



FCC/4511.001

JUN 22 1998

Instrument Specialties Company, Inc. — World Compliance Center
*Electromagnetic Compatibility***EMC Measurement / Technical Report**

Test Specification : Certification for FCC Part 18
RF Lighting Devices
Equipment Authorization : Certification
Manufacturer : LightWave
Equipment Under Test : 9800 Series Electronic Light Ballast

Test Report No. : 73845
Purchase Order No. : 207 Rev. B

Document History					
Revision	Issue Date	Affected Pages	Description of Modifications	Revised By	Approved By
0	16 June, 1998		Initial release		



EMC Measurement / Technical Report

Document No. 73845

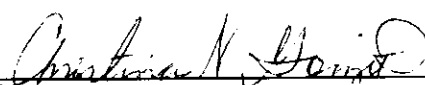
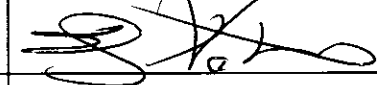
from

Instrument Specialties Co. Inc.

World Compliance Center

**Test for
LightWave**

9800 Series RF Lighting Devices

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MEASUREMENT/TECHNICAL REPORT SUMMARY

Manufacturer Company Address City, State, Zip Country Contact Name Title Phone Fax	LightWave 14431 Ventura Blvd., Suite 325 Sherman Oaks, CA 91423 USA Lake Lau VP Engineering (818) 981-1995 (818) 981-1014
Type of Authorization	Certification for RF Lighting Devices
Applicable FCC Rules	PART 18 – RF LIGHTING DEVICES Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 (10-1-97 Edition). The following subparts are applicable to the results in this test report: Part 18, Subpart C - Technical Standards Paragraph 18.307(c) - Conduction limits Paragraph 18.305(c) – Field Strength Limits
Equipment Under Test	9855, 9838, 9832, 9826, 9813, 9809, 9807 Electronic Light Ballast
Summary of Data	The EUT complies with the following sections of 47 CFR Ch.1 (10-1-97 Edition): Subpart C - Paragraph of Technical Standards for RF Lighting Devices
EMC Test Laboratory Facility Address City, State, Zip Code Country Contact Name Title Phone Fax	Instrument Specialties Company Incorporated World Compliance Center 545 Porter Way Placentia, CA 92870 USA Ed Nakauchi EMC Manager (714) 579-7100 (714) 961-2752



1. GENERAL INFORMATION

1.1 Product Description

Equipment Under Test	RF Lighting Devices
Model Number	9855, 9838, 9832, 9826, 9813, 9809, 9807
Description	Compact fluorescent lamp electronic adapters provide the replacement of incandescent lamp by directly screw into standard base receptacle (E-26) for energy efficiency. The 9855 ballast uses the same adapter as 9838 but different lamp wattage, the 9832 ballast uses the same adapter as 9826 but different wattage lamp. 9855 – 55Watt, 9838 – 38Watt, 9826 – 26Watt, 9813 – 13Watt, 9809 – 9Watt, 9807 – 7Watt.

Refer to the Attachment pages C3 and C4 - components list for the differences between the model numbers.

1.2 Block Diagram(s) of EUT

Please refer to the Attachment page C1- Electronic Ballast Schematic Block Diagram.

1.3 Theory of Operation Description

EMC Filter – This block has a typical low pass filter to prevent the RF noise generated by the ballast going back to the AC supply line and contains a voltage dependent resistor to limit the peak surge voltage from the AC supply.

AC Rectification – This block is based on the principle of full wave rectifying the 60Hz AC supply to produce a DC supply voltage. This DC supply then feeds to next block.

High Frequency Square Wave Inverter – This block is to chop the DC voltage produced by AC rectification into a high frequency (30KHz~50KHz) square wave then powers the lamp.

H. F. Filter – This block is a filter circuit which interfaces the inverter to the lamp. This circuit removes the higher frequency components of the chopped supply voltage so that the lamp runs with a semi-sinusoidal voltage. The filter also provides the lamp starting function.

Ignitor – This block supplies the preheat and starting function of the lamp.

Fault Protection – This block gets the positive feedback information from the output of the inverter and HF filter to detect the normal operation of the lamp and the life of the lamp.

1.4 Test Methodology

Conducted Emissions tests were performed according to the general provisions of FCC/OET MP-5 1986 (FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical Equipment) and the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

The EUT was setup in a shielded enclosure to perform Conducted Emissions measurements in a typical installation configuration. The EUT was powered from the Line Impedance Stabilization Networks (LISN 50 μ H/50 ohm). The LISN's unused connections were terminated with a 50 ohm loads. Measurements were performed from 450 KHz to



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30 MHz in peak detection. The peak measurements within 1 dB of the specification limits were re-measured with the receiver in either quasi-peak or average detection as required. The amplitude levels are recorded in dB μ V.

Field Strength Radiated Emissions Tests were performed according to the general provisions of FCC/OET MP-5 1986 (FCC Methods of Measurements of Radio Noise Emissions from Industrial, Scientific, and Medical Equipment) and the general provisions of ANSI C63.4-1992 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz).

Preliminary radiated scan was performed in a semi ferrite and anechoic shielded enclosure at a distance of 3 meters. Radiated emissions tests were performed at an antenna to EUT distance of 3 meters in the Open Area Test Site. The highest emissions were maximized by rotating the turntable 360 degrees and varying the antenna height 1 to 4 meters. The frequency range of 30 to 1000 MHz was measured utilizing a BiLog antenna. Measurements were made in vertical and horizontal antenna polarizations.

1.5 Test Facility

The open area test site and measurement facility used to collect the conducted and radiated data is located at the Instrument Specialties Co., Inc. test facility in Placentia, CA. This site has been fully described in a report submitted to the FCC and accepted in a letter dated February 5, 1997 (31040/SIT 1300F2). The measurement data will be accepted in conjunction with applications for certification or notification under Parts 15 and 18 of the commission's Rules. The test facility is also a NVLAP approved facility. The test facility is also recognized and accredited from following accreditation organizations.

ISO 9001 (SGS ICS)	Registration Number: US94/0022 MIL-I-45208A, MIL-STD-45662A	Dated: 02/07/1994
NVLAP (NIST)	NVLAP Lab Code: 200119-0 FCC, CISPR	Dated: 12/31/1996
AUSTEL (NATA)	Listing Test House: A97/TH/014 AS / NZS 3548	Dated: 03/27/1997
I²T (Interference Tech. International)	Certificate Number: 7619 CE Mark for European Country	Dated: 03/11/1997
Acemark (Acemark Europe)	Laboratory Number: 0007 CE Mark for European Country	Dated: 03/21/1997
VCCI (Voluntary Control Council)	Registration Number: C-574~6, R-561 VCCI for Japan	Dated: 07/04/1997



3. SYSTEM TEST CONFIGURATION

3.1 Justification

The EUT was used in a system configured for testing in a typical fashion as a customer would normally use it.

3.2 EUT Exercise Software/Equipment

N/A

3.3 Special Accessories

The EUT requires no special accessories to comply with the FCC regulations and limits.

3.4 Equipment Modifications

No modifications and or adjustments were made to the EUT during compliance testing to achieve the required specification limits.



5. TEST DATA

5.1 Conducted Emissions Limits

FCC Part 18, Subpart C, RF Lighting Devices Conducted Emissions Limits	
Frequency Range (MHz)	Maximum RF line voltage Limit (dBμV) measured with a 50μH/50 ohm LISN
Consumer Equipment: 0.45 ~ 30	48

5.2 Summary Table for Highest Conducted Emissions Levels

The initial step in collecting data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the data page, and these signals are then quasi-peaked if necessary. Spectrum analyzer plots and additional tabulated data are included in Appendix B. The following data lists the significant emission frequencies and measured levels measured from the EUT. See Appendix B for supplemental test data sheets.

EUT: 9855

Margins: Passed by -8.6 dB

Sensor Location	Frequency Band (MHz)	Measured* (dBμV)	Delta To Limit (dBμV)
Line	0.4595	36.7	-11.3
	0.4977	36.2	-11.8
	0.5886	36.2	-11.8
	0.6348	36.1	-11.9
	0.5147	36.0	-12.0
	0.6760	35.9	-12.1
Neutral	1.6800	39.4	- 8.6
	1.6450	39.3	- 8.7
	1.7230	39.2	- 8.8
	1.6040	39.0	- 9.0
	1.7600	38.8	- 9.2
	1.5640	38.5	- 9.5

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9838

Margins: Passed by - 9.1 dB

Sensor Location	Frequency Band (MHz)	Measured* (dBμV)	Delta To Limit (dBμV)
Line	2.0810	36.7	-11.3
	0.5458	36.6	-11.4
	0.4732	36.5	-11.5
	2.0380	36.5	-11.5
	1.7670	36.3	-11.7
	1.8120	36.2	-11.8
Neutral	1.6180	38.9	- 9.1
	1.7010	38.9	- 9.1
	2.1070	38.8	- 9.2
	1.7520	38.7	- 9.3
	1.6870	38.6	- 9.4
	1.5380	38.5	- 9.5

* All readings are peak with specified CISPR bandwidth unless stated otherwise.



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EUT: 9832

Margins: Passed by - 3.2 dB

Sensor Location	Frequency Band (MHz)	Measured* (dB μ V)	Delta To Limit (dB μ V)
Line	1.0950	40.2(QP)	- 7.8
	1.0070	36.1(QP)	-11.9
	0.9144	34.2(QP)	-13.8
	1.0500	31.7(QP)	-16.3
	1.1370	31.6(QP)	-16.4
	0.9616	30.6(QP)	-17.4
Neutral	1.0200	44.8	- 3.2
	1.1090	44.8	- 3.2
	0.4894	40.9	- 7.1
	0.9338	40.6	- 7.4
	0.8444	40.5	- 7.5
	2.4200	40.4	- 7.6

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9826

Margins: Passed by - 1.6 dB

Sensor Location	Frequency Band (MHz)	Measured* (dB μ V)	Delta To Limit (dB μ V)
Line	0.5082	39.0	- 9.0
	1.0590	39.0	- 9.0
	0.5458	38.8	- 9.2
	0.5040	38.7	- 9.3
	0.4595	38.2	- 9.8
	1.8740	37.8	-10.2
Neutral	1.0950	46.4	- 1.6
	1.0070	41.9	- 6.1
	0.9183	40.4	- 7.6
	2.5030	40.4	- 7.6
	2.4100	39.9	- 8.1
	2.8150	39.7	- 8.3

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9813

Margins: Passed by - 7.9 dB

Sensor Location	Frequency Band (MHz)	Measured* (dB μ V)	Delta To Limit (dB μ V)
Line	0.5168	40.1	- 7.9
	0.5125	39.4	- 8.6
	0.4693	39.3	- 8.7
	0.5527	38.6	- 9.4
	0.5861	38.6	- 9.4
	0.6537	38.6	- 9.4
Neutral	0.4894	38.0	-10.0
	0.4576	37.3	-10.7
	0.5256	37.2	-10.8
	0.5986	37.1	-10.9
	0.4935	36.6	-11.4
	0.4732	36.3	-11.7

* All readings are peak with specified CISPR bandwidth unless stated otherwise.



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EUT: 9809

Margins: Passed by -11.0 dB

Sensor Location	Frequency Band (MHz)	Measured* (dBμV)	Delta To Limit (dBμV)
Line	0.5692	37.0	-11.0
	0.6510	35.9	-12.1
	0.5190	34.8	-13.2
	0.4713	34.5	-13.5
	0.6295	33.7	-14.3
	1.2160	32.4	-15.6
Neutral	0.5692	36.4	-11.6
	0.5692	35.9	-12.1
	0.5234	35.0	-13.0
	0.5190	34.9	-13.1
	0.4732	34.5	-13.5
	0.6321	33.1	-14.9

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9807

Margins: Passed by - 9.3 dB

Sensor Location	Frequency Band (MHz)	Measured* (dBμV)	Delta To Limit (dBμV)
Line	0.4654	38.7	- 9.3
	0.4998	37.6	-10.4
	0.4772	36.8	-11.2
	0.4713	36.4	-11.6
	0.4956	36.4	-11.6
	0.4853	36.2	-11.8
Neutral	0.5345	37.5	-10.5
	0.4914	36.8	-11.2
	0.5040	36.3	-11.7
	0.5168	36.1	-11.9
	0.4732	35.8	-12.2
	0.5390	35.8	-12.2

* All readings are peak with specified CISPR bandwidth unless stated otherwise.



5.3 Radiated Emissions Limits

FCC Part 18, Subpart C, Field Strength Limits for RF Lighting Devices (Consumer Equipment)	
Frequency Range (MHz)	@ 3 Meters Test Limit (dBμV/m)
30 to 88	40.0
88 to 216	43.5
216 to 1000	46.0

5.4 Summary Table for Highest Radiated Emissions Levels

The test was performed at a 3 meter OATS measurement distance. The RF field strength data was complied with the limits listed above, measured data 20dB below limit was not recorded. Please refer to the data sheets in Appendix B for supplemental test data sheets.

EUT: 9855 & 9838

Margins: Passed by -3.6 dB

Frequency (MHz)	Polarity (V or H)	EMC Receiver Reading* (dBμV)	Correction Factor (dB)	Corrected Reading (dBμV/m)	FCC Limit @ 3 meter (dBμV/m)	Delta To Limit (dB)
42.600	V	46.4	-10.1	36.3	40.0	- 3.7
44.600	V	47.5	-11.1	36.4	40.0	- 3.6
46.500	V	47.3 (QP)	-12.1	35.2	40.0	- 4.8
49.400	V	48.5	-13.6	34.9	40.0	- 5.1
50.000	V	47.3	-13.9	33.4	40.0	- 6.6
80.000	V	48.3	-15.9	32.4	40.0	- 7.6

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9832 & 9826

Margins: Passed by -6.8 dB

Frequency (MHz)	Polarity (V or H)	EMC Receiver Reading* (dBμV)	Correction Factor (dB)	Corrected Reading (dBμV/m)	FCC Limit @ 3 meter (dBμV/m)	Delta To Limit (dB)
49.400	V	43.6	-13.6	30.0	40.0	-10.0
51.300	V	47.2	-14.6	32.6	40.0	- 7.4
78.500	V	49.3	-16.1	33.2	40.0	- 6.8
70.000	V	38.6	-17.1	21.5	40.0	-18.5
124.00	V	35.8	-11.1	24.7	43.5	-18.8

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

EUT: 9807

Margins: Passed by -6.5 dB

Frequency (MHz)	Polarity (V or H)	EMC Receiver Reading* (dBμV)	Correction Factor (dB)	Corrected Reading (dBμV/m)	FCC Limit @ 3 meter (dBμV/m)	Delta To Limit (dB)
49.857	V	44.9	-13.8	31.1	40.0	- 8.9
78.500	V	49.6	-16.1	33.5	40.0	- 6.5

* All readings are peak with specified CISPR bandwidth unless stated otherwise.

5.5 Field Strength Calculation



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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
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor
AG = Amplifier gain

Example:

Assume a receiver reading of 52.5 dB μ V is obtained. The Antenna Factor of 7.4 and a Cable Factor of 1.1 is added. The Amplifier Gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m (Corrected Reading)}$$



APPENDIX A - TEST EQUIPMENT USED

A complete list of test equipment used for each test can be found in their perspective test procedure. The equipment absolute performance calibration, of the equipment requiring calibration, is performed on an as needed basis in accordance with MIL-STD-45662. However, calibration periods do not exceed one (1) year. The test equipment is capable of making measurements within tolerances of at least ± 2 dB amplitude and $\pm 2\%$ frequency deviation. Equipment certifications showing traceability to NIST (National Institute of Standards and Technology) are maintained on file at Instrument Specialties Corporate offices in Delaware Water Gap, PA or Placentia CA. All equipment is checked and verified for proper operation before and after each series of tests.

