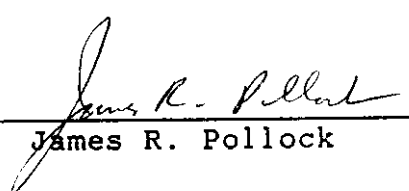


ELECTROMAGNETIC INTERFERENCE TEST REPORT
FOR
GENERAL ELECTRIC
Biax™ ELECTRONIC COMPACT FLUORESCENT LAMP
MODEL FLE24TBX/SPX27 Rev. 3.1
FCC ID: BLD24HLS-1
at 120 VAC & 127 VAC

October 22, 1998

Prepared for: General Electric Company
1975 Noble Road
East Cleveland, OH 44112

Measurements made
and report prepared by:


James R. Pollock

SMITH ELECTRONICS, INC.
8200 SNOWVILLE RD.
CLEVELAND, OH 44141
440/526-4386

EMI/RFI Test Report

Exhibit A FCC ID: BLD24HLS-1

CERTIFICATE OF COMPLIANCE

1. Applicant: General Electric Company
1975 Noble Road
East Cleveland, OH 44112
2. Regulation: CFR47-Part 18 RF Lighting
Devices 18.305 & 18.307
3. Measurement Method: FCC/OST MP-5
4. FCC ID: BLD24HLS-1
5. Model Number: FLE24TBX/SPX27 Rev. 3.1
6. Trade Name: Triple Biax™ Electronic Bulb
7. Operating Frequency: 95 kHz
8. Input Power: 120/127 VAC, 400 mA @ 120V
24 W
9. Date of Test: October 15 & 19, 1998
10. Place of Test: Smith Electronics, Inc. Test
Lab, 8200 Snowville Rd.,
Brecksville, OH. Open Field
Site at 2730 Old Mill Rd.,
Hudson, OH
11. Statement of Compliance:

I hereby certify that measurements of radio frequency emissions from a General Electric Triple Biax™ Electronic Bulb, Model FLE24TBX/SPX27(Rev. 3.1), FCC ID: BLD24HLS-1, were performed by me on October 15 & 19, 1998, and that the results of the measurements confirmed that the unit tested was in compliance with the Rules and Regulations of the Federal Communications Commission for electromagnetic emissions according to Part 18.305 and 18.307 of the Rules.

10-22-98
Date

James R. Pllorch, Pres.
Signature, Title

RADIO FREQUENCY EMISSION MEASUREMENTS

OBJECTIVE

To perform radio frequency interference measurements to ascertain that a General Electric FLE24TBX/SPX27, (Rev. 3.1) Biax™ Electronic Bulb complies with the requirements of Part 18 of the FCC Rules and Regulations for consumer RF lighting devices when operated at 120 VAC and 127 VAC.

SUMMARY

The General Electric FLE24TBX/SPX27 (Rev. 3.1) Biax™ Electronic Bulb was found to comply with the radio frequency emissions requirements for Industrial, Scientific, and Medical Equipment as found in paragraphs 18.305 and 18.307 of the FCC Rules for RF lighting devices used in a consumer environment.

The highest conducted emissions noted are tabulated below.

CONDUCTED EMISSIONS

Frequency (MHz)	Line 1 (dBu)	Line 2 (dBu)	Consumer Limit (dBu)	Diff. (dB)
<u>120 VAC</u>				
0.468	41.6 QP	42.3 QP	48 QP	- 5.7
0.646	43.8 QP	43.9 QP	48 QP	- 4.1
1.02	43.3 QP	43.1 QP	48 QP	- 4.7
1.21	43.6 QP	43.6 QP	48 QP	- 4.4
1.40	42.1 QP	42.1 QP	48 QP	- 5.9
<u>127 VAC</u>				
0.633	43.9 QP	44.0 QP	48 QP	- 4.0
0.816	43.3 QP	43.3 QP	48 QP	- 4.7
1.00	43.8 QP	43.3 QP	48 QP	- 4.2
1.18	43.7 QP	43.7 QP	48 QP	- 4.3
1.37	43.0 QP	42.6 QP	48 QP	- 5.0

The radiated emissions are tabulated in Table 1 and are all more than 11 dB below the consumer limit.

TEST INFORMATION

<u>MANUFACTURER</u>	General Electric Company 1975 Noble Rd. East Cleveland, OH 44112
<u>TEST DATE</u>	October 15 & 19, 1998
<u>EQUIPMENT UNDER TEST</u>	General Electric FLE24TBX/SPX27 (Rev.3.1) Biax™ Electronic Bulb
<u>MEASUREMENT EQUIPMENT</u>	Hewlett-Packard Spectrum Analyzer Type 8568B with 8560A RF Section S/N 2216A02120 85662A Display Section S/N 2152A03686 85650A Quasi-Peak Adapter S/N 2043A00350 Calibrated 5/98 Singer Stoddart EMI Field Intensity Meter Model NM 37/57 S/N 0234-04233 Calibrated 5/98 Hewlett-Packard Preamplifier Model 8447D S/N 1725A01282 50 uH LISN's EMCO Biconical Antenna Model 3104 Freq. Range 20 - 200 MHz EMCO Log-Periodic Antenna Model 3146 Freq. Range 200 - 1000 MHz 6.1 m RG-214/U coaxial cable

Open field measurements were performed on the Smith Electronics open field test site located at 2730 Old Mill Rd., Hudson, OH. Information concerning this site is on file with the FCC.

INTRODUCTION

The General Electric FLE24TBX/SPX27 (Rev. 3.1) Biax™ Electronic Bulb is designed to replace a standard incandescent lamp to provide an energy efficient light source. The lamp/ballast was tested to compare the values of emissions measured to the limits specified by the FCC. Measurements were made of both the conducted and radiated emissions with the results being compared to the applicable limits of 18.305 and 18.307 of the FCC Rules and Regulations.

MEASUREMENT PROCEDURES

The lamp was tested using a metal lamp socket mounted in a plastic base. A two wire, unshielded, lamp cord, approximately 1 meter in length, was used. The connector was polarized so that the hot wire of the AC line was connected to the center conductor of the light socket. Conducted emissions were measured over the frequency range of 450 kHz - 30 MHz. Radiated tests were performed over the frequency range of 30 MHz to 1000 MHz as covered by present FCC Rules and Regulations. Test procedures followed are those described in FCC/OST MP-5, "FCC METHODS OF MEASUREMENT OF RADIO NOISE EMISSIONS FROM INDUSTRIAL, SCIENTIFIC, AND MEDICAL EQUIPMENT".

CONDUCTED EMISSIONS MEASUREMENTS

All conducted emission measurements were made in the shielded room. The test set up is shown photographically in Pictorial 1. The lighting fixture was placed on a non-conducting support, 40 cm. from the shielded room wall. All other metallic surfaces were at least 80 cm. from the lamp. Filtered 120/127 VAC electric power was provided with a variable transformer and fed through the LISN's to the fixture.

With the lamp operating and warmed up for at least 20 minutes, the output of the RF port of the LISN was connected to the spectrum analyzer. A given frequency range was scanned and the results compared to the appropriate FCC limit. Both sides of the line were examined for emissions with reference to ground. The results of these conducted emissions measurements are found in Figs. 1 - 6 of this report. Figure 1 shows the peak emissions between 450 kHz and 3.0 MHz, while Fig. 2 covers the 3 MHz to 30 MHz range for 120 VAC operation. Figures 4 & 5 contain the same information for 127 VAC operation. Figures 3 & 6 contain a plot of Quasi-Peak emissions between 450 kHz and 1.4 MHz, to provide a closer look at the potential interference in this area.

From an examination of Figs. 1 - 6, it can be seen that the conducted emissions from the General Electric FLE24TBX/SPX27 (Rev. 3.1) Biax™ Electronic Bulb do not exceed the FCC limit for consumer lighting devices of 250 uV (48 dBu), when operated at either voltage.

RADIATED EMISSIONS MEASUREMENTS

Initial measurements of the radiated emissions emanating from the lamp were made in the shielded room. The absence of ambient RF noise in the shielded room allows easy measurement of the emissions produced by the lighting device. Measurements conducted in the shielded room have unwanted perturbations caused by reflections, resonances, and antenna loading. However, shielded room measurements are useful in identifying specific frequencies of interest for investigation on the open field site.

The same test setup was used for these measurements as for the conducted emissions except that the lamp was on a non-conducting table about 1 meter above the ground plane and positioned further away from the room walls.

All radiated emissions measured in the shielded room were measured at an antenna distance of 1 meter. All spectral plots made of the detected emissions have scaled FCC limits drawn in for reference. The spectrum analyzer detector was set to peak mode for all measurements. The FCC limits for consumer RF lighting devices radiated emissions are as follows:

Frequency (MHz)	FCC Consumer Limit (1 m)		FCC Consumer Limit (30 m)	
	(uV/m)	(dBuV/m)	(uV/m)	(dBuV/m)
30 - 88	300	49.5	10	20.0
> 88 - 216	450	53.0	15	23.5
> 216 - 1000	600	55.6	20	26.0

To transfer the scaled one meter FCC limits to the spectral plots taken in the shielded room, the following relationship was used:

$$L = FCC - AF - CP + P \quad (\text{Eq. 1})$$

Where: L = Corrected limit on plot in dBuV

FCC = Scaled FCC limit (1 m) at frequency of interest in dBuV/m

AF = Antenna factor in dB at frequency of interest

C = Coax loss in dB at frequency of interest

P = Gain of preamplifier (26 dB).

To determine compliance with FCC limits on the open field site, the following equation was used:

$$Q = S + AF + C - FCC \quad (\text{Eq. 2})$$

Where: Q = Magnitude in dB above/below the FCC limit

S = Measured signal strength of interference in dBuV

AF = Antenna factor in dB at frequency of interest

C = Coax loss in dB at frequency of interest

FCC = FCC Consumer RF lighting device limit (3 m) in dBuV/m at frequency of interest.

Note: The antenna and coax factors used are found in the appendix.

The shielded room measurements, as well as those on the open field, were made using broadband linearly polarized antennas. A biconical antenna was used for measurements between 30 - 200 MHz and a log periodic antenna was used between 200 - 1000 MHz.

Measurements were made with both vertical and horizontal antenna polarizations with the detected emissions in the room

recorded on a spectral plot.

Data obtained in the shielded room is shown in Figs. 7 - 10. Figure 7 covers the range of 30 - 200 MHz while Fig. 8 shows the 200 - 1000 MHz range at 120 VAC operation. Figures 9 & 10 show the same information for 127 VAC operation.

