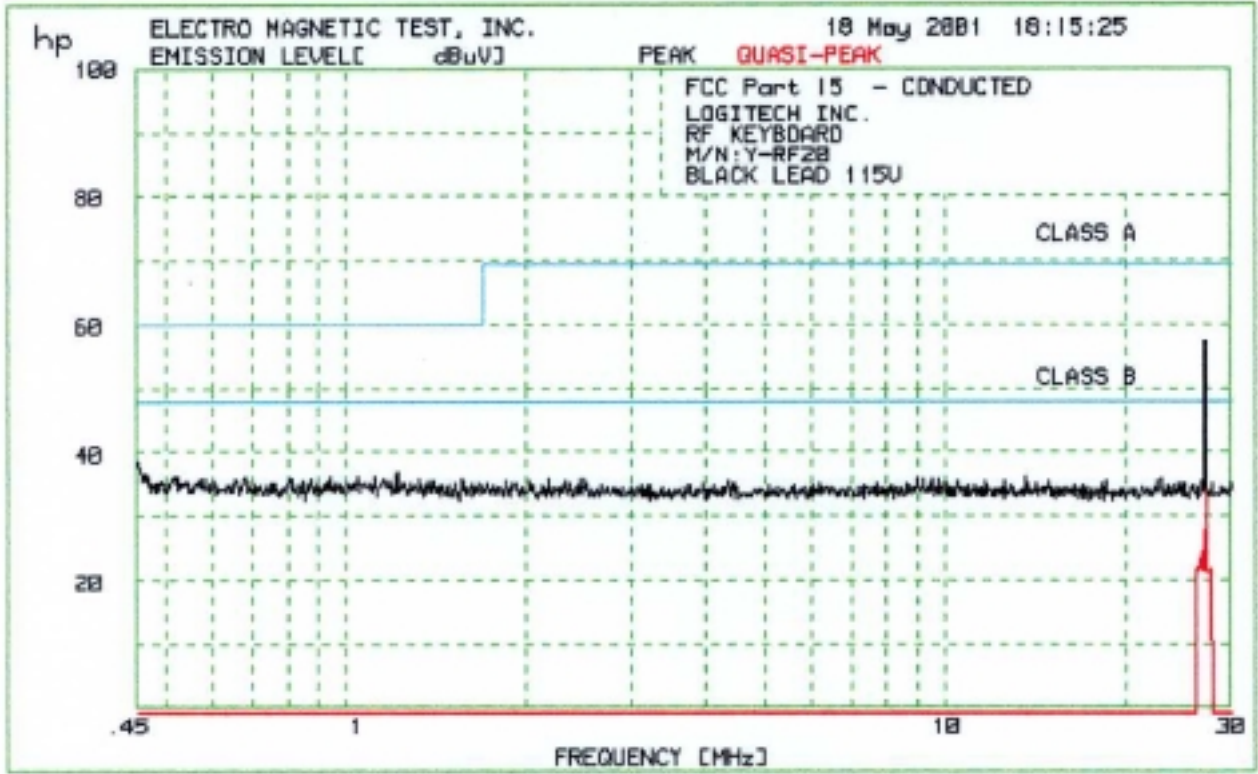
LOGITECH, INC.

RF KEYBOARD

MODEL: Y-RE20

FCC CLASS B - RADIATED EMISSIONS – 5-16-01 & 5-18-01

**PHOTOGRAPH SHOWING THE EUT CONFIGURATION  
FOR MAXIMUM EMISSIONS**



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ELECTRO MAGNETIC TEST, INC. 18 May 2001 18:15:25

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1. CONDUCTED WITH PRESELECTOR  
 1.1 FCC Part 15 - CONDUCTED

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45 highest Peaks above -50 dB of Limit Line #2  
 peak criteria = .1 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	27.13	57.3	9.3
2	1.227	36.8	-11.2
3	.4634	36.4	-11.6
4	.4673	36.3	-11.7
5	.5234	36.2	-11.8
6	1.055	36.2	-11.8
7	1.123	36.2	-11.8
8	.9456	36.1	-11.9
9	.4713	36	-12.0
10	13.69	36	-12.0
11	.5278	35.9	-12.1
12	.6817	35.9	-12.1
13	.5861	35.8	-12.2
14	1.564	35.8	-12.2
15	9.228	35.8	-12.2
16	.6592	35.7	-12.3
17	.8097	35.7	-12.3
18	1.157	35.7	-12.3
19	2.188	35.7	-12.3
20	2.482	35.7	-12.3
21	8.999	35.7	-12.3
22	.5788	35.6	-12.4
23	.8165	35.6	-12.4
24	.8805	35.6	-12.4
25	1.334	35.6	-12.4
26	2.513	35.6	-12.4
27	9.583	35.6	-12.4
28	9.745	35.6	-12.4
29	23.03	35.6	-12.4
30	.8515	35.5	-12.5
31	1.379	35.5	-12.5
32	1.409	35.5	-12.5
33	1.584	35.5	-12.5
34	2.038	35.5	-12.5
35	11.67	35.5	-12.5
36	22.55	35.5	-12.5
37	.4935	35.4	-12.6
38	.5435	35.4	-12.6
39	1.858	35.4	-12.6
40	2.331	35.4	-12.6
41	4.373	35.4	-12.6
42	10.51	35.4	-12.6
43	12.59	35.4	-12.6
44	18.6	35.4	-12.6
45	26.9	35.4	-12.6

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ELECTRO MAGNETIC TEST, INC. 18 May 2001 18:15:25

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1. CONDUCTED WITH PRESELECTOR

1.1 FCC Part 15 - CONDUCTED

=====

Quasi-Peaks above -50 dB of Limit Line #2

peak criteria = .1 dB

PEAK#	FREQ (MHz)	(dBuV)	DELTA
1	27.24	34.2	-13.8
2	26.79	24.3	-23.7
3	27.82	21.6	-26.4