A.1 Specific Equipment Used

<i>Test Instrument</i>	<i>Mfg / Model No.</i>	<i>Serial No.</i>	<i>Cal Due Date</i>
Conducted Emission Test			
EMI Receiver System	Hewlett Packard / 8574A	2837A00824	11/26/98
Line Impedance Stabilization Network	Solar / 8012-50-R-24-BNC	8379355	12/03/98
RF Coax Cable	Pasternack / RG223	020	12/02/98
Field Strength Radiated Emission Test			
EMI Receiver System	Hewlett Packard / 8574A	2974A01015	04/01/99
Biconical Antenna	A. H. Systems / SAS-200/540	234	11/17/98
Log-Periodic Antenna	A. H. Systems / SAS-200/512	117	11/17/98
BiLog Antenna	Chase / CBL6111A	1823	04/03/99
Preamplifier	ISCI / ZFL2000	017	01/20/99
Preamplifier	Hewlett Packard / 8347A	3307A00926	12/01/98
RF Coaxial Cable	Pasternack /RG223	020	12/02/98
RF Coaxial Cable	Times Microwave / LMR-600	030	12/05/98



APPENDIX B – SUPPLEMENTAL TEST DATA

<i>Test Type</i>	<i>Basic Standard</i>	<i>Details</i>	<i>Data Format</i>	<i>Page No.</i>
Conducted Emissions	FCC Part 18 RF Lighting Devices	9855, Line	Tabulated	B1
		9855, Line	Plotted	B2
		9855, Neutral	Tabulated	B3
		9855, Neutral	Plotted	B4
		9838, Line	Tabulated	B5
		9838, Line	Plotted	B6
		9838, Neutral	Tabulated	B7
		9838, Neutral	Plotted	B8
		9832, Line	Tabulated	B9
		9832, Line	Plotted	B10
		9832, Neutral	Tabulated	B11
		9832, Neutral	Plotted	B12
		9826, Line	Tabulated	B13
		9826, Line	Plotted	B14
		9826, Neutral	Tabulated	B15
		9826, Neutral	Plotted	B16
		9813, Line	Tabulated	B17
		9813, Line	Plotted	B18
		9813, Neutral	Tabulated	B19
		9813, Neutral	Plotted	B20
		9809, Line	Tabulated	B21
		9809, Line	Plotted	B22
		9809, Neutral	Tabulated	B23
		9809, Neutral	Plotted	B24
		9807, Line	Tabulated	B25
		9807, Line	Plotted	B26
		9807, Neutral	Tabulated	B27
		9807, Neutral	Plotted	B28



<i>Test Type</i>	<i>Basic Standard</i>	<i>Details</i>	<i>Data Format</i>	<i>Page No.</i>
Field Strength Radiated Emissions	FCC Part 18 RF Lighting Devices	9855	Prescan Plotted	B29
		9838	Prescan Plotted	B30
		9832	Prescan Plotted	B31
		9826	Prescan Plotted	B32
		9813	Prescan Plotted	B33
		9809	Prescan Plotted	B34
		9807	Prescan Plotted	B35
		9855 & 9838	Tabulated	B36
		9832 & 9826	Tabulated	B37
		9807	Tabulated	B38



ATTACHMENTS

INDEX OF ATTACHMENTS

<i>Description of Contents</i>	Page No.
Schematic Block Diagram, Circuitry Diagram, and Components List	C1-C4
User's Instructions	C5

INSTRUMENT SPECIALITIES CO., INC.
EMI TEST DATA

DATE: 05-08-98 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LIGHTNAVE
LOT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 9555 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR FOL: 57M
FREQUENCY RANGE: 15 - 30MHz
TEST PERFORMED BY/DIC: CHANG REPR: 72F REM: 54X
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 100V/60Hz

=====

EMC COMPLIANCE CENTER 8 May 1999 09:00:44

1. CONDUCTED EMISSION
1.1 FCC PART 15 RF LIGHTING DEVICES

LIGHTNAVE
MODEL: 9555 (50)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ 100V/60Hz LINE

25 Highest Peaks above -20 dB of limit line #1
peak criteria = 1.1 dB

PEAK #	FREQ (MHz)	(dBuV)	DELTA
1	1.5535	35.7	-11.7
2	1.1977	35.2	-11.2
3	1.5539	35.2	-11.9
4	1.5541	35.1	-11.9
5	1.1147	35	-12.0
6	1.576	35.5	-11.7
7	1.5207	35.2	-11.2
8	1.7153	35.7	-11.3
9	1.5458	35.6	-12.4
10	1.5410	35.5	-12.5
11	1.712	34.5	-13.2
12	1.625	34.7	-13.3
13	1.556	34.6	-13.4
14	1.7867	34.6	-13.4
15	1.7732	34.4	-13.6
16	1.5151	34.4	-13.6
17	1.5053	34.7	-13.7
18	1.701	34.2	-13.7
19	1.659	34.2	-13.8
20	1.757	34.2	-13.8
21	1.725	34.1	-13.9
22	1.72	34.1	-13.9
23	1.7061	34.1	-13.9
24	1.75	34	-14.0
25	1.762	34	-14.0

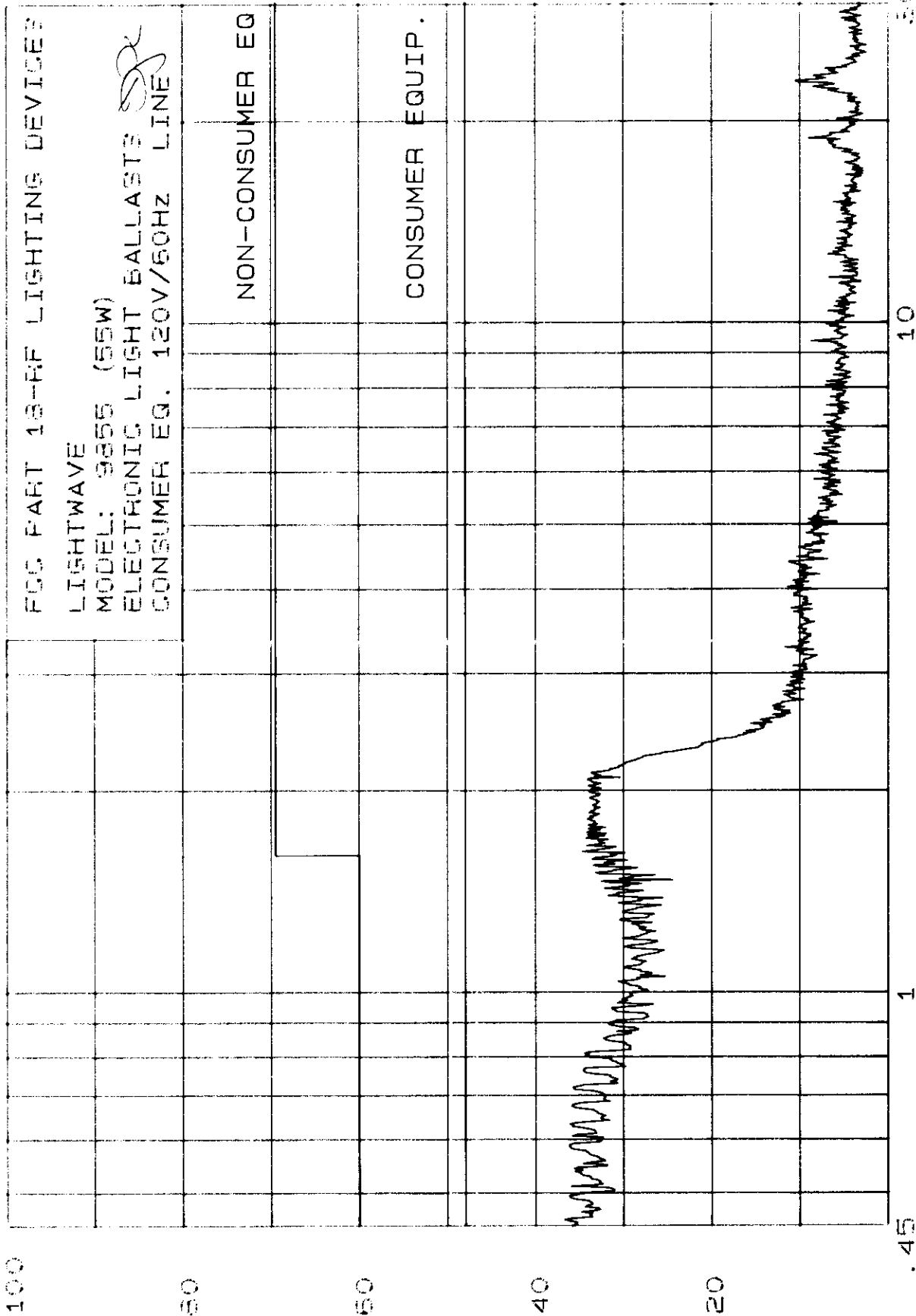
WORLD COMPLIANCE CENTER
EMISSION LEVEL (dBuV)

8 May 1998 02:00:44

PEAK

hp

100



INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 05/20/98 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
EQUIPMENT: LIGHTWAVE
EQUIPMENT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 8855 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: NEUTRAL (W/ OR FOL): N/A
FREQUENCY RANGE: 145 - 2000
TEST PERFORMED BY: DICK CHAMBERS (ENV. CON. HUM. 54%)
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 120V/50Hz

WORLD COMPLIANCE CENTER 9 May 1998 09:35:16

CONDUCTED EMISSION
FCC PART 15 RF LIGHTING DEVICES

LIGHTWAVE
MODEL: 8855 (855)
ELECTRONIC LIGHT BALLASTS
CONSUMER EMI 120V/50Hz NEUTRAL

dB highest Peaks above +30 dB of limit line #1
peak tolerance = 1.0 dB

PEAK#	FREQ. (MHz)	(dBμV)	DELTA
1	1.60	39.4	-8.6
2	1.645	39.3	-8.7
3	1.68	39.3	-8.6
4	1.674	39	-9.0
5	1.75	38.6	-9.2
6	1.554	38.5	-8.5
7	1.701	38.3	-8.7
8	1.666	38	-10.0
9	1.774	38	-10.0
10	1.797	38	-10.0
11	1.82	37.9	-10.2
12	2.125	37.7	-10.3
13	1.625	37.6	-10.4
14	2.072	37.6	-10.4
15	2.09	37.5	-10.5
16	1.5165	37.4	-10.6
17	1.535	37.4	-10.6
18	1.550	37.4	-10.6
19	1.532	37.2	-10.7
20	1.534	37	-11.0
21	1.971	37	-11.0
22	1.552	36.9	-11.1
23	1.758	36.9	-11.1
24	2.021	36.9	-11.1
25	2.101	36.9	-11.1

WORLD COMPLIANCE CENTER
EMISSION LEVEL (dBuV)

hp
100

8 May 1998 08:36:16

PEAK

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9855 (55W)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ. 120V/60HZ NEUTRAL

80

60

40

20

.45

NON-CONSUMER EQ

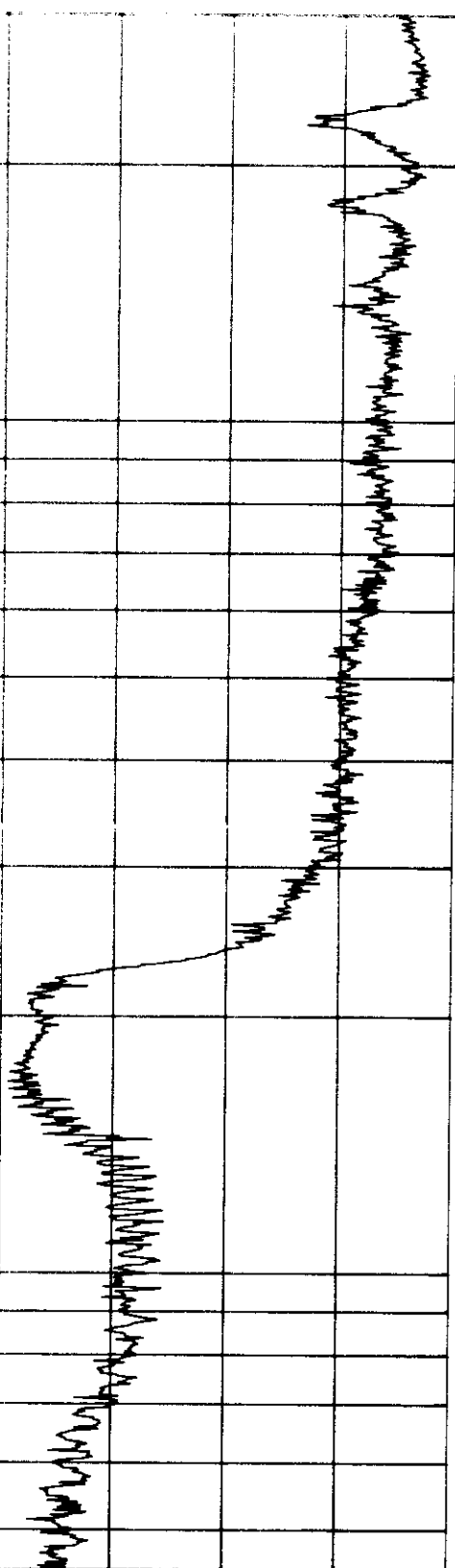
CONSUMER EQUIP.

1

10

30

FREQUENCY [MHz]



INSTRUMENT SPECIALTIES CO., INC.
EM TEST DATA

DATE: 05/02/88 TEST NO.:
TITLE OF TEST: FCC PART 15 RF LIGHTING DEVICES
CUSTOMER: LIGHTWAVE
EUT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 8850 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR POL: N/A
FREQUENCY RANGE: 145-10MHz
TEST PERFORMED BY: JIMMY CHANG TEST: 72F HUM: 64%
TEST RESULT: COMPLIANCE WITH LIMIT
TEST CONDITIONS: 10M/70MHz

WORLD COMPLIANCE CENTER 8 May 1988 00:50:00

1. CONDUCTED EMISSION
1.1 FCC PART 15 RF LIGHTING DEVICES

LIGHTWAVE
MODEL: 8850 (300)
ELECTRONIC LIGHT BALLASTS
WAVELENGTH 50-120W-60Hz LINE

25 highest peaks above -20 dB of limit line #1
peak criteria = 1.1 dB

PEAK#	FREQ (MHz)	(dBm)	DELTA
1	1.961	31.7	-11.3
2	1.8458	31.5	-11.4
3	4.132	30.5	-11.6
4	2.038	30.3	-11.9
5	1.707	30.3	-11.7
6	1.812	30.2	-11.3
7	2.124	30.2	-11.8
8	1.817	30.1	-11.9
9	1.956	30.1	-11.0
10	1.944	30	-12.0
11	1.675	30.0	-12.2
12	1.707	30.0	-12.2
13	1.680	29.8	-12.2
14	1.551	30.7	-12.3
15	1.752	30.7	-12.3
16	1.4030	30.6	-12.5
17	1.652	30.6	-12.5
18	1.659	30.6	-12.5
19	1.507	30.2	-12.8
20	1.635	30.2	-12.8
21	1.802	30.1	-12.8
22	2.116	30.1	-12.8
23	1.874	29	-12.9
24	5.936	24.9	-15.1
25	1.701	24.9	-15.1

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV] PEAK

8 MAY 1998 06:58:00

hp
100

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9858 (38W)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ. 120V/60HZ LINE

NON-CONSUMER EQ

CONSUMER EQUIP.