Radiated emissions measurements were also made on a 3 m open field site with the lamp set up as shown photographically in Pictorial 2. The lamp could be rotated from the measurement position. The 120/127 VAC was provided in the same manner as for the conducted emissions tests except that the LISN's were not used. With the appropriate antenna in place, the frequency range was scanned using the EMI receiver. Quasi-Peak detection was used for these measurements.

When an emission was detected, the lamp was rotated until the maximum level was observed. The measurement antenna was then raised and lowered between 1 & 4 meters to again find the maximum value. This maximum value was then recorded. Measurements were made using both horizontal and vertical polarizations and the results of these open field radiated measurements at each voltage are found in Table 1.

The measured values of the radiated emissions were recorded in dBuV. To these values are added the antenna factors and a coax loss factor.

Linear extrapolation is used to convert measurements from the 3 meter distance to the 30 meter limit distance.

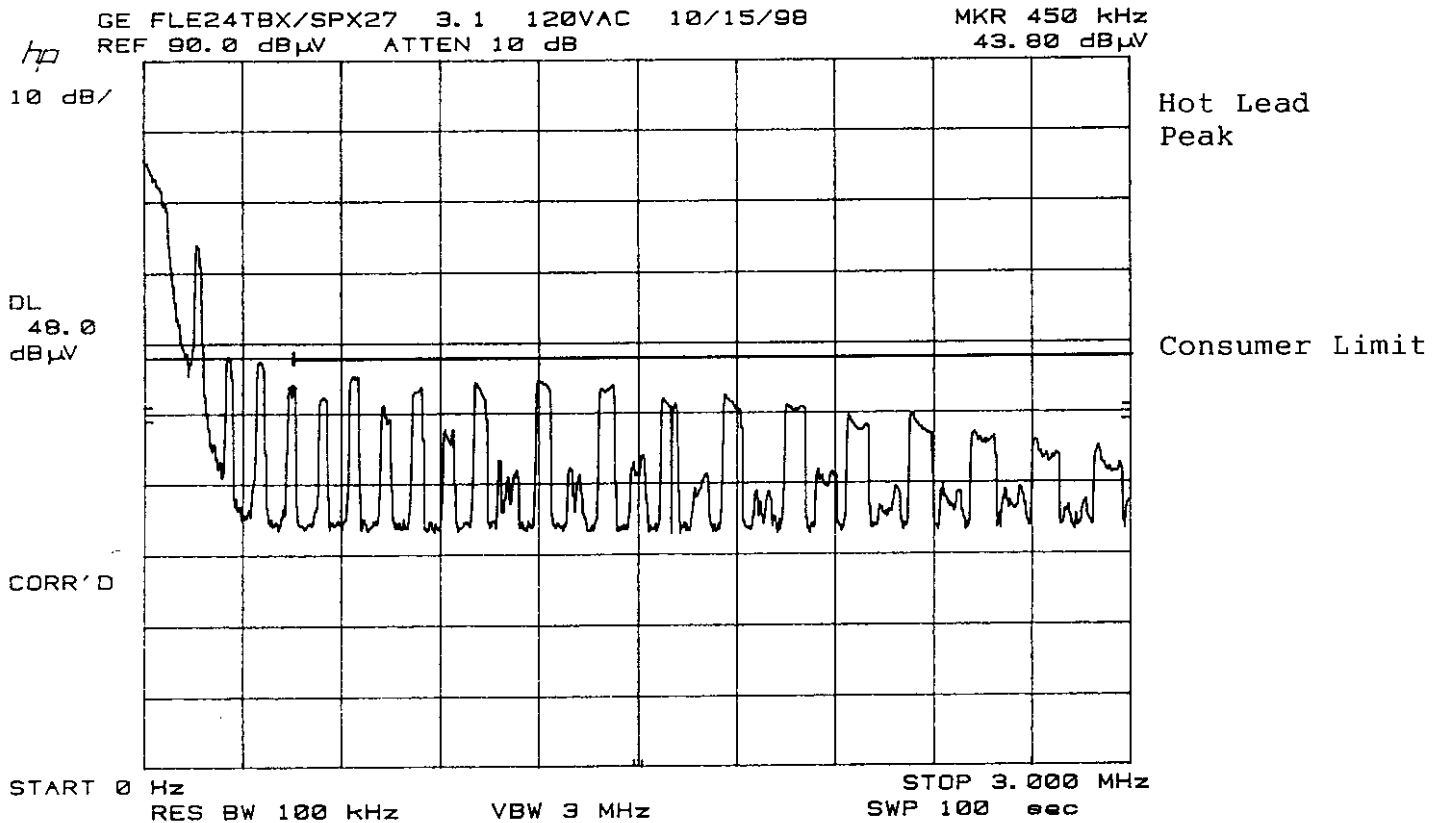
All measured values recorded in Table 1 are below the FCC limits for radiated emissions for consumer lighting devices.

RESULTS

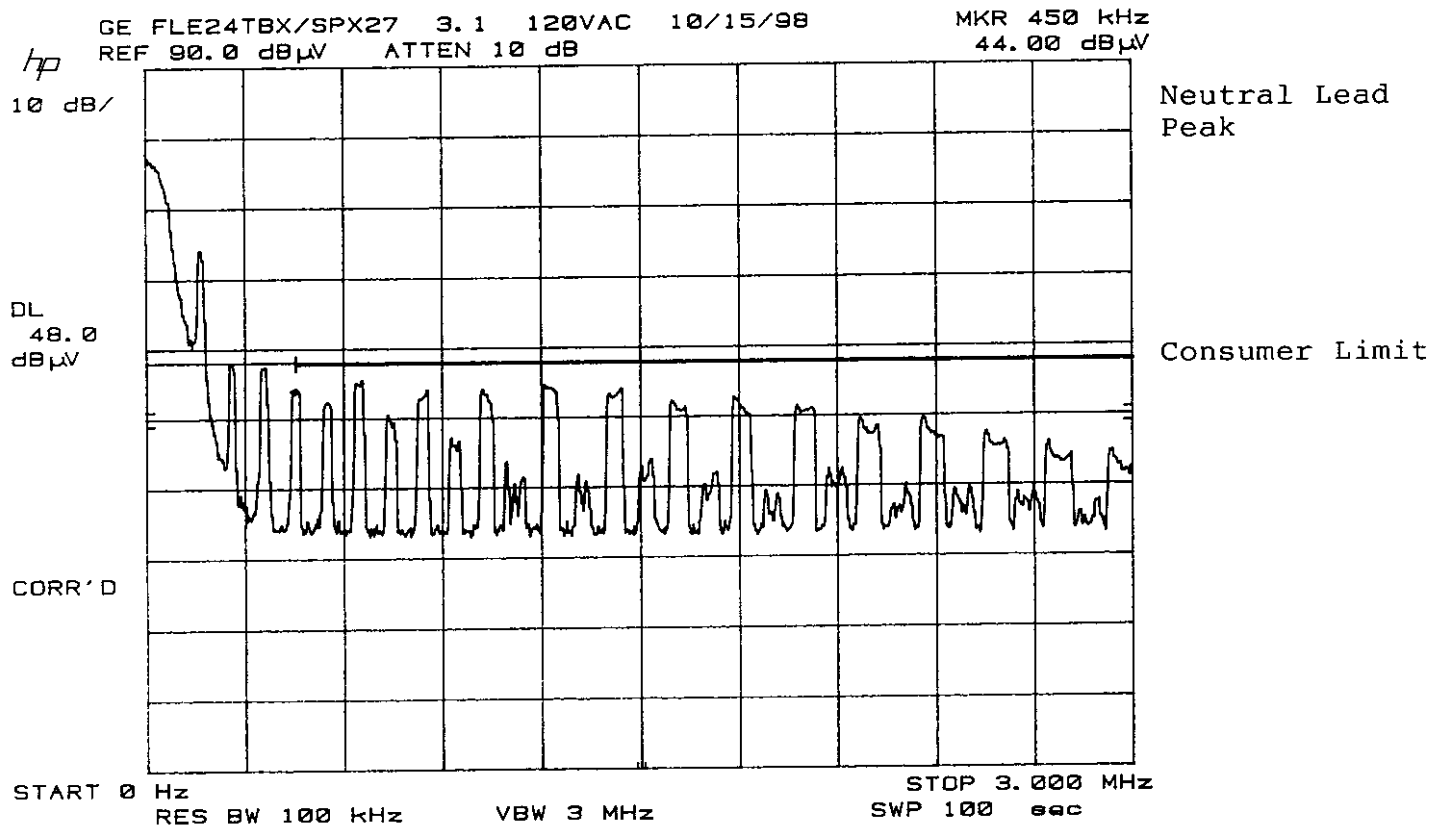
The plots of the conducted emissions found in Figs. 1 - 6 show that the emissions are below the limits specified for consumer RF lighting devices in paragraph 18.307 of the FCC rules.

The results of the radiated emissions measurements taken on the open field site and tabulated in Table 1 indicated that the bulb tested also complies with the limits for consumer RF lighting devices given in paragraph 18.305 of the FCC rules. This is found in the column labeled "DB VS. FCC B" in the table. At 34 MHz in Table 1, at 127 VAC, a quasi-peak value of 26.6 uV/m was obtained which is 11.5 dB below the 100 uV/m limit at 3 meters. The "DB VS. FCC A" column would compare the reading to the limit for non-consumer RF lighting devices.

The FLE24TBX/SPX27 (Rev. 3.1), FCC ID: BLD24HLS-1, as installed in the lighting fixture, and operating from either 120 or 127 VAC, does comply with the requirements for radiated and conducted radio frequency emissions for consumer RF lighting devices as provided for in paragraphs 18.3054 and 18.307 of the Federal Communications Commission's Rules and Regulations.



154



112

Fig. 1
 CONDUCTED EMISSIONS
 GE FLE24TBX/SPX27 (Rev. 3.1)
 FCC ID: BLD24HLS-1
 450 kHz - 3.0 MHz Peak 120 VAC

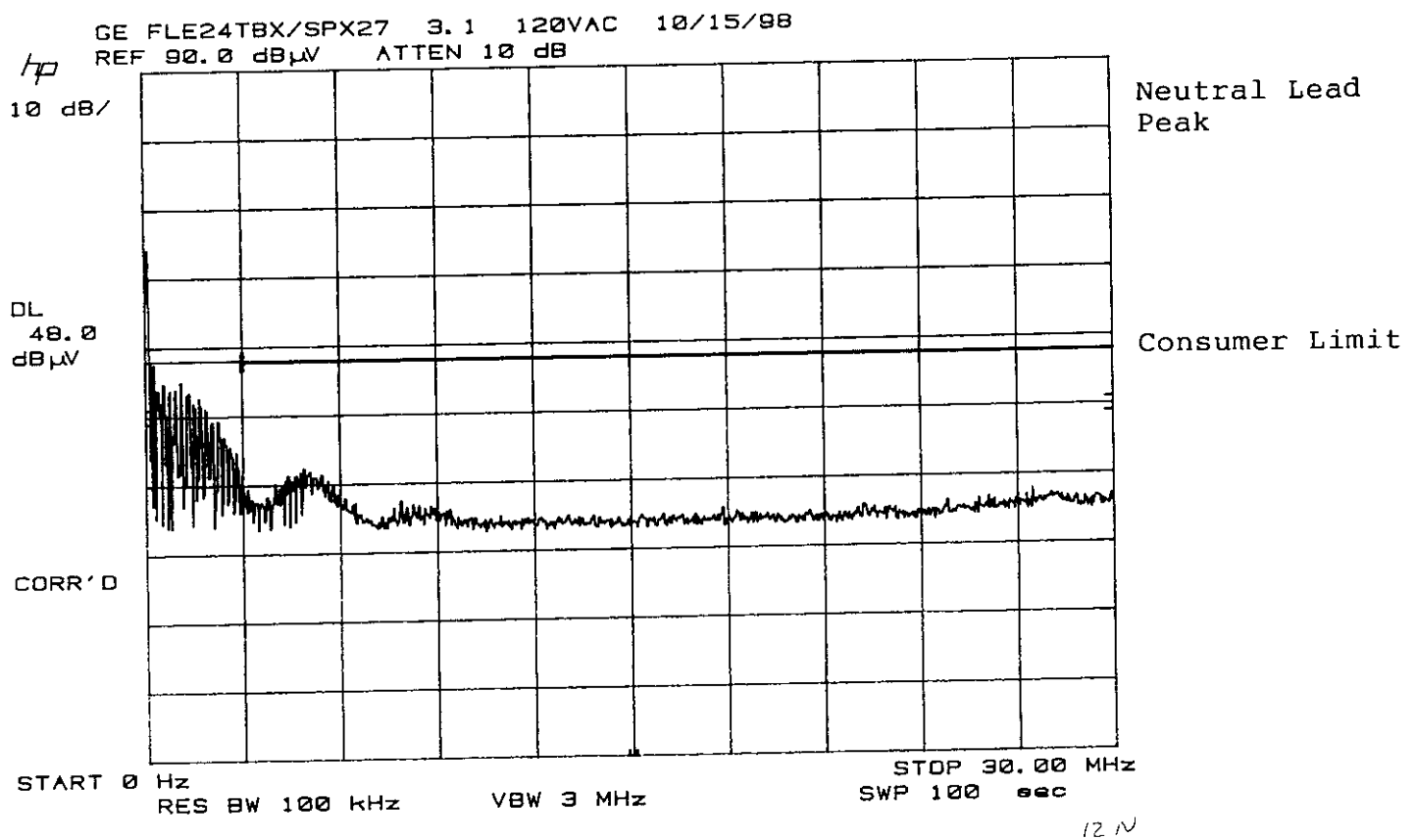
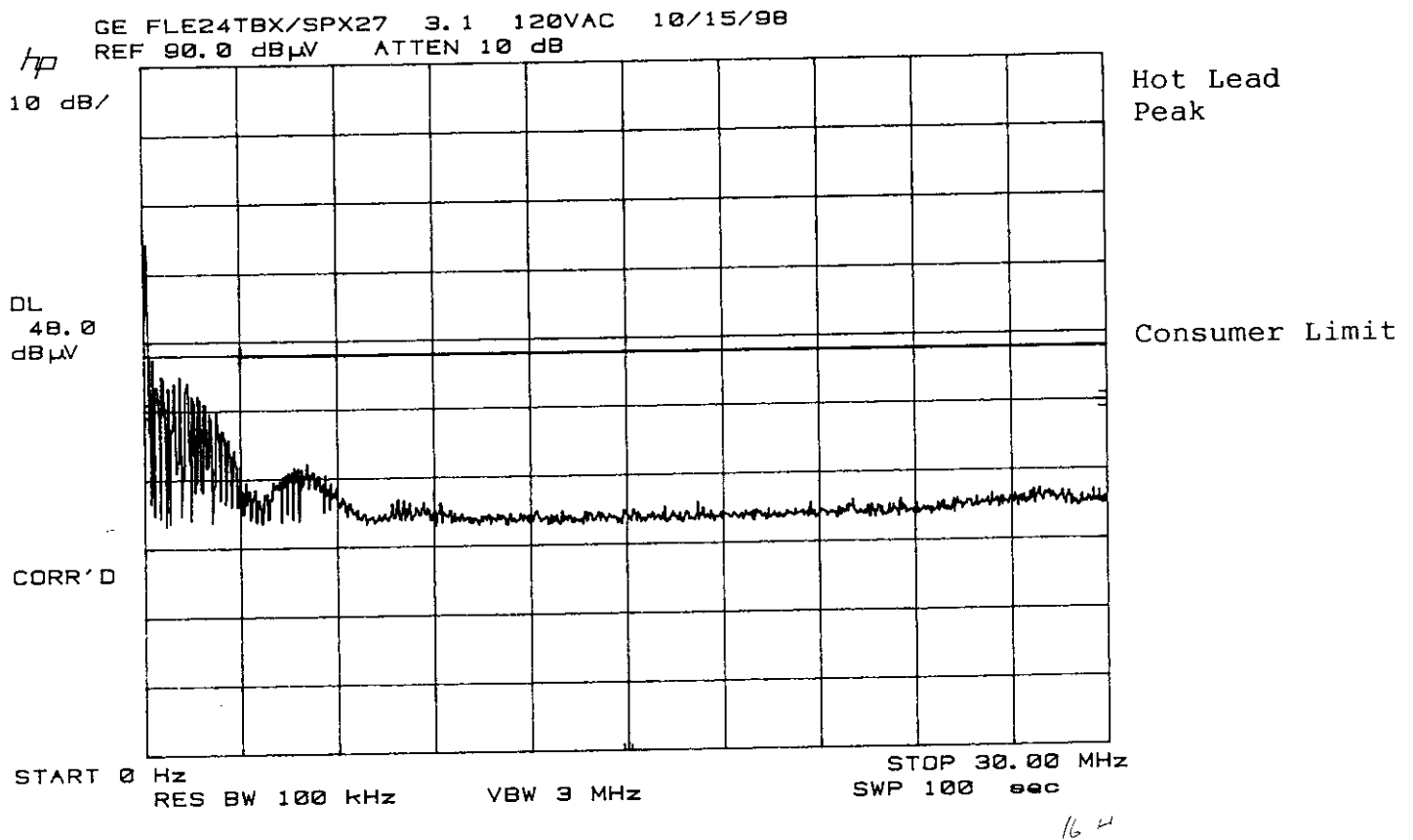


Fig. 2
CONDUCTED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1
3 MHz - 30 MHz Peak 120 VAC