80

60

40

20

.45

1

10

30

FREQUENCY [MHz]

INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 08.01.88 TEST NO.:
TITLE OF TEST: FCC PART 15 - AP LIGHTING DEVICE
CUSTOMER: LIGHTWAVE
P/N DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 8838 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: NEUTRAL SENSOR FOL.: N/A
FREQUENCY RANGE: 145 - 30MHz
TEST PERFORMED BY: JIC/CHANG ICHM: V2F HUM: 54%
TEST RESULT: COMPLIANT WITH LIMITS
TEST CONDITIONS: 120V/60Hz

WORLD COMPLIANCE CENTER 9 MAY 1998 08:53:26

1. CONDUCTED EMISSION

1.1 FCC PART 15-RE LIGHTING DEVICES

LIGHTWAVE

MODEL: 8838 (120V)

ELECTRONIC LIGHT BALLASTS

CUSTOMER EQ: 120V/60Hz NEUTRAL

25 highest peaks above -20 dB of limit line #1
peak criteria = 1.1 dB

PEAK#	FREQ. (MHz)	Obsd	DELTA
1	1.610	38.9	-9.1
2	1.701	38.9	-9.1
3	2.107	38.9	-9.2
4	1.782	38.7	-9.3
5	1.697	38.6	-9.4
6	1.538	38.5	-9.5
7	1.855	38.5	-9.5
8	2.004	38.5	-9.5
9	1.93	38.4	-9.6
10	1.767	38.3	-9.7
11	1.812	38.2	-9.8
12	2.021	38.1	-9.9
13	2.152	38.1	-9.9
14	1.678	37.9	-10.1
15	1.709	37.9	-10.1
16	1.971	37.9	-10.1
17	1.859	37.9	-10.2
18	1.73	37.5	-10.5
19	1.835	37.5	-10.5
20	1.85	37.4	-10.6
21	1.808	37.3	-10.7
22	1.881	37.2	-10.7
23	2.004	37.3	-10.7
24	1.918	37.2	-10.6
25	1.6164	36.9	-11.1

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV]

8 May 1998 08:53:26

PEAK

hp

100

FCC PART 18-RF LIGHTING DEVICES

LIGHTWAVE

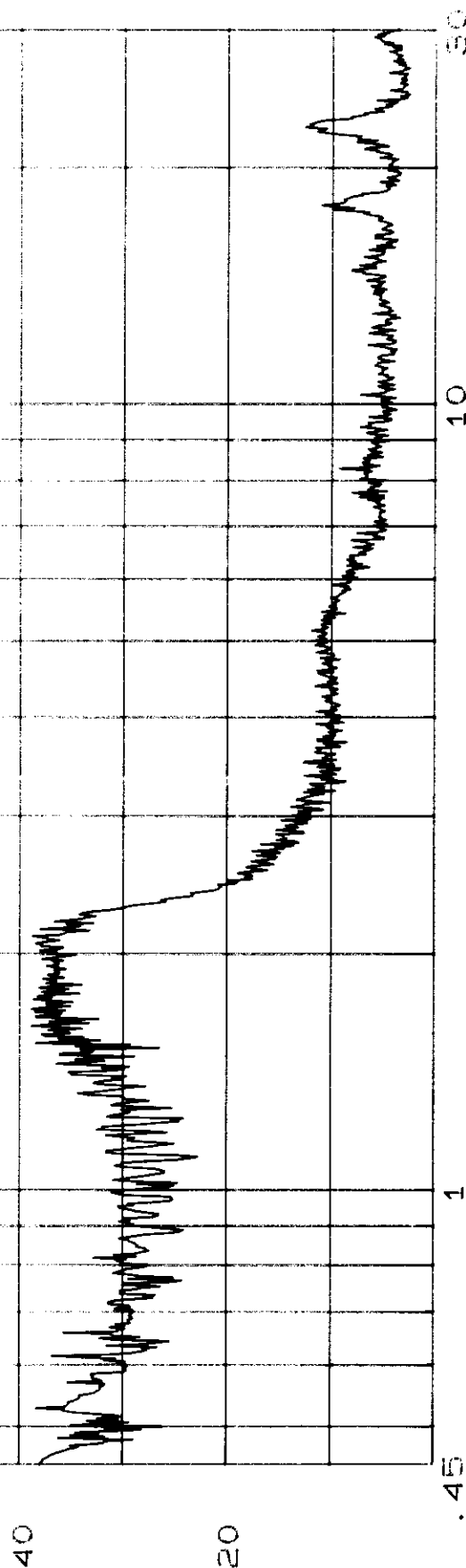
MODEL: 9838 (38W)

ELECTRONIC LIGHT BALLASTS

CONSUMER EQ. 120V/60HZ NEUTRAL

NON-CONSUMER EQ

CONSUMER EQUIP.



FREQUENCY [MHZ]

INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 03/28/96 TEST NO: 1
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LITHIUMWAVE
EUT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 9832 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR POL.: N/A
FREQUENCY RANGE: 145 - 100MHz
TEST PERFORMED BY: DICK CHANG TEMP: 72F HUM: 64%
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 100V/60Hz

=====

WORLD COMPLIANCE CENTER 8 May 1996 00:15:59

=====

1. CONDUCTED EMISSION
FCC PART 15 RF LIGHTING DEVICES

=====

LITHIUMWAVE
MODEL: 9832 (LUV)
ELECTRONIC LIGHT BALLASTS
CONSUMER EUL (100V/60Hz) LINE

25 highest level peaks above 100 dB of limit line #1
peak criteria = 1 dB

PEAK#	FREQ (MHz)	AMPL (uV)	DELTA
1	1.036	40.1	-7.8
2	1.007	36.1	-11.9
3	1.014	34.2	-13.6
4	1.03	31.7	-15.3
5	1.137	21.5	-18.4
6	1.016	20.6	-17.4

hp
100

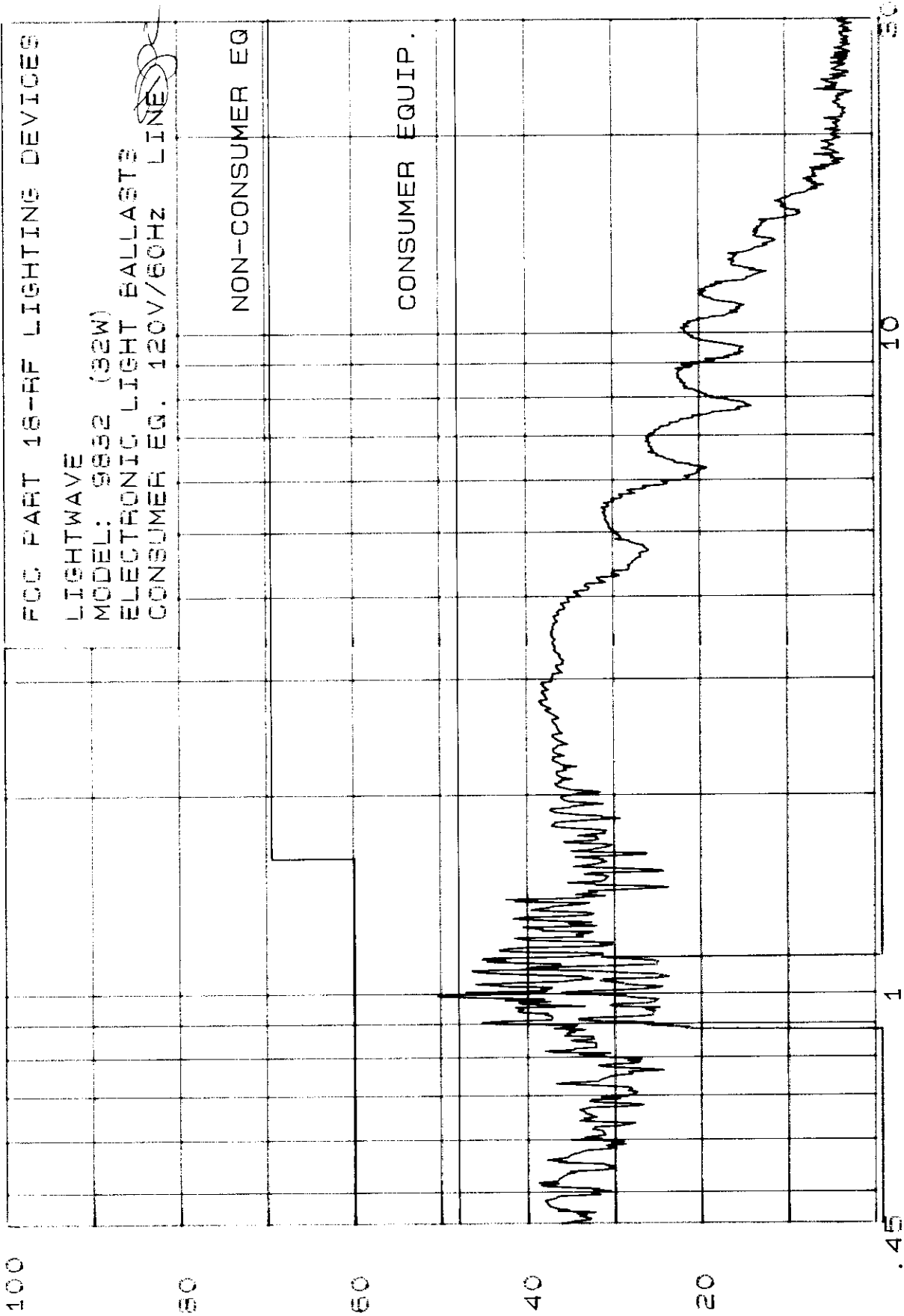
WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV]

8 May 1998 08:15:59
PEAK QUASI-PEAK

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9832 (32W)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ. 120V/60HZ LINE

NON-CONSUMER EQ

CONSUMER EQUIP.



FREQUENCY [MHz]

INDEPENDENT SPECIAL TESTS CO., INC.
EMI TEST DATA

DATE: 05/05/90 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CONSUMER: LIGHTWAVE
EUT DESIGNATION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: SS12 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: NEUTRAL SENSOR FOL.: N/A
FREQUENCY RANGE: 145 - 170MHz
TEST PERFORMED BY: JON CHANE TEMP. REF HUMID. 64%
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDUCTED BY: J202/LOH

=====

GLOBAL COMPLIANCE CENTER 2 May 1996 06:19:45

=====

1. CONDUCTED EMISSION
1.1 FCC PART 15 RF LIGHTING DEVICES

=====

LIGHTWAVE

MODEL: SS12 (32W)

ELECTRONIC LIGHT BALLASTS

CONSUMER ED 110V/60Hz NEUTRAL

15 highest peaks above 30 dB A limit line #1
peak criteria = 14 dB

PEAK #	FREQ (MHz)	(dBuV)	DELTA
1	1.02	44.7	-3.1
2	1.168	44.8	-3.2
3	1.4854	44.8	-3.1
4	1.6730	40.6	-7.4
5	1.444	40.5	-7.5
6	2.42	40.4	-7.6
7	1.6345	40.4	-7.6
8	1.6670	40	-8.0
9	1.4830	39.8	-8.2
10	1.331	39.7	-8.3
11	1.441	39.7	-8.3
12	1.535	39.4	-8.6
13	2.013	39.2	-8.8
14	1.636	39	-9.0
15	1.386	38.9	-9.1
16	2.588	38.7	-9.3
17	2.16	38.6	-9.4
18	2.163	38.6	-9.5
19	1.617	38.6	-9.5
20	2.911	38.6	-9.5
21	2.136	38.3	-9.7
22	2.722	38	-10.0
23	1.162	37.9	-10.1
24	2.988	37.9	-10.1
25	2.064	37.7	-10.3

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV] PEAK

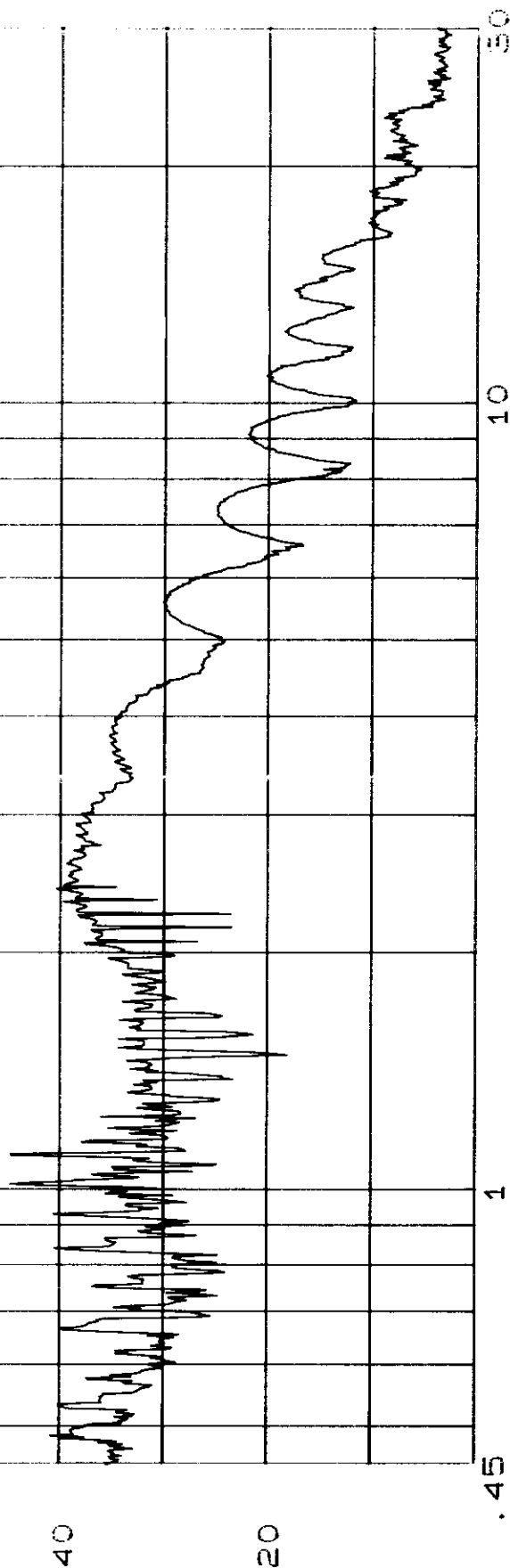
3 MAY 1998 08:31:45

hp
100

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9852 (32W)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ. 120V/60HZ NEUTRAL

NON-CONSUMER EQ

CONSUMER EQUIP.



FREQUENCY [MHz]

INSITUATION SPECIALTIES CO., INC.
QUI TEST DATA

DATE: 05-14-88 TEST NO.:
TITLE OF TEST: ETC PART 15 - RF EMISSIONS DUTIES
CUSTOMER: LIGHTWAVE
EXT. DESCRIPTION: ELECTRONIC LIGHT RELAY
MODEL NO.: 5825 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR POL.: N/A
FREQUENCY RANGE: 145 - 2200 MHz
TEST REPORTED BY: J.L. CHANE TEMP: 72F HUM: 61%
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 120V/60Hz

=====

WORLD COMPLIANCE CENTER 5 May, 1988 05:10:56

=====

1. UNDESIRABLE EMISSION

1.1. ETC PART 15 RF EMISSION DUTIES

LIGHTWAVE

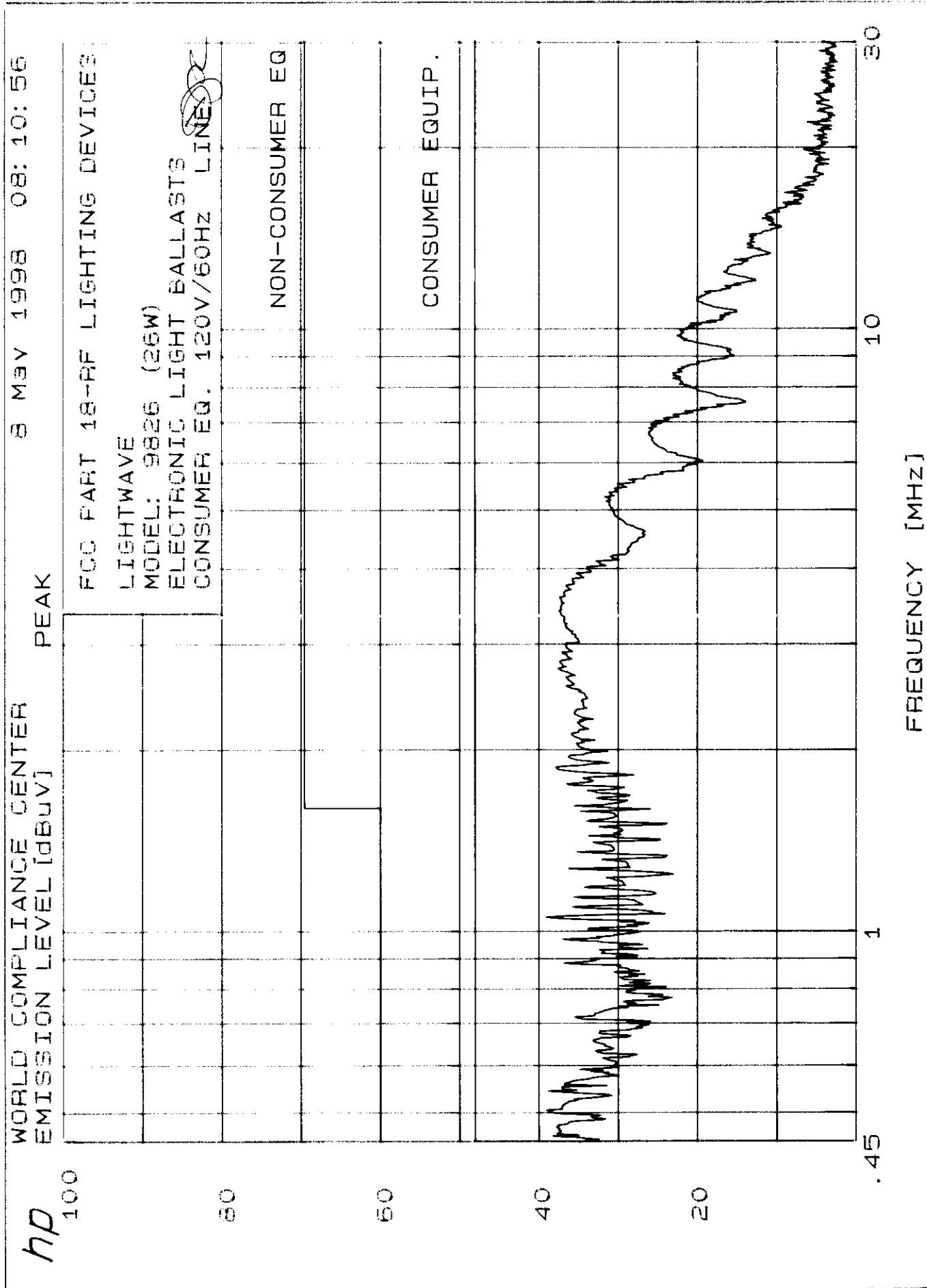
MODEL: 5825

ELECTRONIC LIGHT RELAY

CUSTOMER NO. 120V/60Hz LINE

20 Highest Peaks above -30 dB of Limit Line 31
peak criteria: 1.5 dB

PEAK#	FREQ (MHz)	dBm	DELTA
1	1.5812	39	-9.0
2	1.605	39	-9.0
3	1.6456	38.0	-9.0
4	1.684	38.7	-9.3
5	1.6896	38.2	-9.8
6	1.674	37.8	-10.2
7	1.6624	37.7	-10.3
8	1.4752	37.0	-10.5
9	2.133	37.0	-10.5
10	2.111	37.4	-10.6
11	2.103	37.3	-10.7
12	2.19	37.2	-10.7
13	1.6527	37.1	-10.8
14	2.191	37	-11.0
15	1.7734	36.9	-11.1
16	1.6697	36.0	-11.2
17	1.888	36.4	-11.2
18	2.136	36.2	-11.2
19	2.119	36.6	-11.4
20	2.1356	36.5	-11.5
21	2.643	36.5	-11.5
22	2.172	36.5	-11.5
23	2.714	36.5	-11.5
24	1.76	36.4	-11.6
25	1.274	36.2	-11.8



INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 05/05/98 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LIGHTWAVE
EMI DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 9825 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: NEUTRAL SENSOR FC: N/A
FREQUENCY RANGE: 15 - 30MHz
TEST PERFORMED: RESONANT CHAMBER TEMP: 72F HUM: 64%
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 120V 50Hz

WORLD COMPLIANCE CENTER 8 May 1998 08:29:11

1. CONDUCTED EMISSION
1.1 FCC PART 15- RF LIGHTING DEVICES

SIGNATURE
MODEL: 9825 (FCU)
ELECTRONIC LIGHT BALLASTS
CONSUMER E.V. 120V/50Hz 100Watt

25 Highest Peaks above -20 dB of Limit Line #1
peak number 1 1.08

PEAK #	FREQ (MHz)	Observed	DELTA
1	1.085	46.4	-1.6
2	1.090	47.3	-6.1
3	1.313	49.4	-7.0
4	1.443	32.4	-7.6
5	1.41	32.4	-8.1
6	1.815	31.7	-8.3
7	1.4713	39.5	-8.4
8	1.321	39.5	-8.4
9	1.520	39.5	-8.4
10	1.0542	39.5	-8.5
11	1.198	39.5	-8.7
12	1.777	39.1	-8.8
13	1.855	39.1	-8.9
14	1.702	39	-9.0
15	1.4555	39.3	-9.1
16	1.5278	39.3	-9.1
17	1.710	39.3	-9.1
18	1.5134	39.5	-9.4
19	1.8688	39.4	-9.6
20	1.632	39.4	-9.6
21	1.8302	38.1	-9.9
22	1.104	39	-10.3
23	1.215	37.3	-10.7
24	1.4215	37.5	-10.1
25	1.152	37.7	-10.3

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV]

8 May 1998 08:29:11

PEAK

hp

100

FCC PART 18-RF LIGHTING DEVICES

LIGHTWAVE

MODEL: 9826 (26W)

ELECTRONIC LIGHT BALLASTS

CONSUMER EQ. 120V/60HZ NEUTRAL

80

NON-CONSUMER EQ

60

CONSUMER EQUIP.

40

20

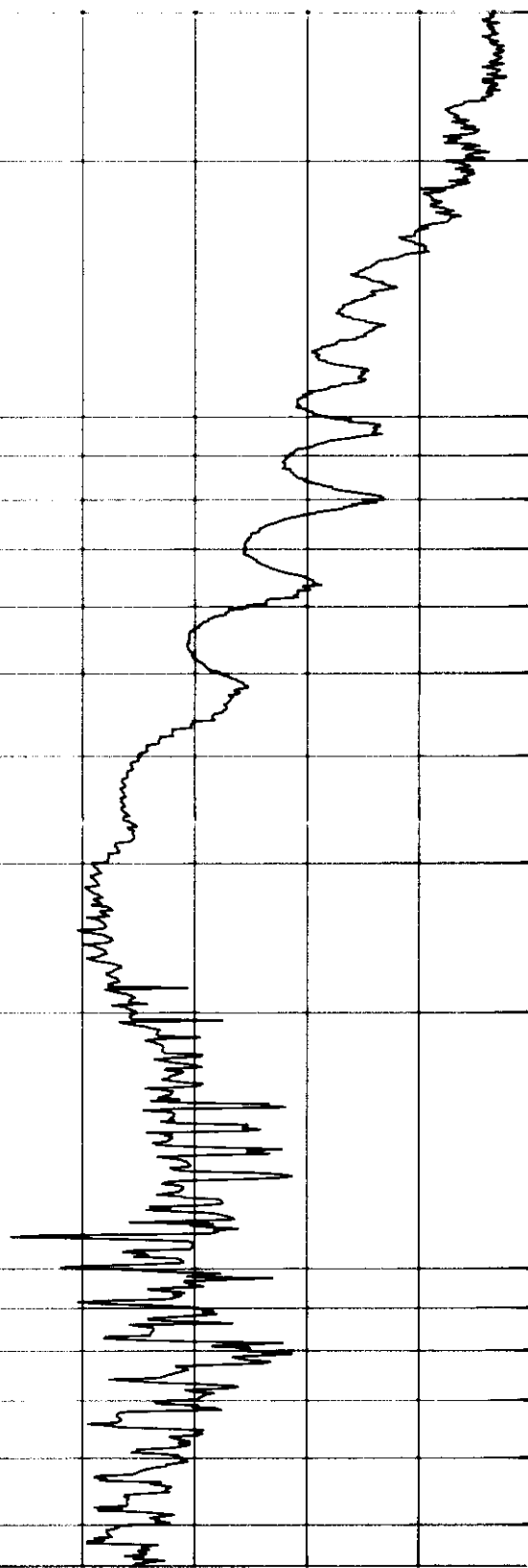
.45

1

10

30

FREQUENCY [MHz]



INSTRUMENT QUALITIES CO., INC.
EMI TEST DATA

DATE: 05/08/99 TEST NO.:
TITLE OF TEST: VOL PART 17 OF LIGHTING DEVICES
CUSTOMER: LIGHTWAVE
EMI DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 9810 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
WIRE LOCATION: LINE GROUND POL.: N/A
FREQUENCY RANGE: 1.05 - 300MHz
TEST PERFORMED BY: GUY CHANDLER TEMP. REF HUM. 64.4
TEST RESULTS: COMPLIANCE WITH LIMITS
TEST CONDITIONS: 10KV/60Hz

=====

WORLD COMPLIANCE CENTER May 1999 05120.45

=====

1. CONDUCTED EMISSION

1.1 VOL PART 17-47 LIGHTING DEVICES

=====

LIGHTWAVE

MODEL: 9810 (10W)

ELECTRONIC LIGHT BALLASTS

CONSUMER 40. 10KV/60Hz LINE

25 Highest Peaks above -20 dB of Limit Line #1

Peak Criteria = 1 Hz

PEAK#	FREQ (MHz)	CHRGD	PEL18
1	15168	40.1	-11.9
2	15128	39.4	-11.6
3	14603	39.0	-11.7
4	15627	38.6	-11.4
5	15061	38.6	-11.4
6	15517	38.0	-11.4
7	15167	37.9	-12.1
8	17939	37.8	-12.1
9	17116	37.7	-12.3
10	15216	37.6	-12.4
11	14567	37.2	-12.7
12	16859	37.2	-12.3
13	16030	36.8	-11.2
14	14099	36.6	-11.4
15	15936	36.6	-11.4
16	18118	36.3	-11.7
17	16110	36.2	-11.8
18	16596	36	-12.0
19	14358	35.7	-12.3
20	16544	35.6	-12.4
21	16042	35.3	-12.7
22	16080	35.3	-12.9
23	16072	34.8	-13.2
24	16157	34.7	-13.3
25	16061	34.5	-13.4

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV]

8 MAY 1998 08:20:45

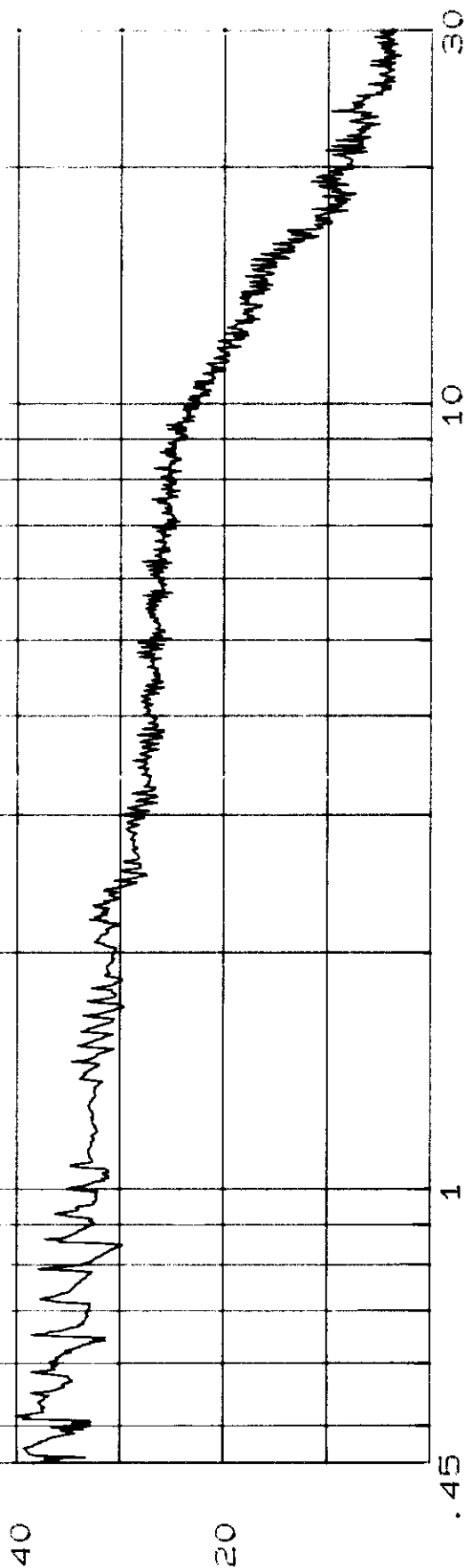
PEAK

hp
100

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9813 (13W)
ELECTRONIC LIGHT BALLASTS
CONSUMER EQ. 120V/60HZ LINE

NON-CONSUMER EQ

CONSUMER EQUIP.



FREQUENCY [MHz]

INSTRUMENT SPECIALTIES CO., INC.
EMC TEST DATA

DATE: 05/03/95 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LIGHTWARE
EUT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 9813 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: COUL-RAI SENSOR FILE: 7176
FREQUENCY RANGE: 145 - 30MHz
TEST PERFORMED BY: LIA CHAN-FCI TERM: TCI REM: 644
TEST RESULT: COMPLIANT WITH LIMITS
TEST CONDITIONS: 120/60Hz

WORLD COMPLIANCE CENTER 3 May 1995 09:24:17

1. COMPACTED ENVELOPE
1.1 FCC PART 15-RF LIGHTING DEVICES

LIGHTWARE
MODEL: 9813 (12W)
ELECTRONIC LIGHT BALLAST
CONSUMER CO. 120V-60Hz BULBTYPE

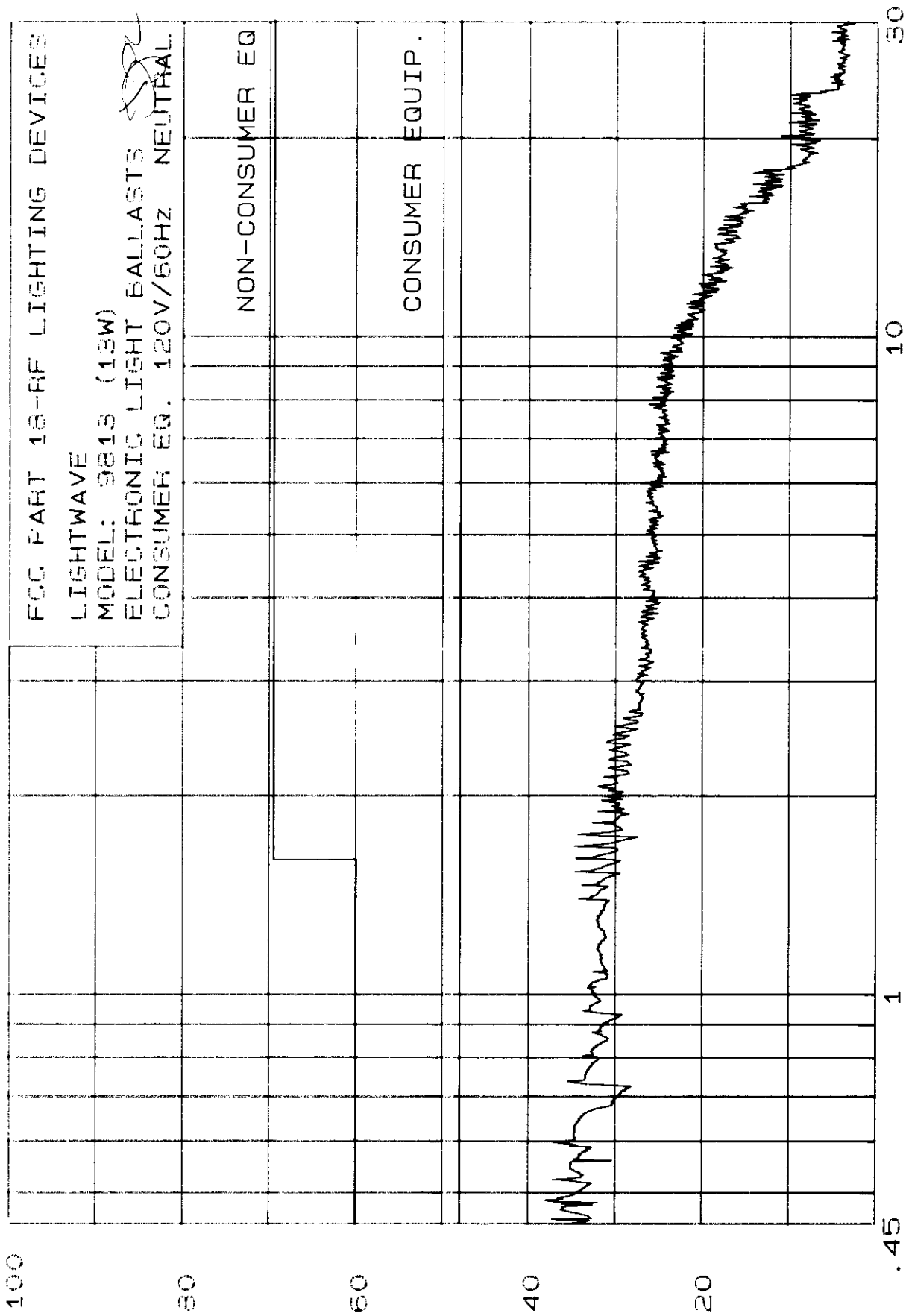
25 highest peaks above -20 dB of limit line \$1
peak column = 21 dB

PEAK#	FREQ (MHz)	POWER	DEL (m)
1	1.4194	32	-12.0
2	1.4575	27.2	-12.7
3	1.5055	31.2	-12.8
4	1.5535	27.2	-13.9
5	1.4935	32.6	-11.4
6	1.4732	35.3	-11.7
7	1.4633	35.1	-11.9
8	1.4993	30.5	-12.5
9	1.5458	25.2	-12.8
10	1.5911	25.2	-12.5
11	1.6344	24.9	-13.2
12	1.6113	24.5	-13.2
13	1.635	24.7	-12.2
14	1.65	24.7	-13.3
15	1.611	24.5	-13.4
16	1.752	24.4	-13.5
17	1.697	24.2	-12.7
18	1.674	24.2	-13.8
19	1.468	23.3	-14.1
20	1.8063	23.7	-14.3
21	1.455	22.7	-14.3
22	1.5837	23.4	-14.9
23	1.624	23.2	-14.2
24	1.633	23.1	-14.9
25	1.6159	20.8	-15.2

hp WORLD COMPLIANCE CENTER EMISSION LEVEL [dBuV] PEAK 8 MAY 1998 09:04:17

FCC PART 18-RF LIGHTING DEVICES
 LIGHTWAVE
 MODEL: 9813 (13W)
 ELECTRONIC LIGHT BALLASTS
 CONSUMER EQ. 120V/60HZ NEUTRAL

NON-CONSUMER EQ
 CONSUMER EQUIP.



IMPROVEMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 05-09-98 TEST NO.:
TITLE OF TEST: FCC PART 18 RF LIGHTING DEVICE
CUSTOMER: LIGHTWAVE
EUT DESCRIPTION: ELECTRONIC LIGHT BALLAST
MODEL NO.: 9809 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR POR : N/A
FREQUENCY RANGE: 145 - 10000
TEST PERFORMED BY: DHH DUSNG TEMP: 71F HUM: 64%
EUT RESET BY: COMPLIANT WITH LIMIT
EUT CONDITION: 120V/60Hz

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WORLD COMPLIANCE CENTER 6 May 1998 05:12:13

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1. UNPUBLISHED EMISSION

1.1 FCC PART 18 RF LIGHTING DEVICES

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Lightwave

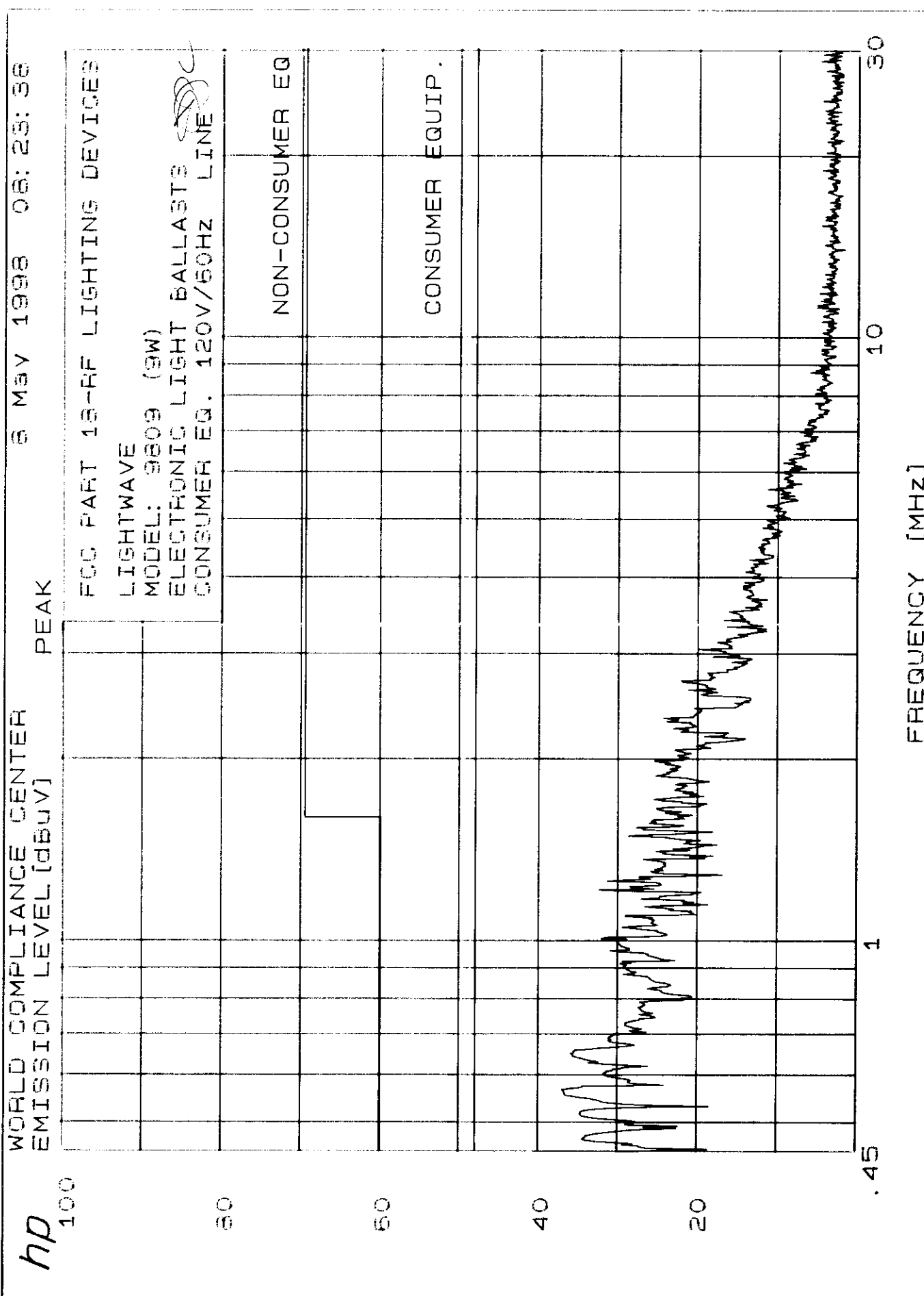
MODEL: 9809 (98)

ELECTRONIC LIGHT BALLAST

CONSUMER EQ. 120V 60Hz LINE

2. highest Peak Above -32 dB of Limit Line #1
peak criteria = 1.0 dB

PEAK #	FREQ. (MHz)	Obsd	Delta
1	1.5583	37	+11.0
2	1.561	35.9	+12.1
3	1.519	34.2	+12.2
4	1.4713	34.5	+12.5
5	1.5235	27.7	+4.3
6	1.516	32.4	+15.6
7	1.511	32.1	+15.9
8	1.5035	31.0	+15.2
9	1.5258	31.4	+16.6
10	1.5246	29.2	+16.0
11	1.5307	31.2	+16.6
12	1.4657	31	+17.0
13	1.502	30.2	+17.8
14	1.5131	29.7	+18.3
15	1.555	29.5	+18.5
16	1.4815	29.4	+18.6
17	1.526	29.4	+18.6
18	1.5305	29.3	+18.7
19	1.5068	29.3	+18.7
20	1.526	29.1	+18.9
21	1.5	29.1	+18.9
22	1.4377	29	+19.0
23	1.5551	29.7	+19.3
24	1.454	28.7	+19.3
25	1.7189	22.6	+19.6



INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 05/08/98 TEST NO.:
 TITLE OF TEST: EMI PART 1A - RF LIGHTING DEVICES
 CUSTOMER: LIGHTWAVE
 EUT DESCRIPTION: ELECTRONIC LIGHT BALLAST
 MODEL NO.: 9808 SERIAL NO.: N/A
 TEST MODE: CONTINUOUS POWER ON
 CONDUCTOR LOCATION: NEUTRAL SENSOR POLL: N/A
 FREQUENCY RANGE: 45 - 100MHz
 TEST PERFORMED BY: JOK CHENG TEMP. 72F HUMID. 54%
 TEST RESULTS: COMPLIANCE WITH LIMITS
 TEST CONDITIONS: 120V/60Hz

=====

WORLD COMPLIANCE CENTER 0 May, 1998 09:01:10

=====

1. CONDUCTED EMISSION

1.1 EMI PART 15-MA LIGHTING DEVICES

=====

LIGHTWAVE

MODEL: 9808 (8W)

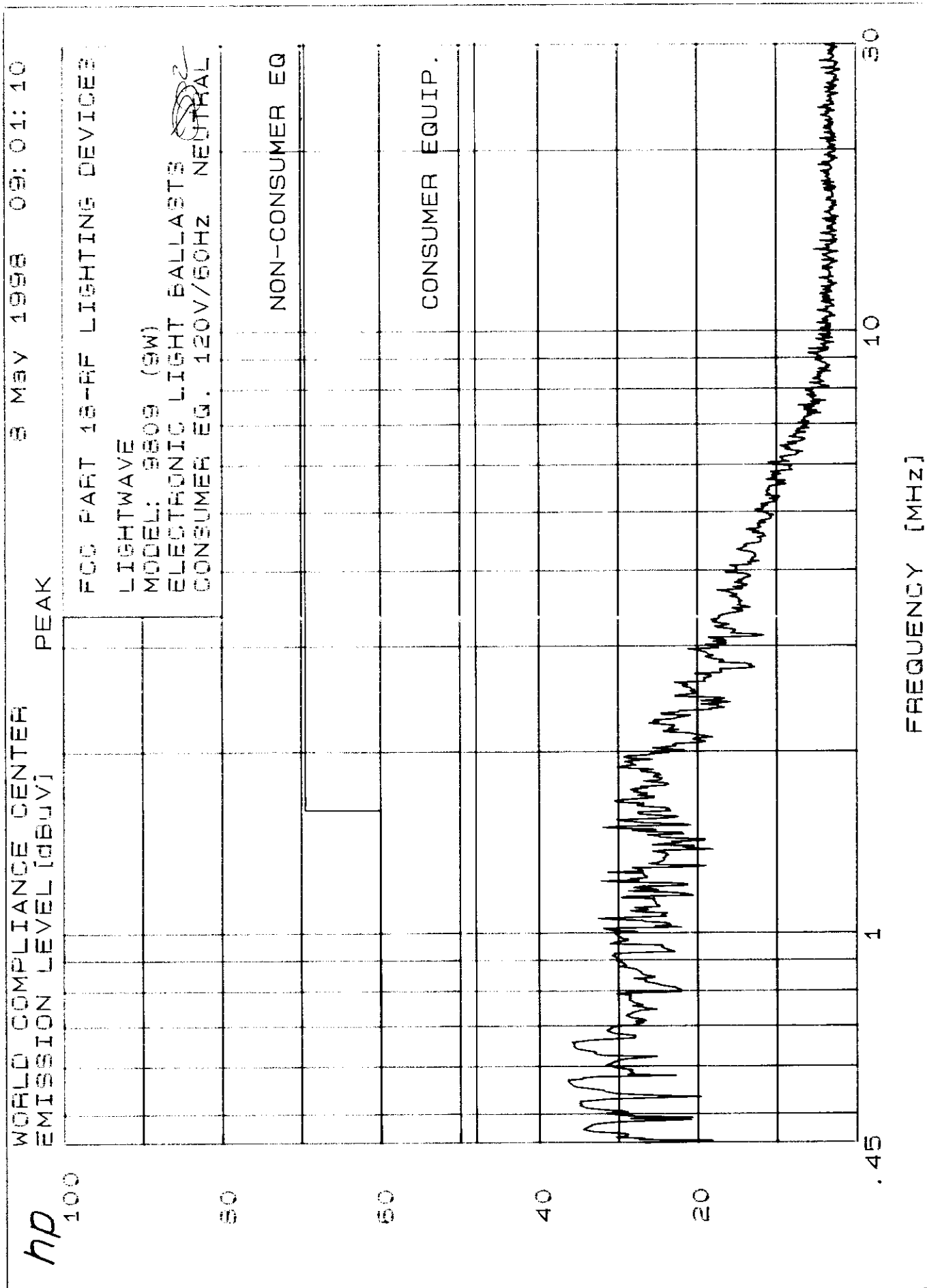
ELECTRONIC LIGHT BALLAST

CONDUCTOR ID: 120V/60Hz NEUTRAL

25 highest Peaks above 20 dB re limit Line #1

peak in temp = 1.1 dB

PEAK#	FREQ (MHz)	(dBµV)	DELTA
1	.6592	30.4	-11.6
2	.6592	25.9	-11.1
3	.5234	25	-13.0
4	.5119	34.3	-12.1
5	.4732	34.5	-12.5
6	.6327	22.1	-14.9
7	1.059	22.6	-15.4
8	1.231	20.2	-16.8
9	1.5	21	-15.0
10	1.02	31.9	-16.1
11	504	21.0	-16.4
12	.5036	31.0	-16.4
13	.6920	31.5	-16.5
14	1.203	31.4	-16.6
15	.5615	31.1	-16.9
16	.9180	39.0	-17.2
17	1.055	30.5	-17.5
18	.4590	30.4	-17.6
19	.998	30.4	-17.6
20	1.729	30.3	-17.7
21	1.545	32.2	-17.9
22	1.03	30.1	-17.8
23	1.245	24.8	-18.1
24	1.147	23.1	-18.2
25	1.502	25.3	-18.7



INSTRUMENT SPECIFICATIONS CO., INC.
EMI TEST DATA

DATE: 05/03/99 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LIGHTWAVE
ISA DESCRIPTION: ELECTRONIC LIGHT BALLAST
MODEL NO.: 9501 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR LOCATION: LINE SENSOR PORT: N/A
FREQUENCY RANGE: 145 - 130MHz
TEST PERFORMED BY: IOR CHENG FREQ. 72F HOP. 64%
TEST RESULTS: COMPLIABLE WITH LIMITS
TEST CONDITIONS: 120V/60Hz

WORLD COMPLIANCE CENTER 215, 1998 05125:50

1. CONDUCTED EMISSION

1.1 FCC PART 15-RF LIGHTING DEVICES

LIGHTWAVE

MODEL: 9501 (70)

ELECTRONIC LIGHT BALLASTS

COMPLIANCE: FCC 1502/60Hz 1.0VRL

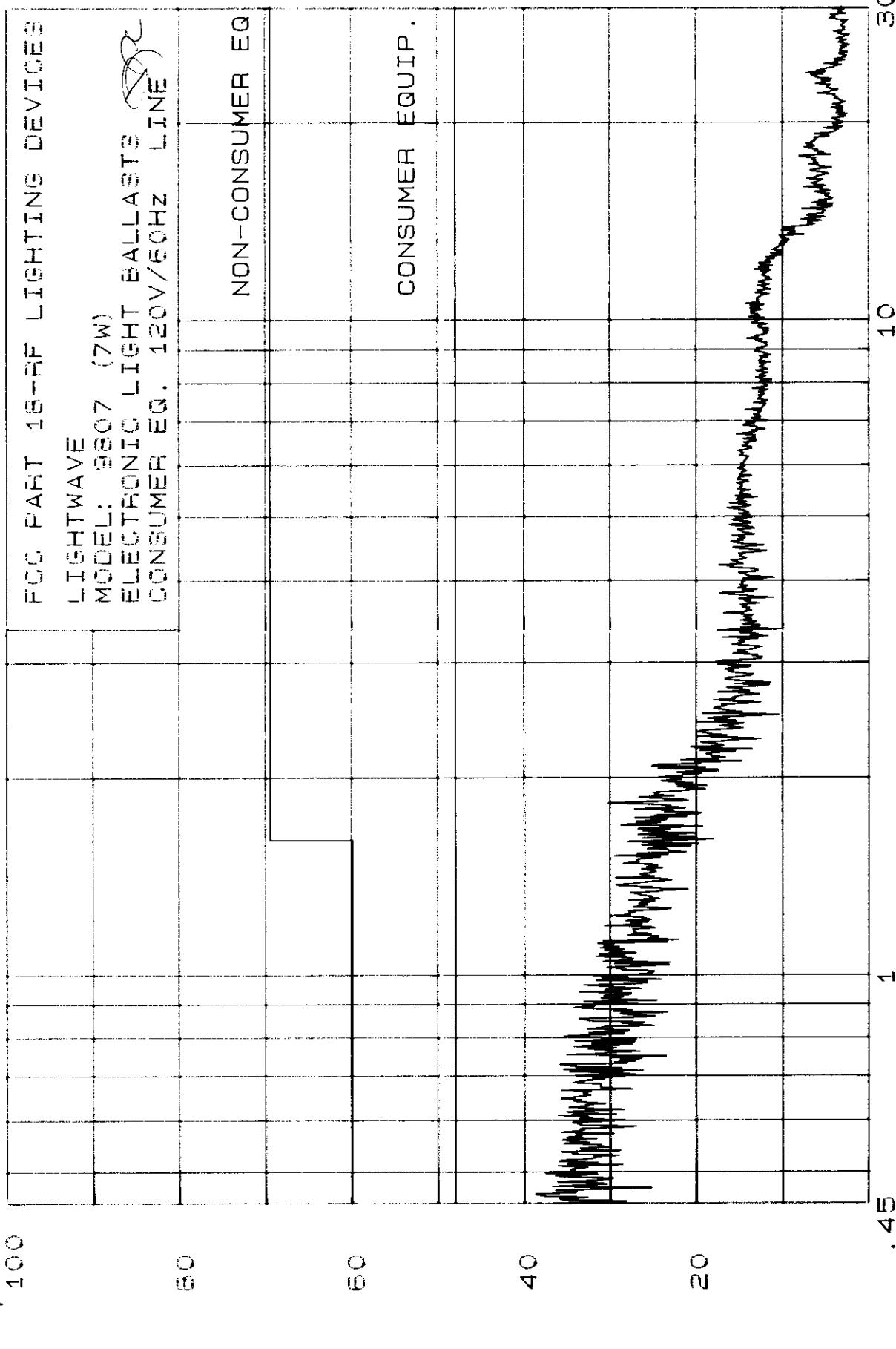
25 highest peaks above 140 dB of limit Line #1
peak location = 1.1 dB