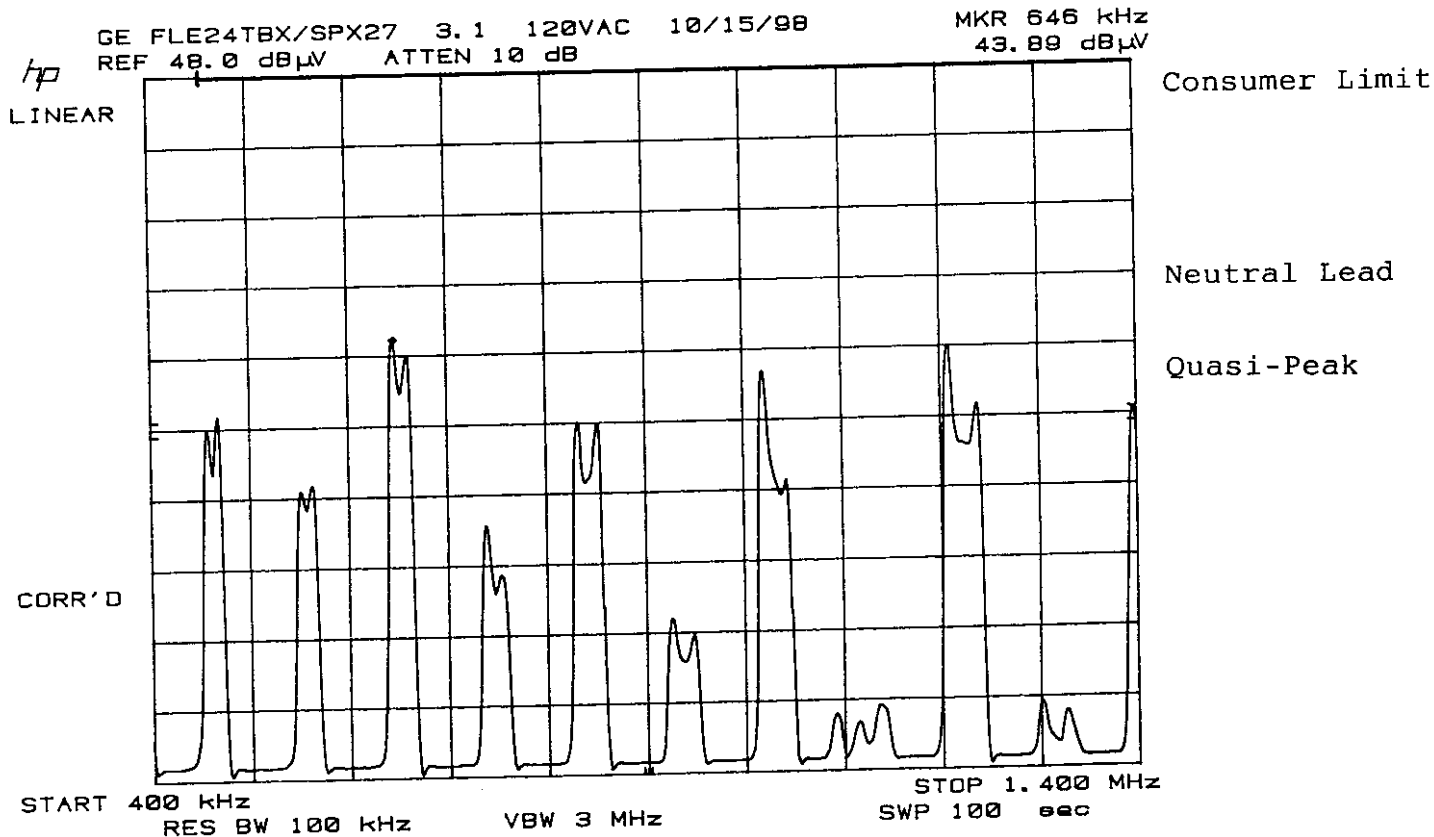
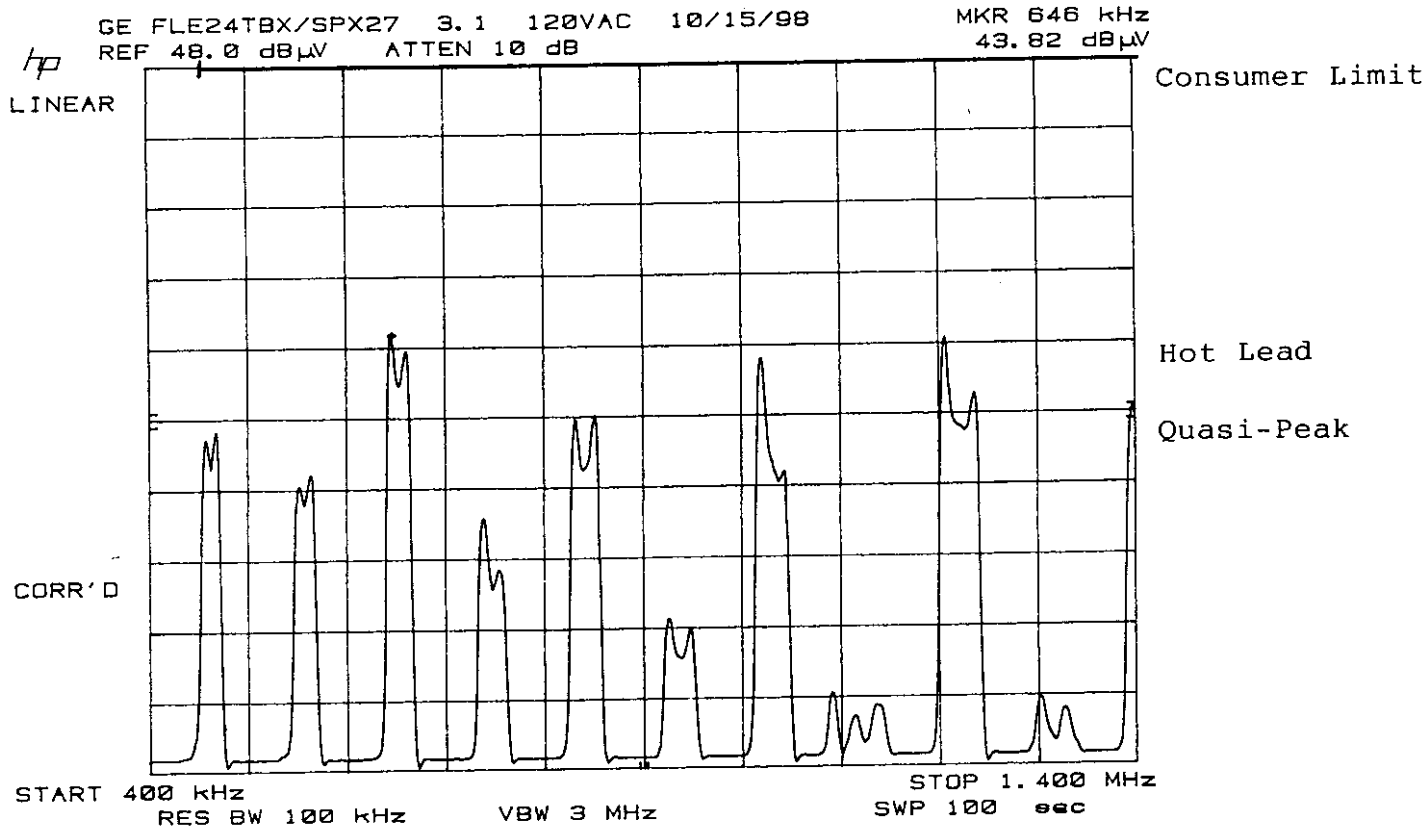


Fig. 3
CONDUCTED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1

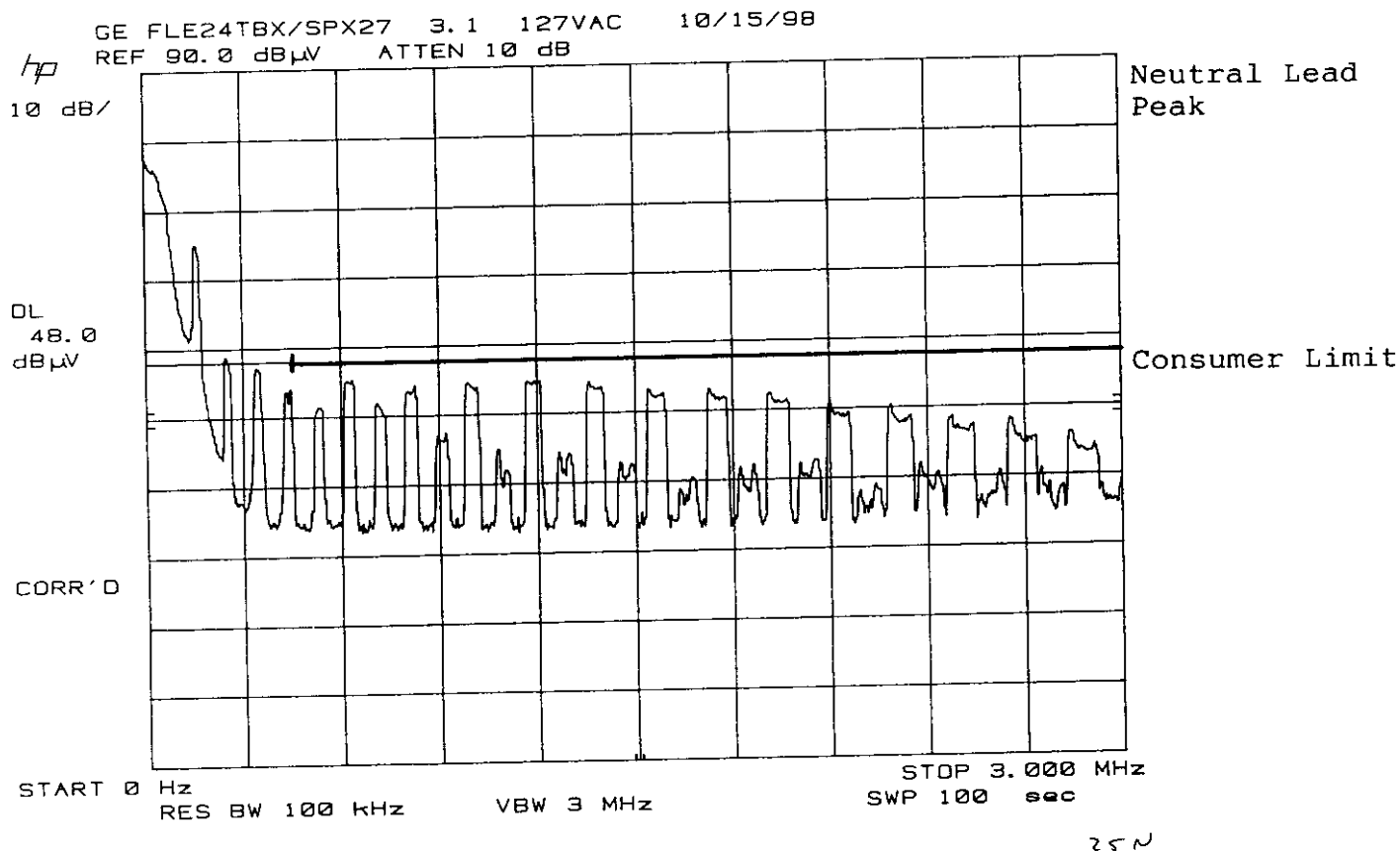
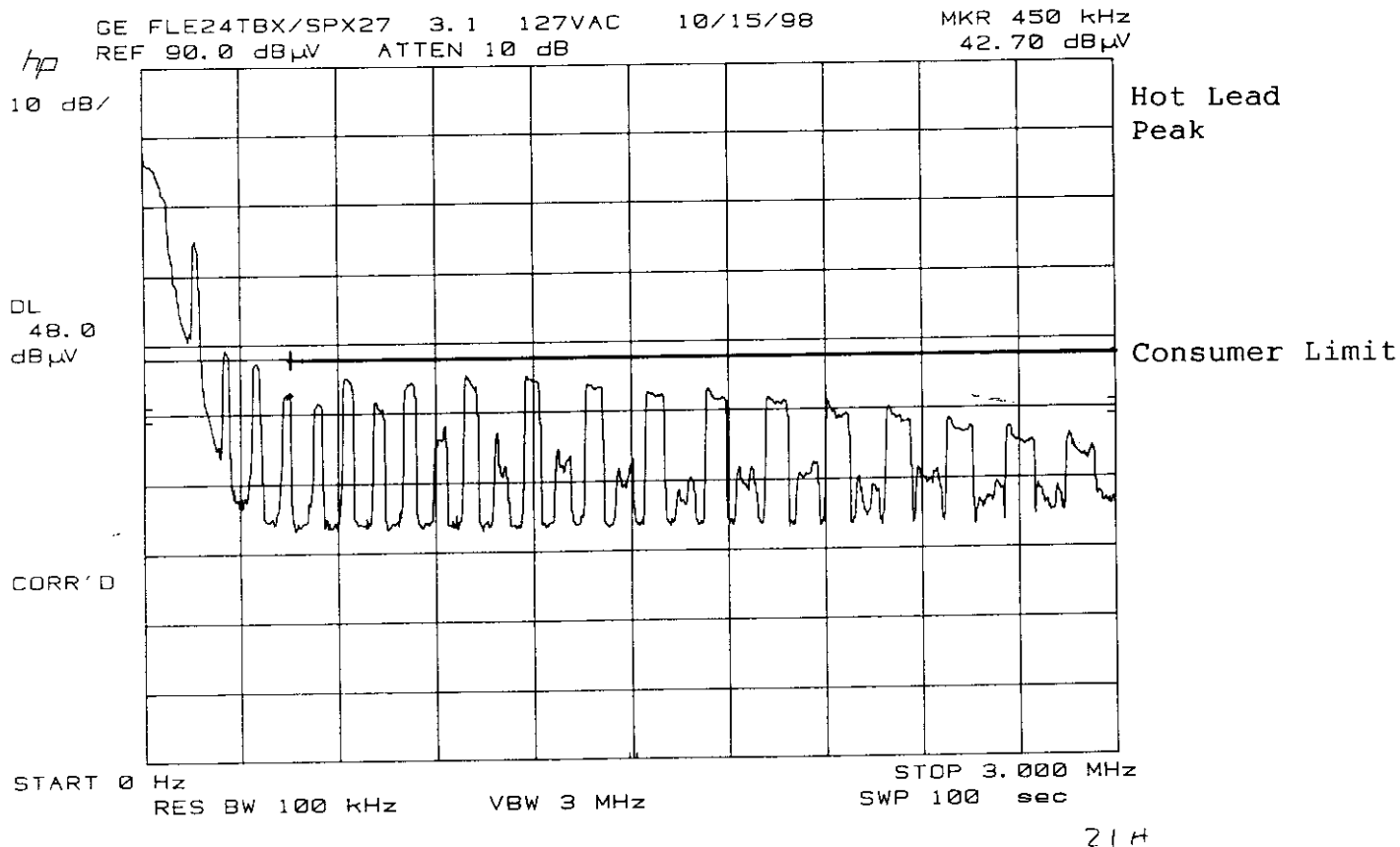
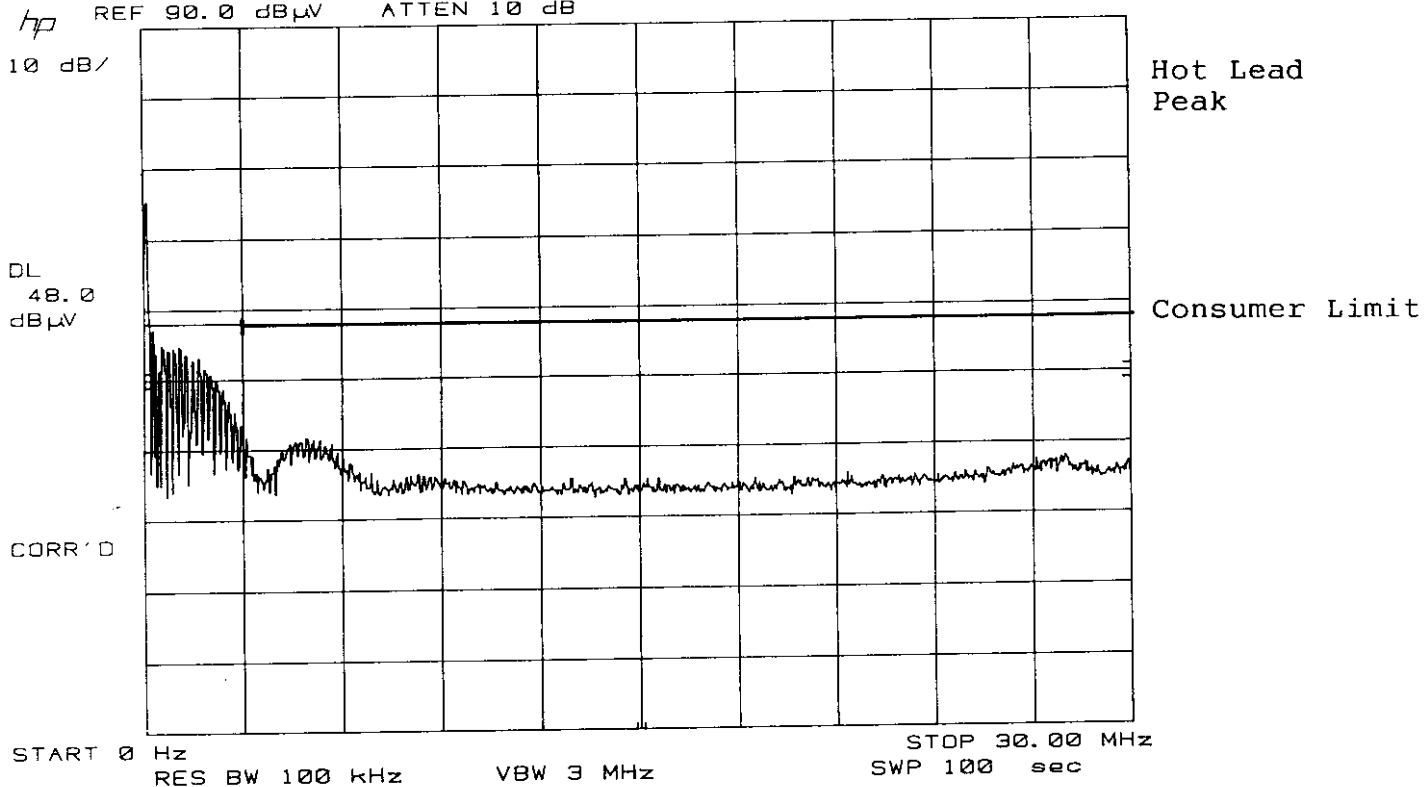