PEAK #	FREQ (MHz)	dBmV	VOLTA
1	14654	39.7	9.3
2	14998	31.0	-10.4
3	14770	28.8	-11.2
4	14710	36.4	-11.6
5	14856	36.4	-11.6
6	14653	33.2	-11.8
7	15125	35.1	-11.9
8	15113	35.1	-11.9
9	15170	36	-12.0
10	15112	36	-12.0
11	1519	35.8	-12.1
12	16462	35.3	-12.2
13	1539	35.7	-12.3
14	15704	35.7	-12.3
15	15076	35.7	-12.3
16	15021	35.6	-12.4
17	1558	35.6	-12.5
18	14169	35.6	-12.5
19	15963	35.4	-12.6
20	15562	35.1	-12.9
21	1513	35.1	-12.9
22	15459	35.1	-12.9
23	15158	35	-13.0
24	15135	34.4	-13.1
25	15109	34.2	-13.2

hp 100

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV] PEAK

8 May 1998 08:25:50



INSTRUMENT SPECIALTIES CO., INC.
EMI TEST DATA

DATE: 05/03/86 TEST NO.:
TITLE OF TEST: FCC PART 15 - RF LIGHTING DEVICES
CUSTOMER: LIGHTWAVE
EUT DESCRIPTION: ELECTRONIC LIGHT BALLASTS
MODEL NO.: 5807 SERIAL NO.: N/A
TEST MODE: CONTINUOUS POWER ON
SENSOR: CHA (ENV): NEUTRAL SENSOR FOL: N/A
FREQUENCY RANGE: 145 - 50MHz
TEST PERFORMED BY: DICK CHANDR TEMP: 72°F HUM: 54%
TEST PERIOD: - COMPLIANCE WITH LIMITS
TEST CONDITIONS: 120V/60Hz

WORLD COMPLIANCE CENTER July 1986 08:08:23

1. CONDUCTED EMISSION
15. FCC PART 15-RF LIGHTING DEVICES

LIGHTWAVE
MODEL: 5807-7A
ELECTRONIC LIGHT BALLASTS
CONSUMER EOL: 120V/60Hz - NEUTRAL

25 highest Peaks above 20 dB of limit with 31
peak number = 11 dB

PEAK#	FREQ (MHz)	Mag	DELTA
1	13345	17.5	-10.5
2	14314	35.5	-11.2
3	1504	35.5	-11.7
4	15163	35.5	-11.8
5	16332	35.5	-12.2
6	1659	35.5	-12.2
7	14613	35.5	-12.4
8	1613	35.5	-12.5
9	15621	35.5	-12.6
10	17153	35.5	-12.8
11	15827	35	-13.0
12	14335	34.8	-13.1
13	15856	34.6	-13.4
14	16455	34.6	-13.4
15	14877	34.5	-13.5
16	17575	34.4	-13.6
17	15104	34.7	-13.7
18	14576	34.2	-13.8
19	16023	33.6	-14.1
20	16166	33.6	-14.5
21	16444	33.6	-14.5
22	16932	33.4	-14.6
23	16052	33.5	-14.6
24	16037	33.3	-15.0
25	15256	32.7	-15.3

WORLD COMPLIANCE CENTER
EMISSION LEVEL [dBuV]

PEAK

6 May 1998 09:06:23

hp

100

FCC PART 18-RF LIGHTING DEVICES
LIGHTWAVE
MODEL: 9807 (7W)
ELECTRONIC LIGHT BALLAST
CONSUMER EQ. 120V/60HZ NEUTRAL

NON-CONSUMER EQ

CONSUMER EQUIP.

.45

1

10

30

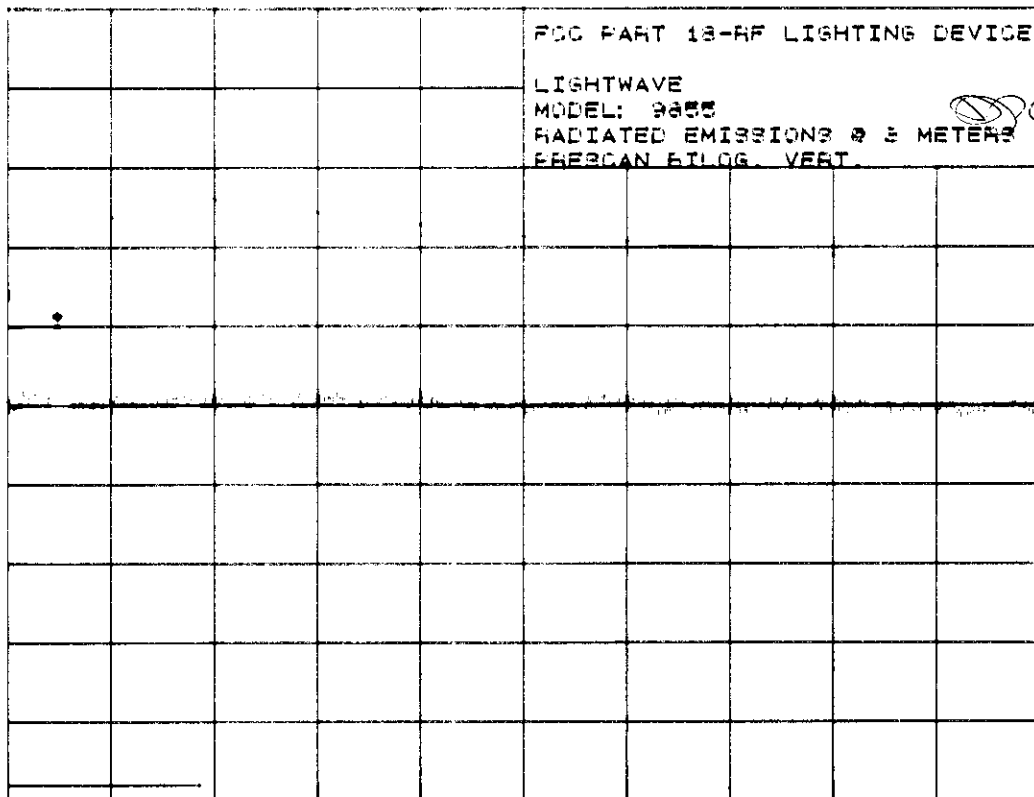
FREQUENCY [MHz]