Fig. 4
CONDUCTED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1

GE FLE24TBX/SPX27 3.1 127VAC 10/15/98

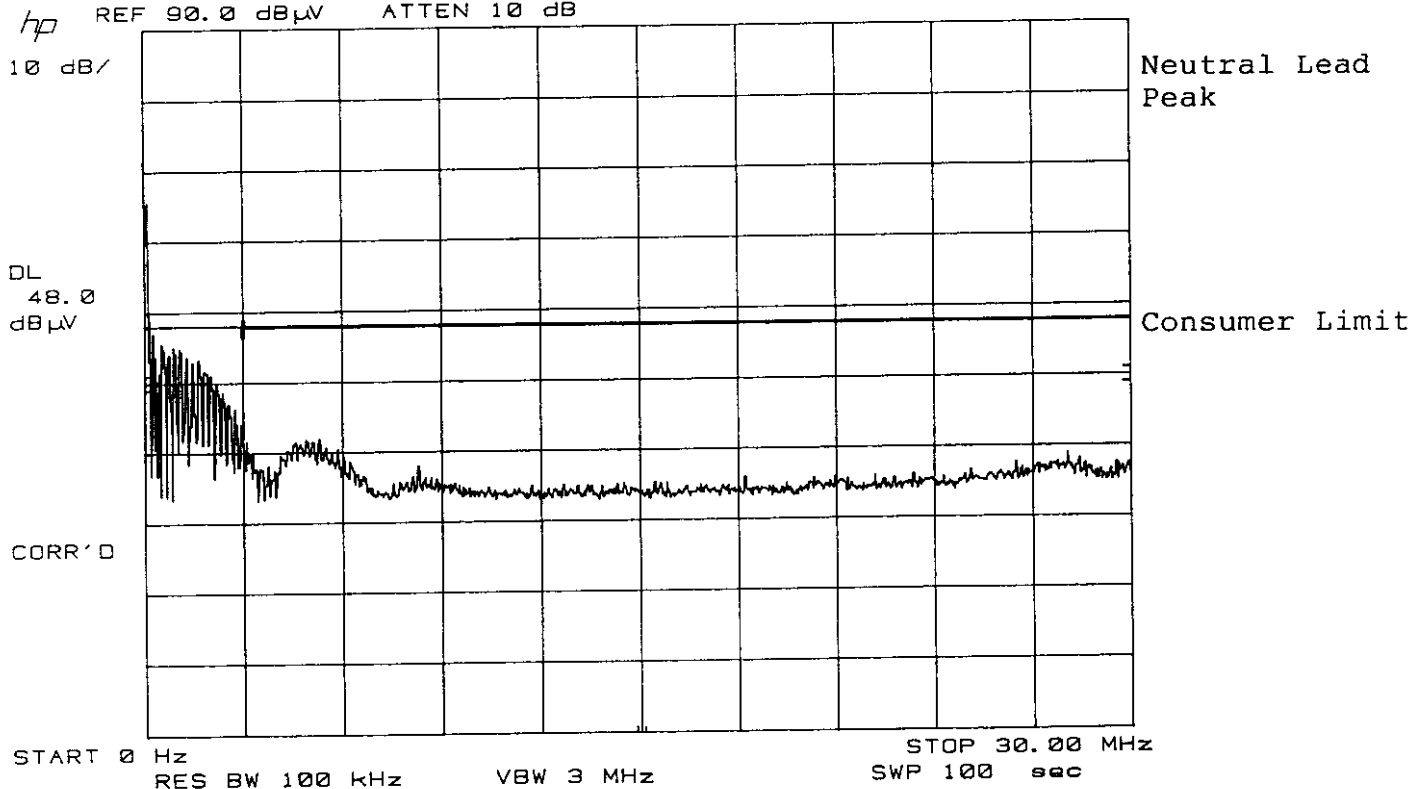
REF 90.0 dBμV ATTEN 10 dB



22 14

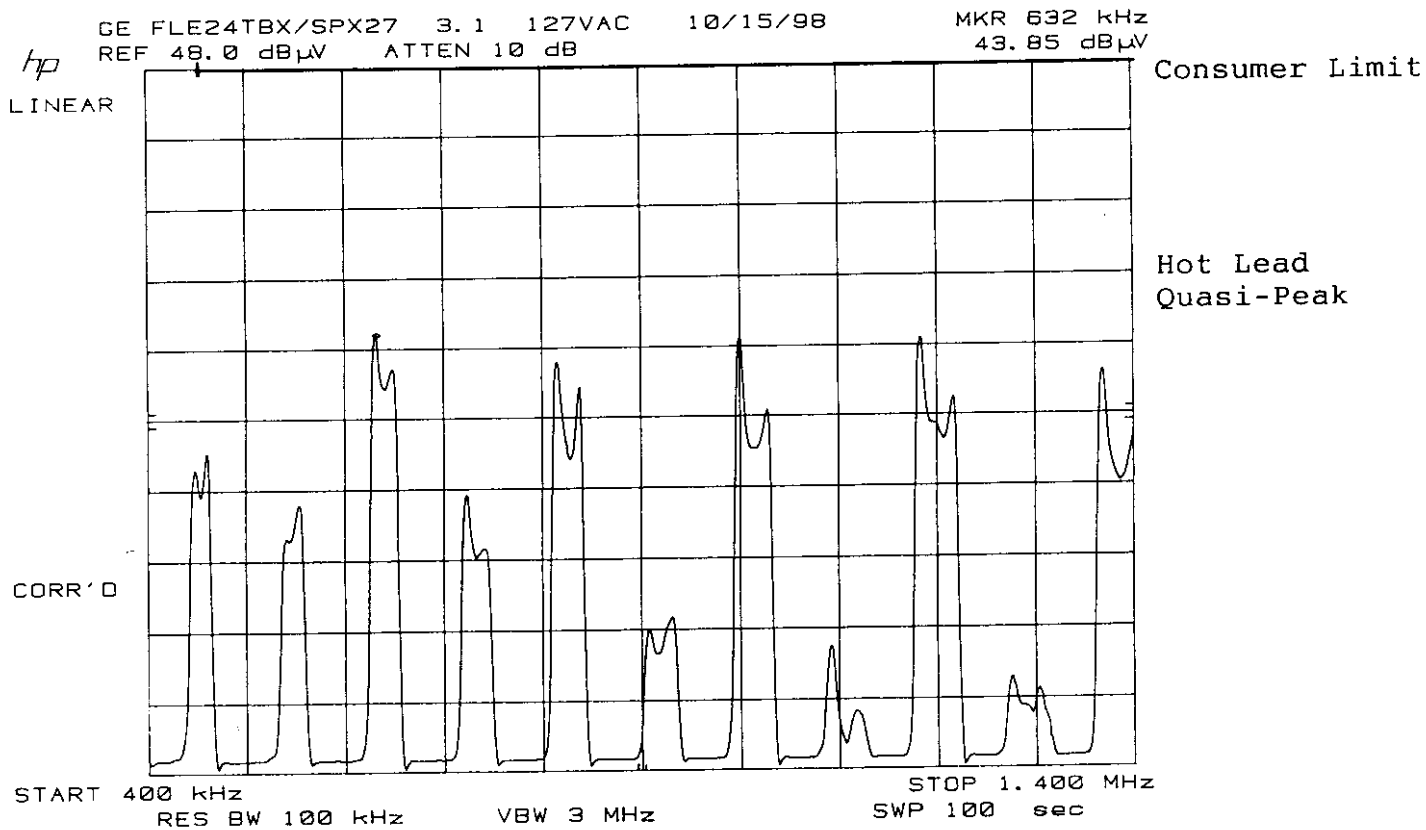
GE FLE24TBX/SPX27 3.1 127VAC 10/15/98

REF 90.0 dBμV ATTEN 10 dB

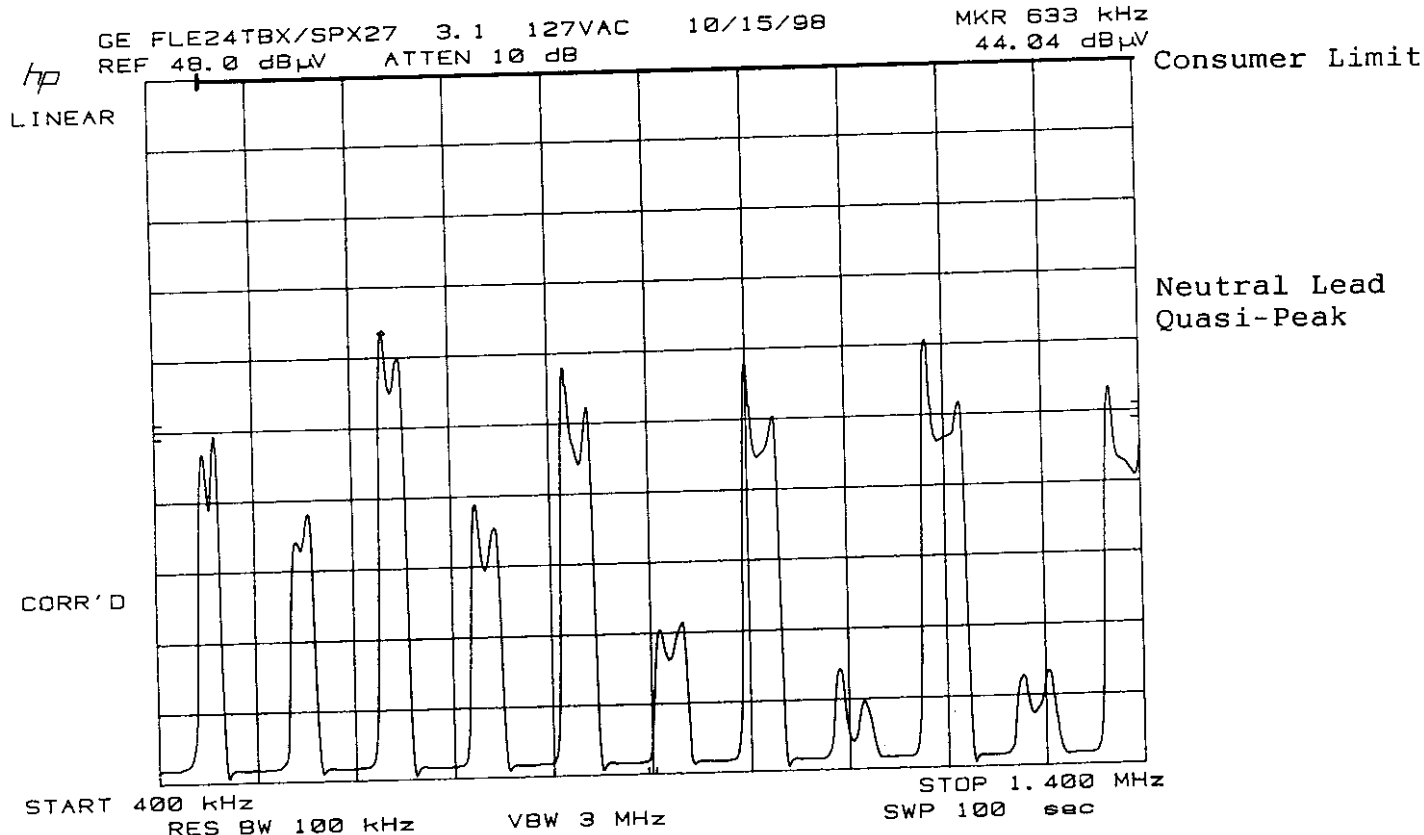


26 N

Fig. 5
CONDUCTED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1
3 MHz - 30 MHz QP 127 VAC