WORLD COMPLIANCE CENTER MKR 75.6 MHz
 hp REF 87.0 dBV ATTN 0 dB + 10 dB 48.20 dBV

10 dB/

POB PK

OFFSET

-10.0
dB

START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 1.000 GHz

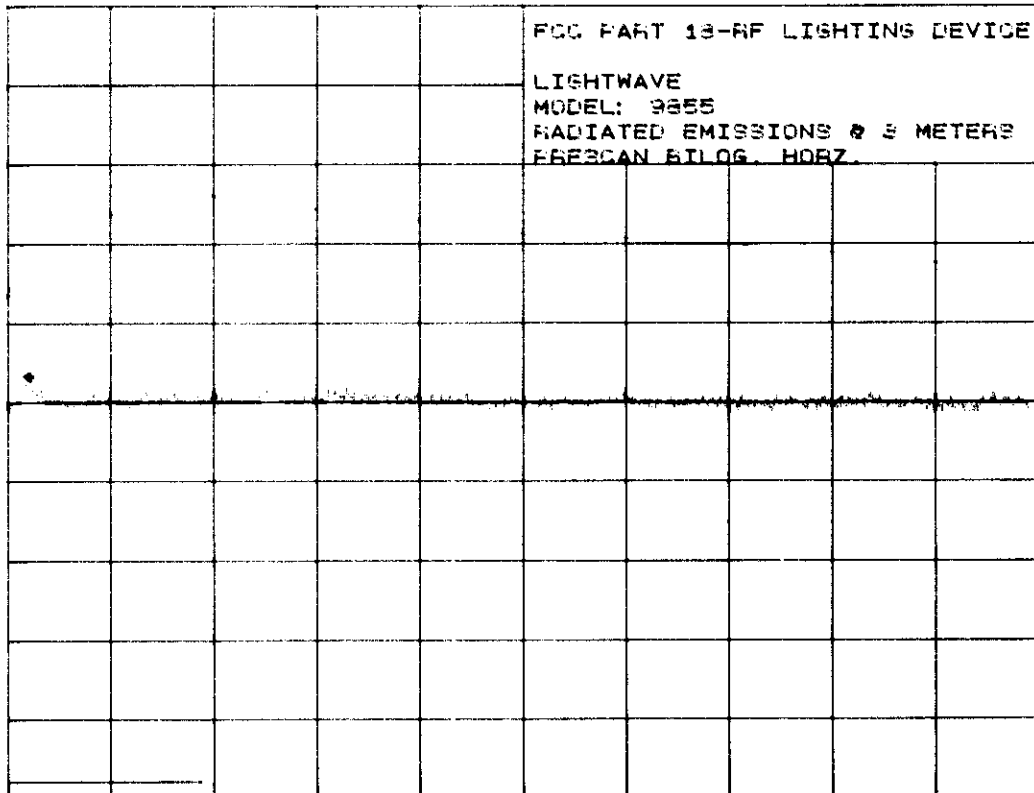
SWP 1.00 sec

WORLD COMPLIANCE CENTER MKR 49.4 MHz
 hp REF 87.0 dBV ATTN 0 dB + 10 dB 40.20 dBV

10 dB/

POB PK

OFFSET

-10.0
dB

START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 1.000 GHz

SWP 1.00 sec

WORLD COMPLIANCE CENTER MKR 74.6 MHz
 REF 37.0 dBuV ATTN 0 dB + 10 dB 52.20 dBuV

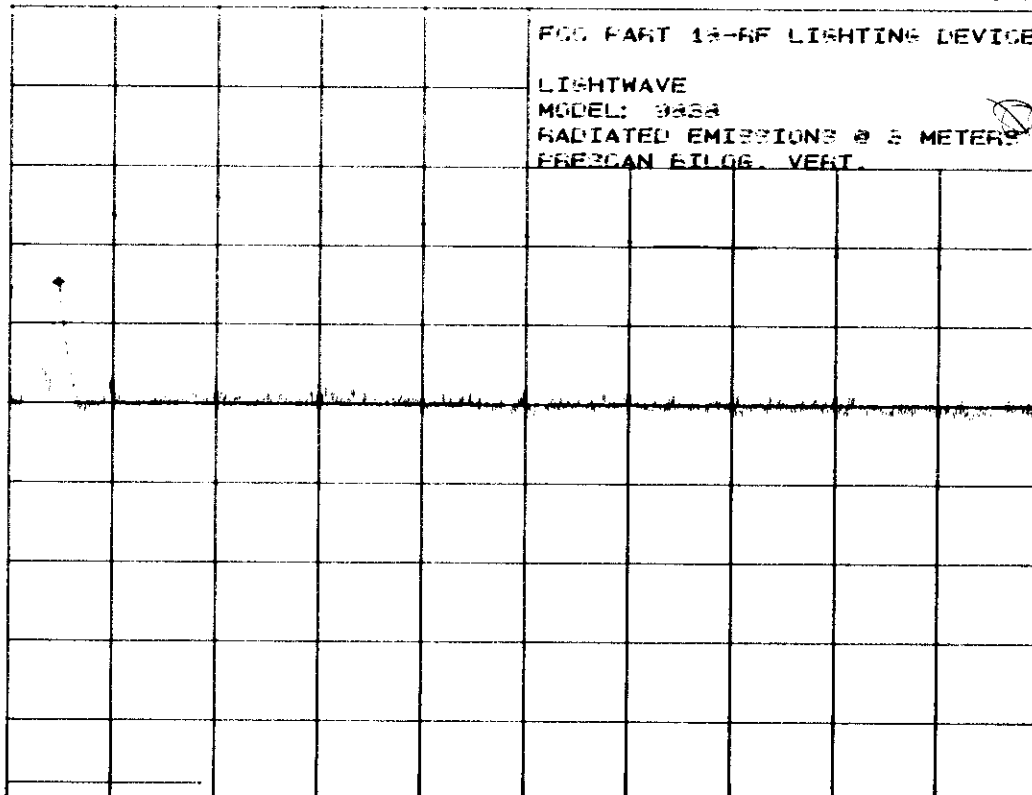
10 dB/

POF PK

OFFSET

-10.0

dB



START 30 MHz

RES BW 1 MHz

VBW 1 MHz

STOP 1.000 GHz

SWP 1.00 sec

WORLD COMPLIANCE CENTER MKR 44.6 MHz
 REF 37.0 dBuV ATTN 0 dB + 10 dB 43.00 dBuV

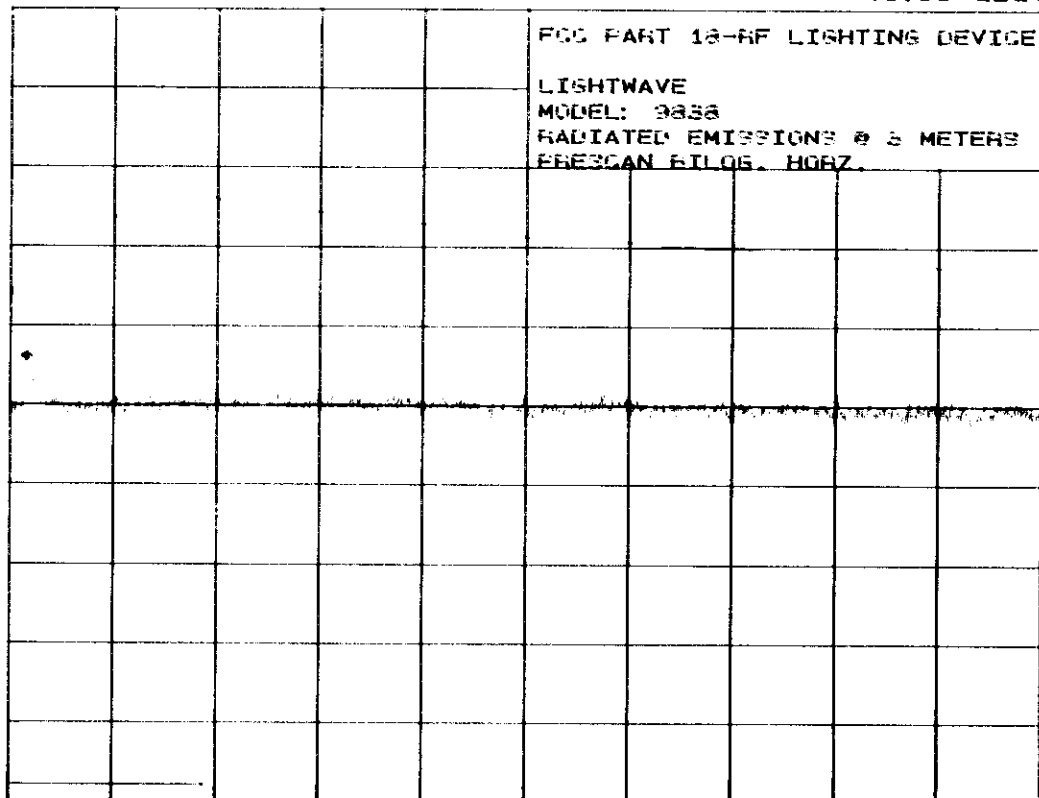
10 dB/

POF PK

OFFSET

-10.0

dB



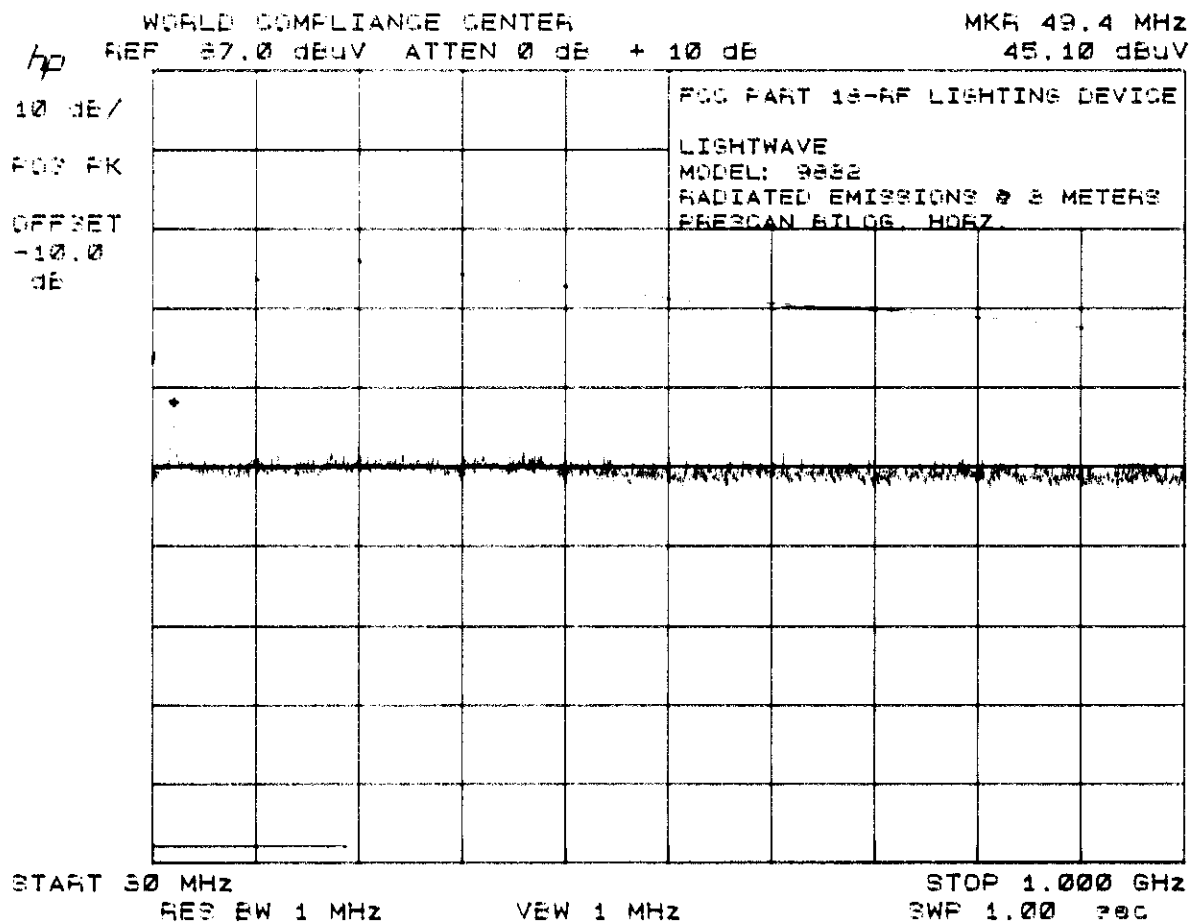
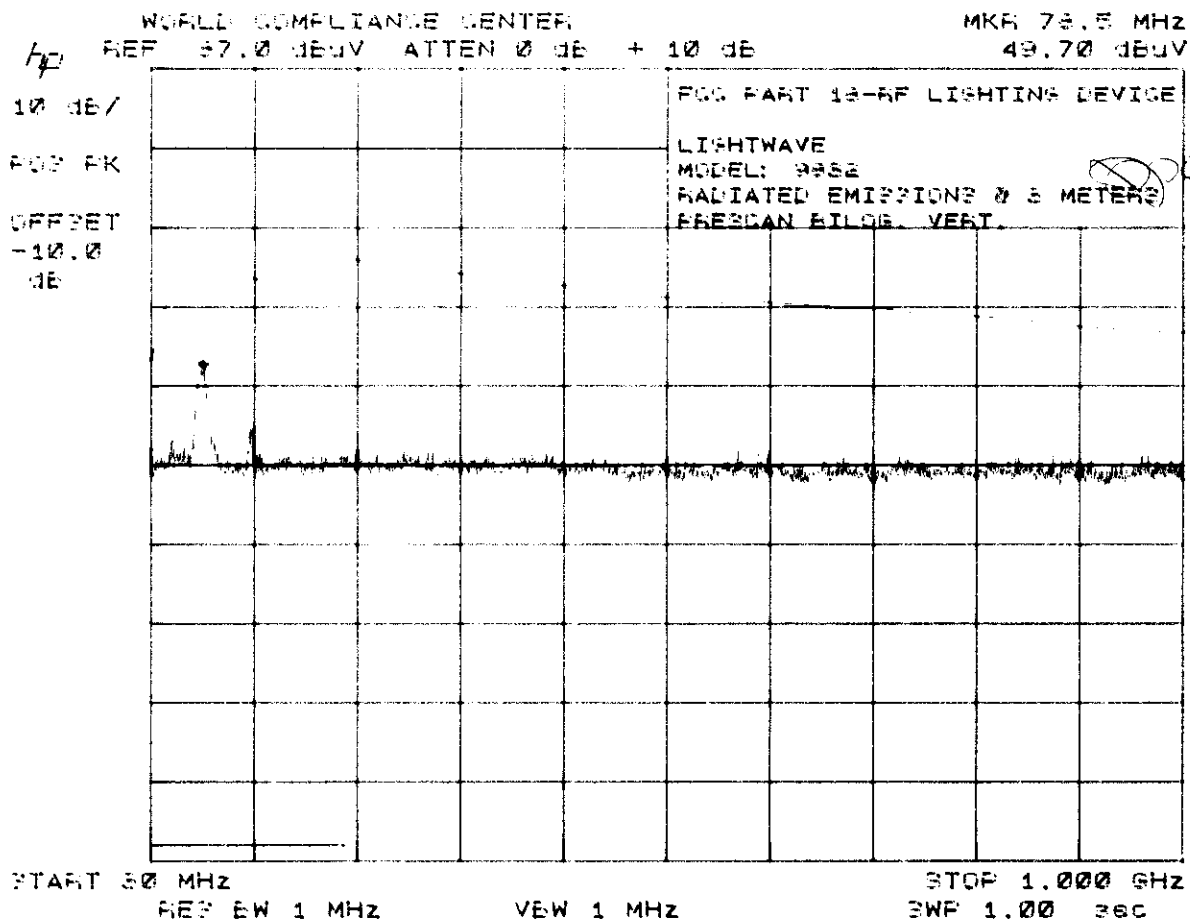
START 30 MHz

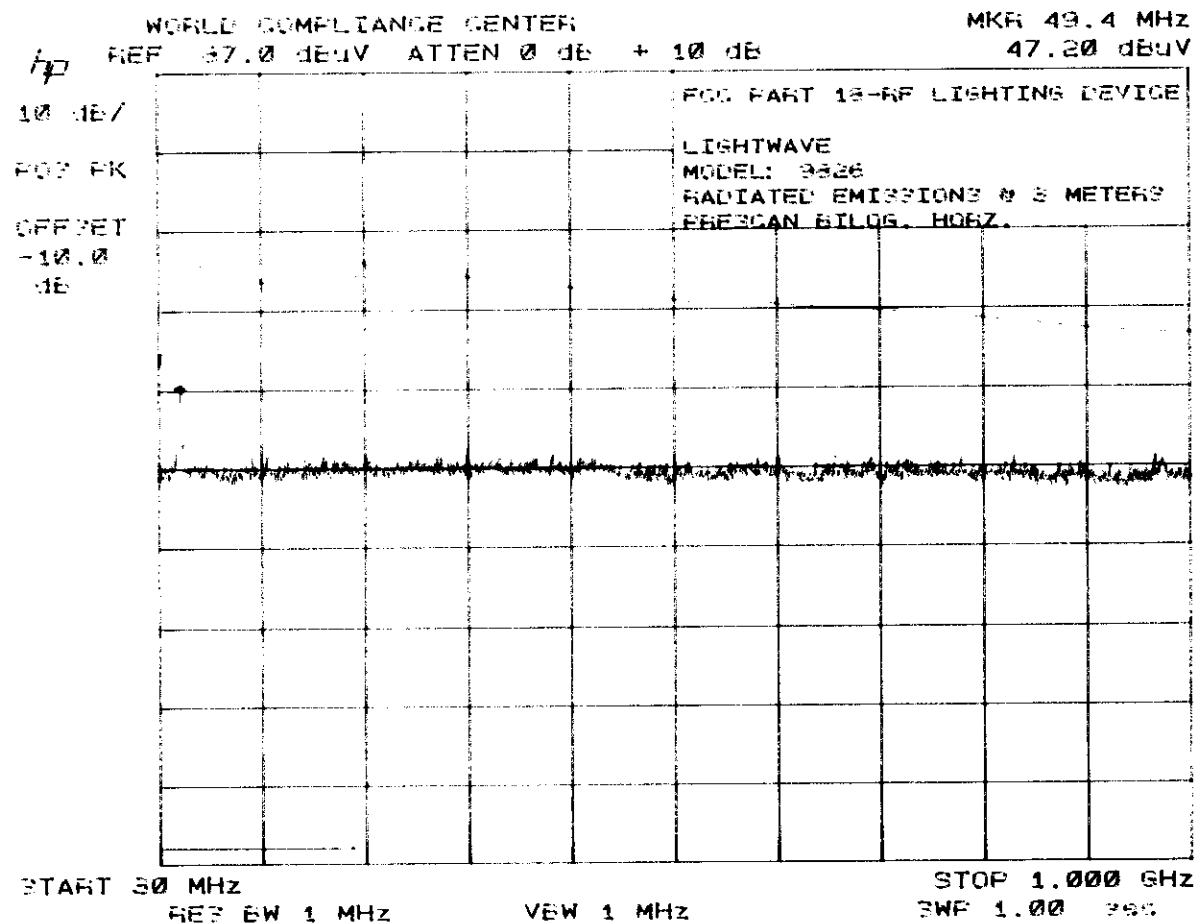
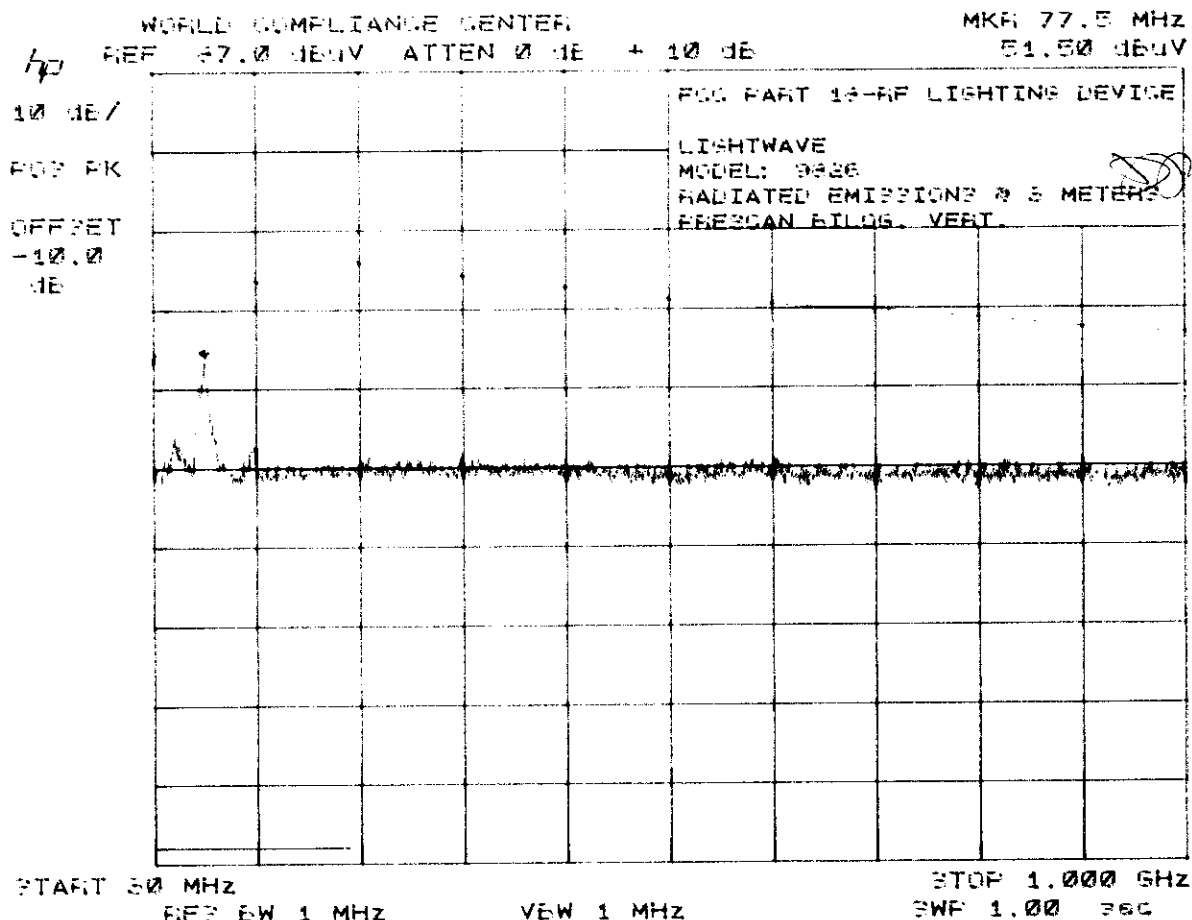
RES BW 1 MHz

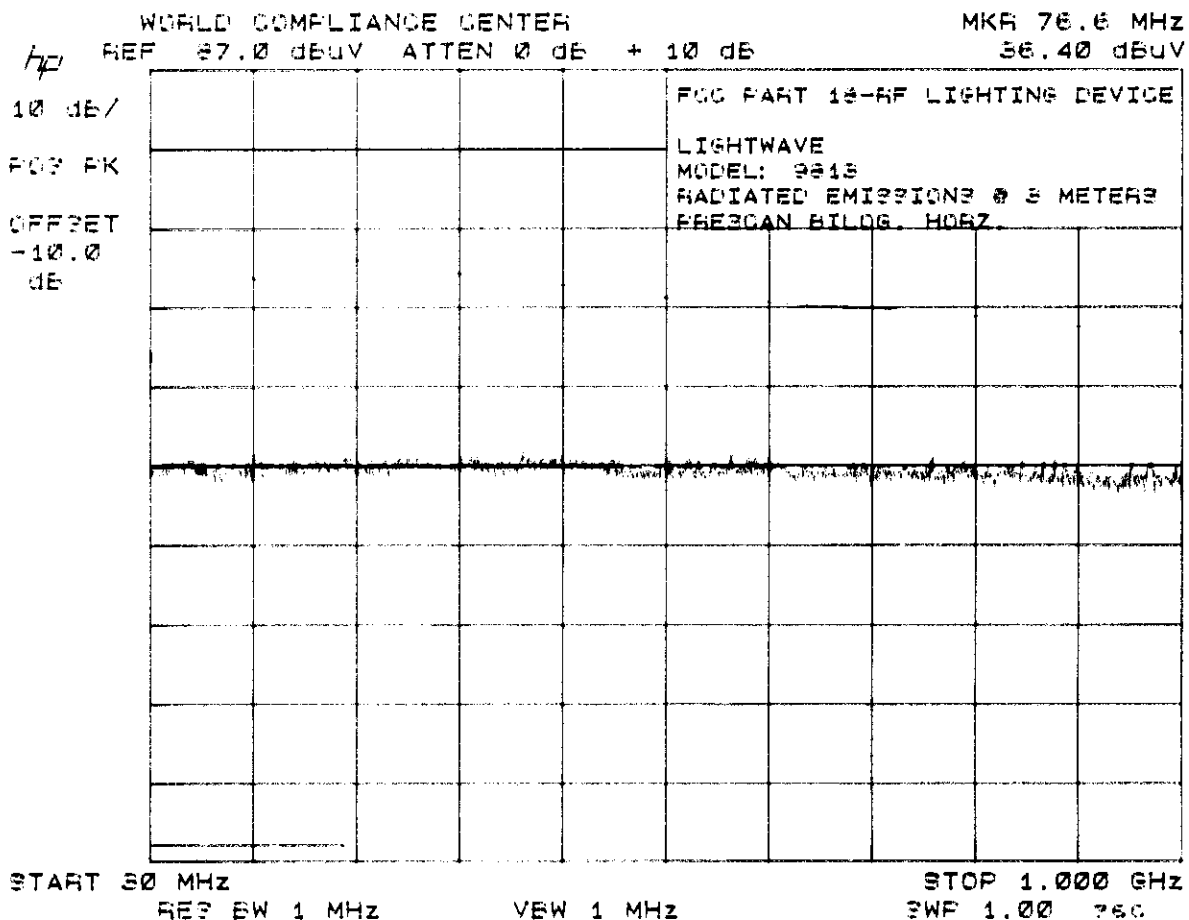
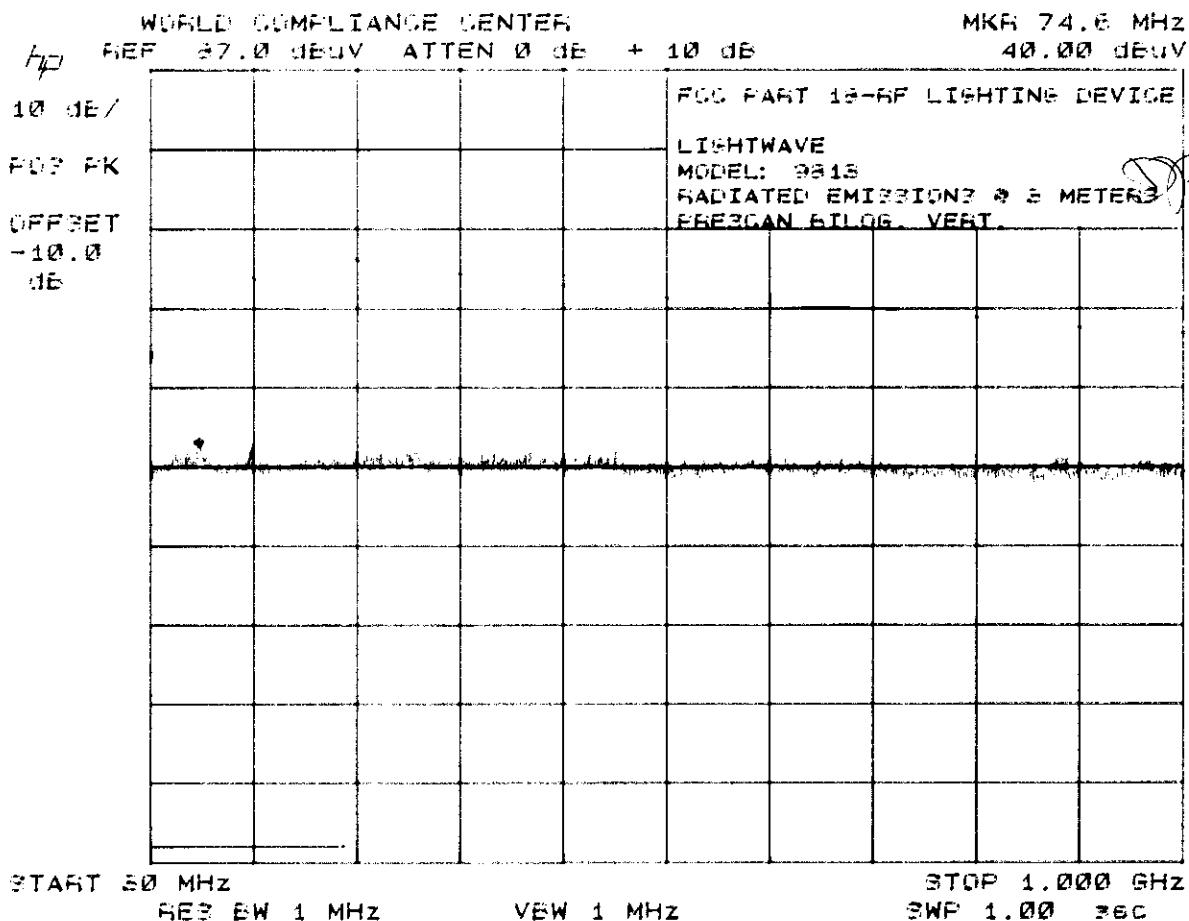
VBW 1 MHz

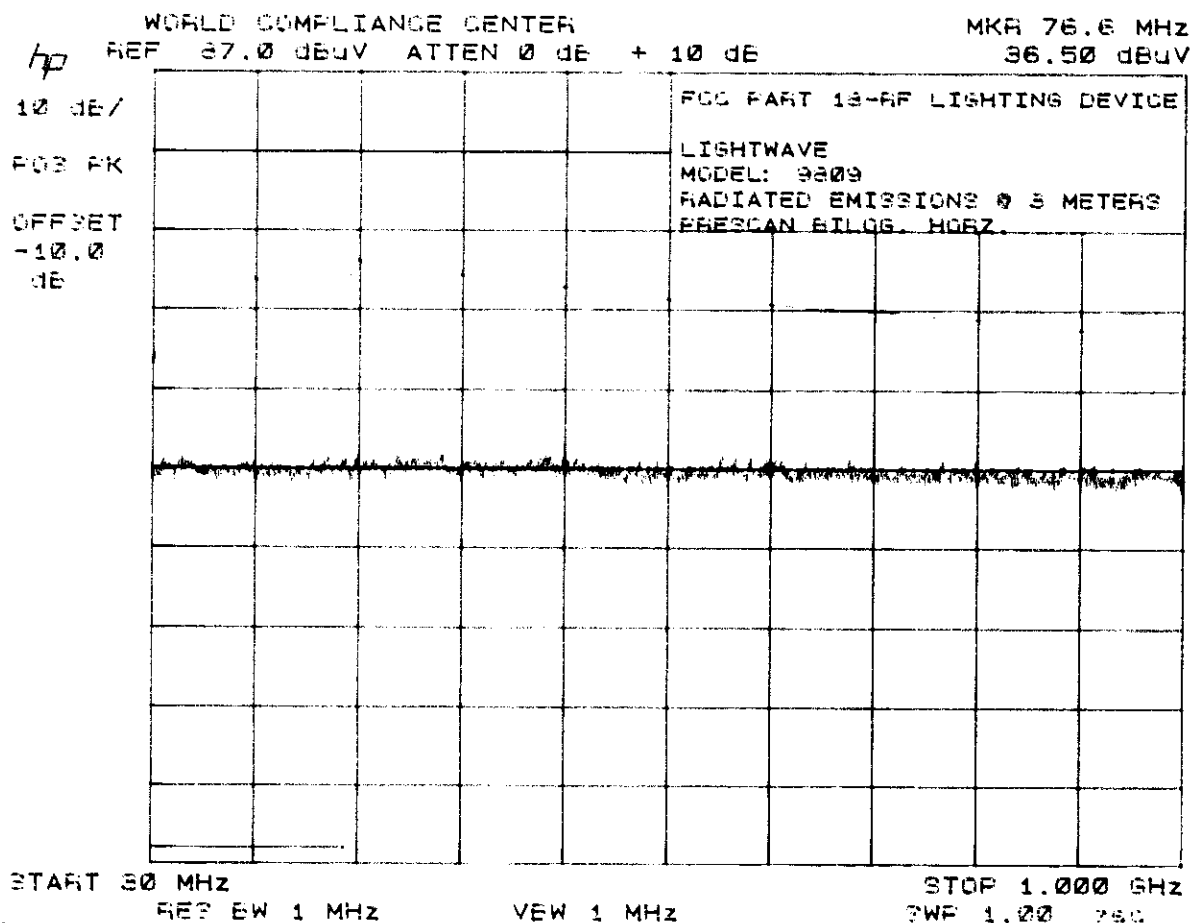
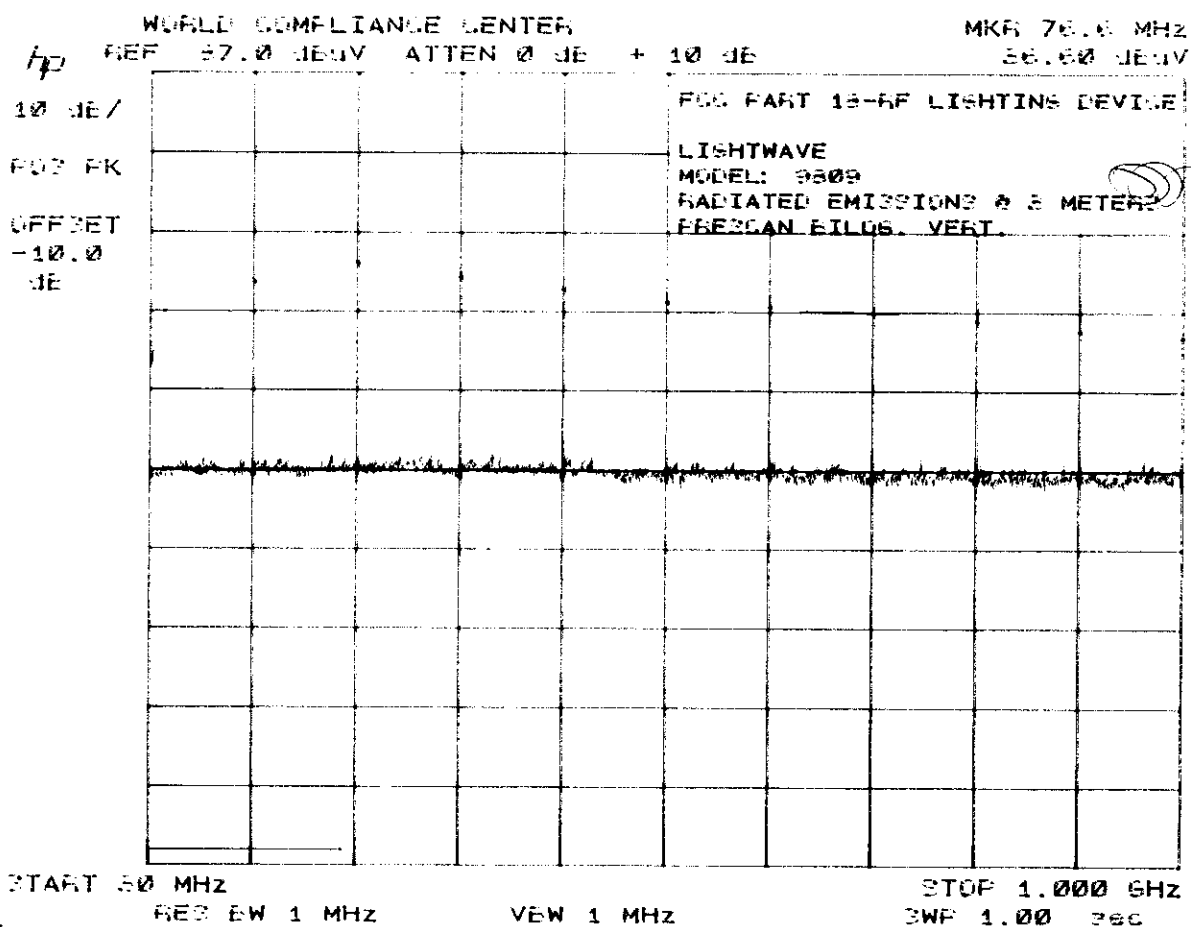
STOP 1.000 GHz

SWP 1.00 sec









WORLD COMPLIANCE CENTER
 HP REF 27.0 dBV ATTEN 0 dB + 10 dB

MKR 76.5 MHz
 46.00 dBV

10 dB/
 F02 PK
 OFFSET
 -10.0
 dB

FOC PART 15-RE LIGHTING DEVICE
 LIGHTWAVE
 MODEL: 9807
 RADIATED EMISSIONS @ 3 METERS
 FRESCAN 6105, VERT.

START 50 MHz

RES BW 1 MHz

VIEW 1 MHz

STOP 1.000 GHz

SWP 1.00 %

WORLD COMPLIANCE CENTER
 HP REF 27.0 dBV ATTEN 0 dB + 10 dB

MKR 50.4 MHz

39.40 dBV

10 dB/
 F02 PK
 OFFSET
 -10.0
 dB

FOC PART 15-RE LIGHTING DEVICE
 LIGHTWAVE
 MODEL: 9807
 RADIATED EMISSIONS @ 3 METERS
 FRESCAN 6106, HORIZ.

START 50 MHz

RES BW 1 MHz

VIEW 1 MHz

STOP 1.000 GHz

SWP 1.00 %

REF DES	9807	9809	9813	9826	9832	9838	9855
F1	2A	2A	2A	2A	2A	2A	2A
MOV	140VAC	140VAC	140VAC	140VAC	140VAC	140VAC	140VAC
C1	0.1uF250V	0.1uF250V	0.1uF250V	0.1uF250V	0.1uF250V	0.22uF250V	0.22uF250V
C2	22uF200V	22uF200V	22uF200V	47uF200V	47uF200V	47uF200V	68uF200V
C3	47nF50V	47nF50V	47nF50V	0.1uF50V	0.1uF50V	0.1uF50V	0.1uF50V
C4	2.2nF500V	2.2nF500V	2.2nF500V	680pF1KV	680pF1KV	680pF1KV	680pF1KV
C5	47nF250V	47nF250V	47nF250V	0.1uF250V	0.1uF250V	0.1uF250V	0.1uF250V
C6				0.1uF250V	0.1uF250V	0.1uF250V	0.1uF250V
C7				4.7nF630V	4.7nF630V	4.7nF630V	27nF630V
C8	10nF630V	10nF630V	6.8nF630V	15nF630V	15nF630V	47nF400V	0.1uF400V
C9	10nF630V	10nF630V	6.8nF630V	6.8nF630V	6.8nF630V	15nF630V	15nF630V
C10						1uF50V	1uF50V
D1	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D2	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D3	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D4	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D5	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D6				10V ZENER	10V ZENER	10V ZENER	10V ZENER
D7				10V ZENER	10V ZENER	10V ZENER	10V ZENER
D8				10V ZENER	10V ZENER	10V ZENER	10V ZENER
D9				10V ZENER	10V ZENER	10V ZENER	10V ZENER
D10	DB3 32V	DB3 32V	DB3 32V	DB3 32V	DB3 32V	DB3 32V	DB3 32V
D11	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
D12	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004	1N4004
Q1	MJE13003	MJE13003	MJE13003	IRF624	IRF624	IRF624	IRF624
Q2	MJE13003	MJE13003	MJE13003	IRF624	IRF624	IRF624	IRF624
Q3						K1500	K1500
Q4						SCR5mA	SCR5mA
R1	1M OHM	1M OHM	1M OHM	220K OHM	220K OHM	220K OHM	220K OHM
R2	1M OHM	1M OHM	1M OHM	220K OHM	220K OHM	220K OHM	220K OHM
R3				22 OHM	22 OHM	22 OHM	22 OHM
R4	5.1 OHM	5.1 OHM	5.1 OHM	10 OHM	10 OHM	10 OHM	10 OHM
R5	5.1 OHM	5.1 OHM	5.1 OHM	10 OHM	10 OHM	10 OHM	10 OHM
R6						22 OHM	22 OHM
R7						7.5K OHM	7.5K OHM
PTC						70 OHM	70 OHM
L1	680uH	680uH	680uH	680uH	680uH	330uH	330uH
L2	2.2mH	2mH	1.75mH	0.9mH	0.9mH	0.70mH	0.85mH

T1 PRI	8windings	8windings	8windings	2windings	2windings	2windings	3windings
T2 SEC	2windings	2windings	2windings	28windings	28windings	28windings	32windings