23H



27N

Fig. 6
 CONDUCTED EMISSIONS
 GE FLE24TBX/SPX27 (Rev. 3.1)
 FCC ID: BLD24HLS-1
 450 kHz - 1.4 MHz QP 127 VAC

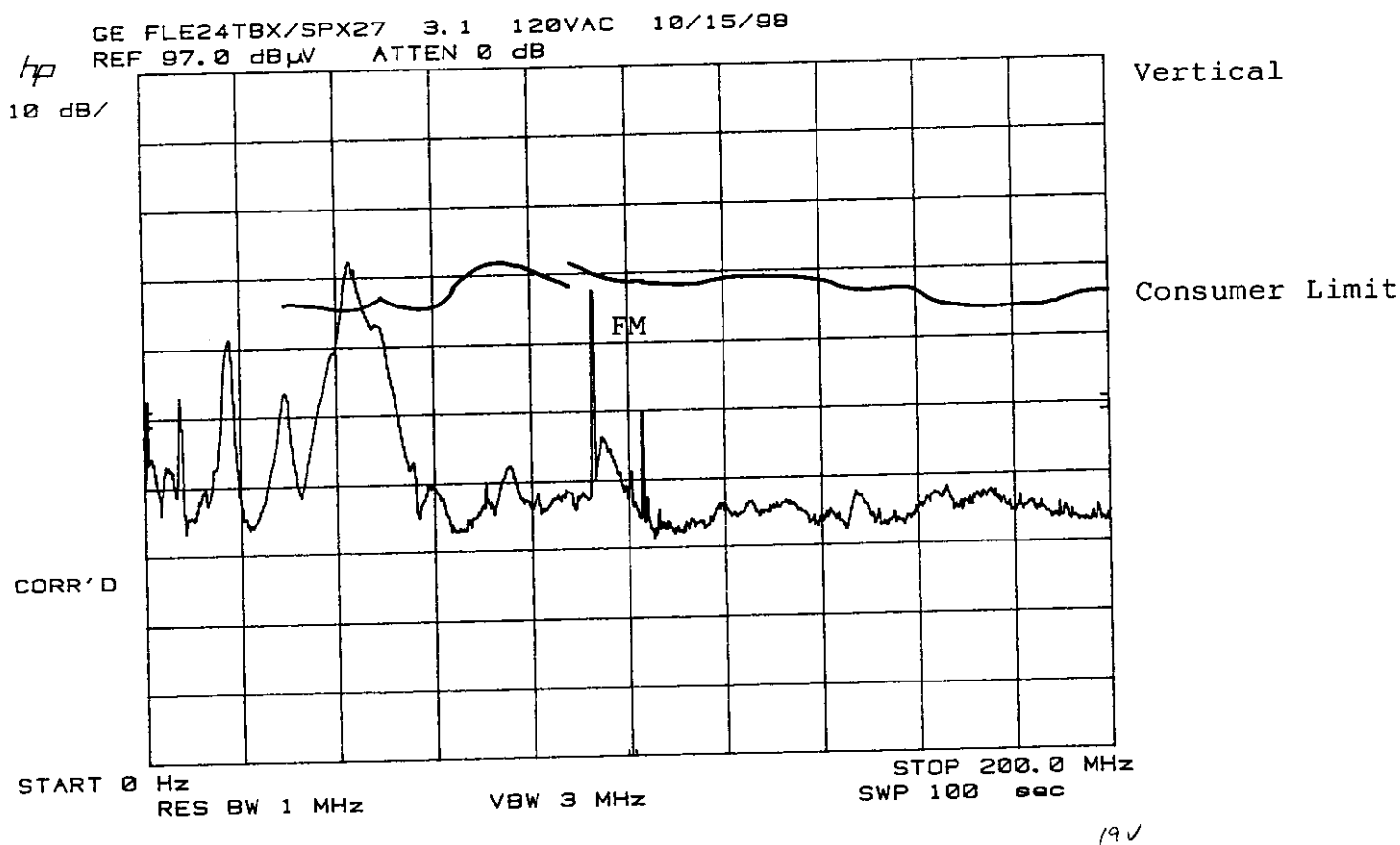
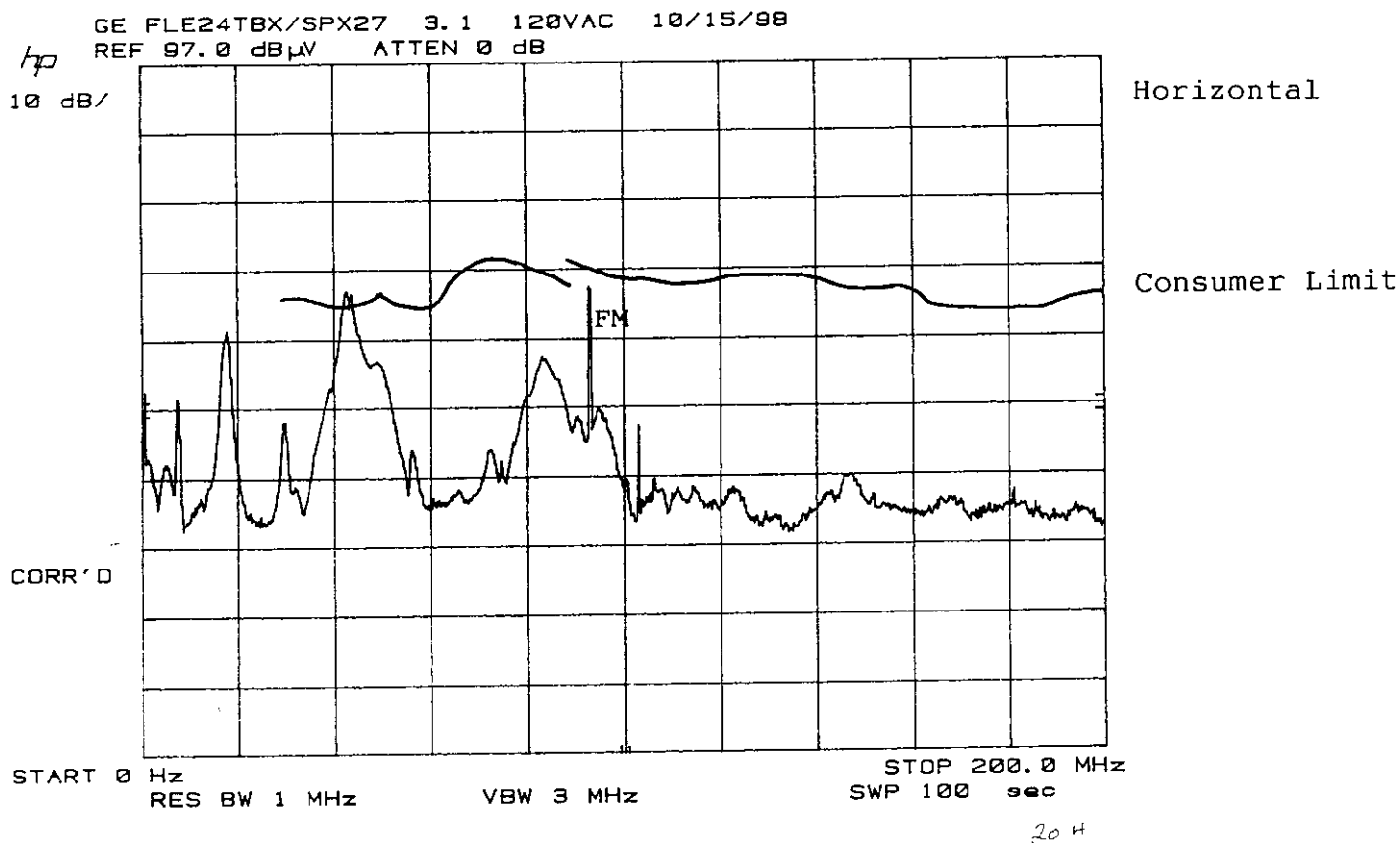
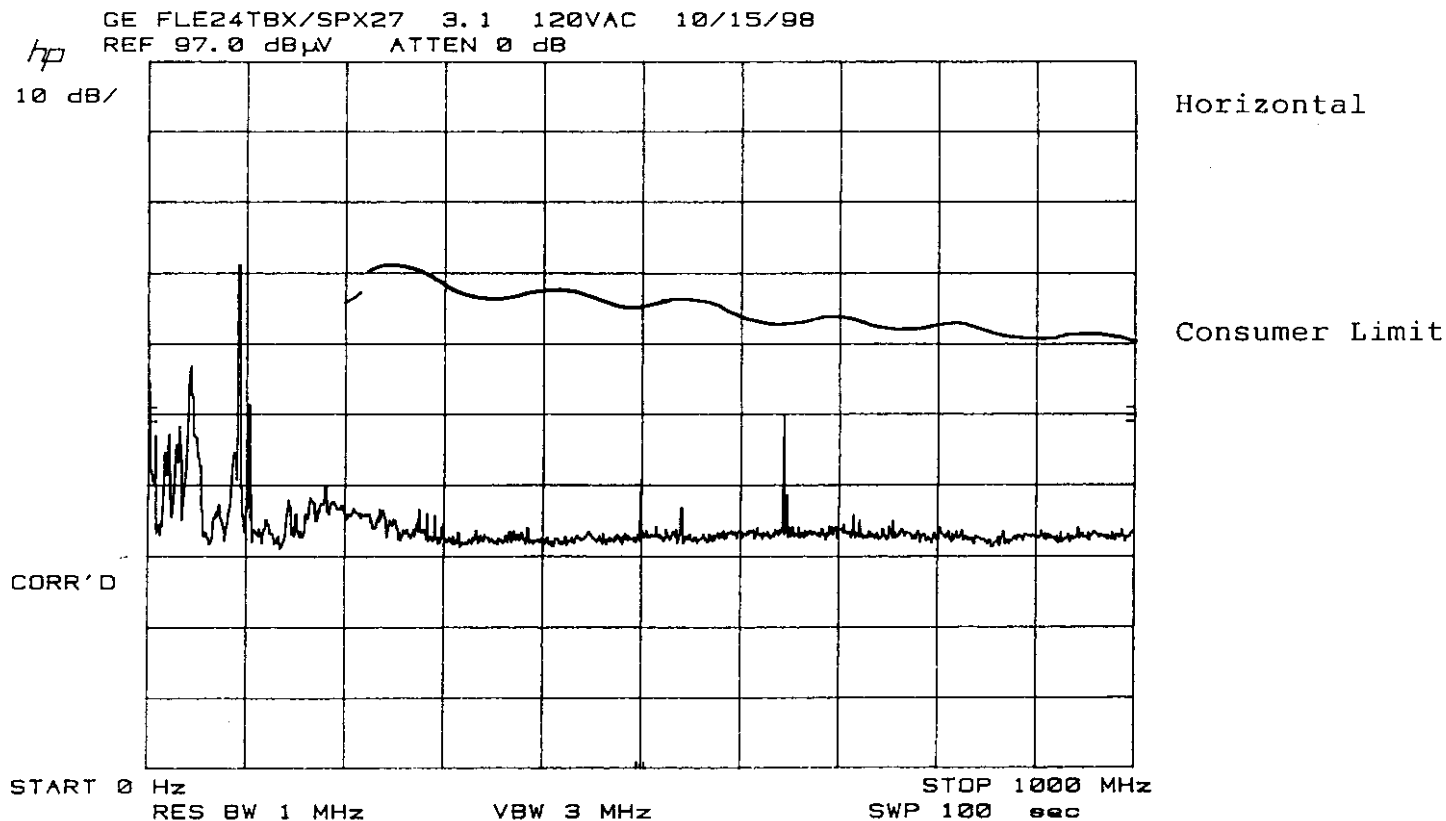
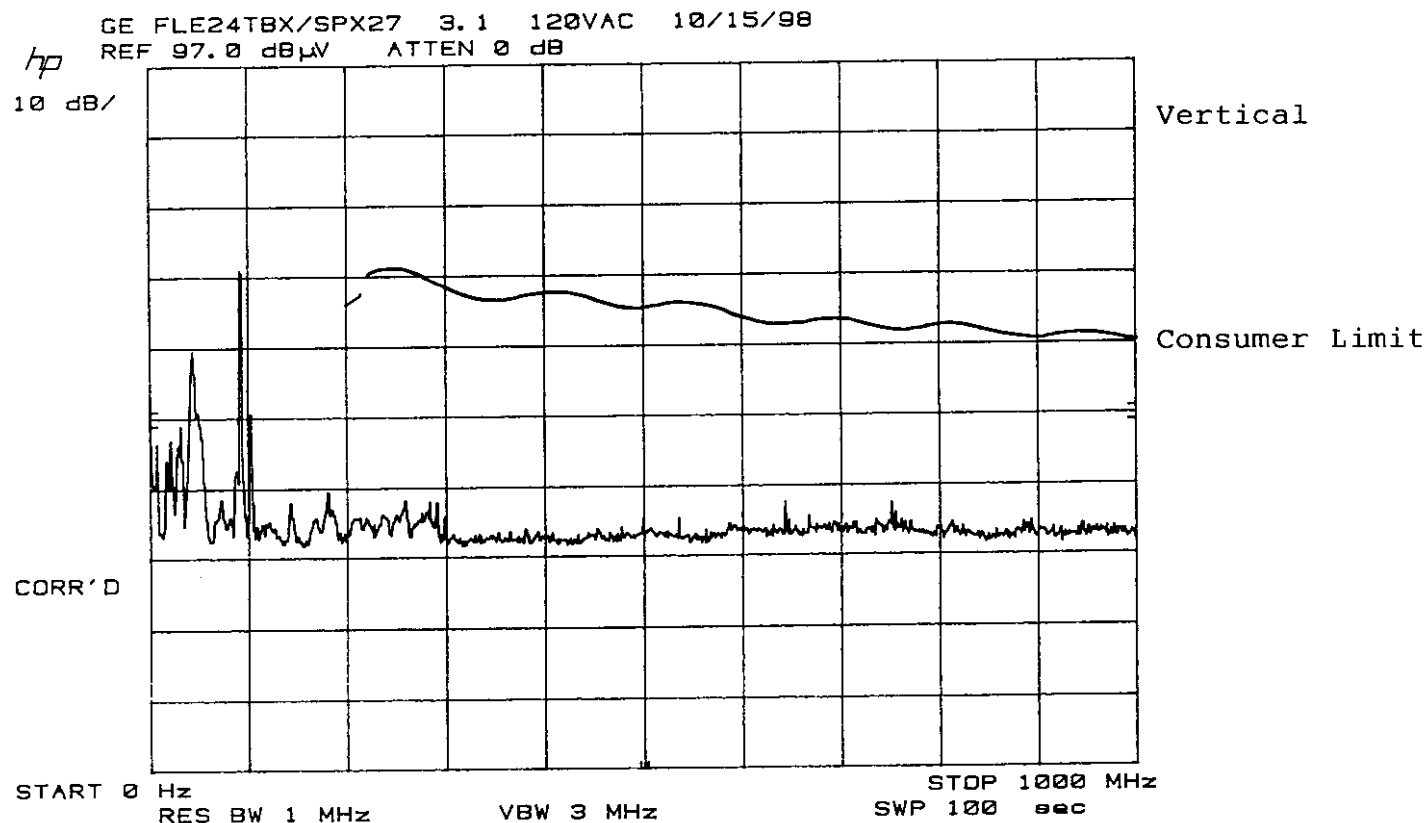


Fig. 7
RADIATED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1
30 MHz - 200 MHz 120 VAC



184



170

Fig. 8
 RADIATED EMISSIONS
 GE FLE24TBX/SPX27 (Rev. 3.1)
 FCC ID: BLD24HLS-1
 200 MHz - 1000 MHz 120 VAC

GE FLE24TBX/SPX27 3.1 127VAC 10/15/98

REF 97.0 dB μ V ATTEN 0 dB

hp
10 dB/

Horizontal

Consumer Limit

CORR'D

START 0 Hz RES BW 1 MHz VBW 3 MHz STOP 200.0 MHz SWP 100 sec

28A

GE FLE24TBX/SPX27 3.1 127VAC 10/15/98
REF 97.0 dB μ V ATTEN 0 dB

hp
10 dB/

Vertical

Consumer Limit

CORR'D

START 0 Hz RES BW 1 MHz VBW 3 MHz STOP 200.0 MHz SWP 100 sec

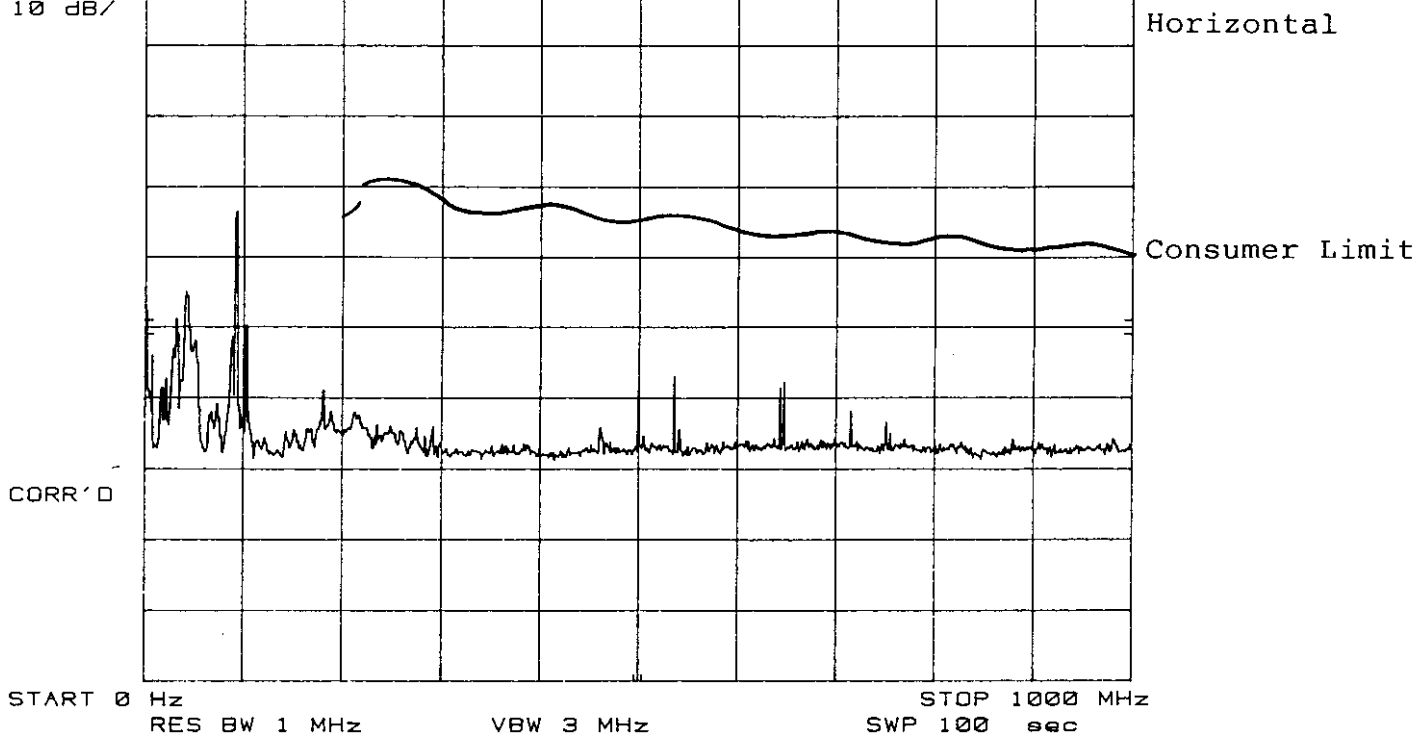
27V

Fig. 9
RADIATED EMISSIONS
GE FLE2 TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1
30 MHz - 200 MHz 127 VAC

GE FLE24TBX/SPX27 3.1 127VAC 10/15/98

hp REF 97.0 dBμV ATTN 0 dB

10 dB/

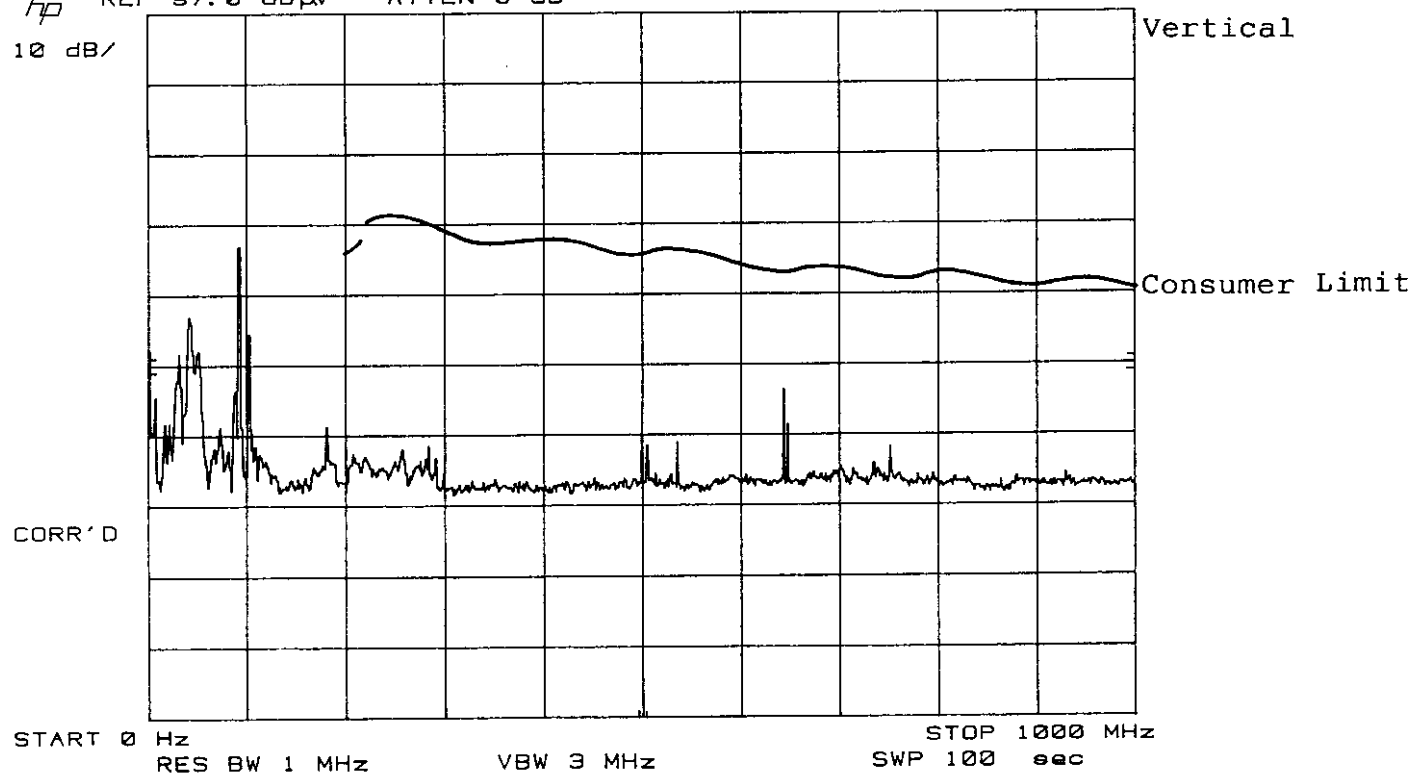


30H

GE FLE24TBX/SPX27 3.1 127VAC 10/15/98

hp REF 97.0 dBμV ATTN 0 dB

10 dB/



29V

Fig 10
RADIATED EMISSIONS
GE FLE24TBX/SPX27 (Rev. 3.1)
FCC ID: BLD24HLS-1
200 MHz - 1000 MHz 127 VAC

TABLE 1 OPEN FIELD TEST SUMMARY, RADIATED EMISSIONS
 GENERAL ELECTRIC FLE24TBX/SPX27 Rev. 3.1
 ELECTRONIC TRIPLE BIAx COMPACT FLUORESCENT LAMP
 FCC ID; BLD24HLS-1 TEST SAMPLE "ATA" OCT 19 1998
 MEASUREMENT DISTANCE, 3 METERS

FREQ. MHZ	SIGNAL DBUV	ANTENNA FACTOR	COAX FACTOR	E UV/M	DB VS. FCC A	DB VS. FCC B	ANTENNA TYPE
120 VAC							
35.0	18.0	9.4	0.2	24.0	-21.9	-12.4	BCON.V
41.0	18.0	10.0	0.3	25.9	-21.3	-11.7	BCON.V
46.0	18.0	10.4	0.3	27.2	-20.8	-11.3	BCON.V
57.0	12.0	9.5	0.3	12.3	-27.7	-18.2	BCON.V
68.0	9.0	8.9	0.4	8.1	-31.3	-21.8	BCON.V
75.0	8.0	9.0	0.4	7.4	-32.2	-22.6	BCON.V
82.0	9.0	13.3	0.4	13.6	-26.8	-17.3	BCON.V

127 VAC							
34.0	19.0	9.3	0.2	26.6	-21.0	-11.5	BCON.V
40.0	16.0	9.9	0.3	20.4	-23.4	-13.8	BCON.V
46.0	17.0	10.4	0.3	24.3	-21.8	-12.3	BCON.V
56.0	16.0	9.4	0.3	19.4	-23.8	-14.3	BCON.V
72.0	7.0	8.0	0.4	5.9	-34.1	-24.6	BCON.V
75.0	8.0	9.0	0.4	7.4	-32.2	-22.6	BCON.V
84.0	10.0	13.4	0.4	15.4	-25.8	-16.2	BCON.V

A P P E N D I X

Antenna Factors: EMCO 3104 Biconical Antenna
EMCO 3146 Log Periodic Antenna

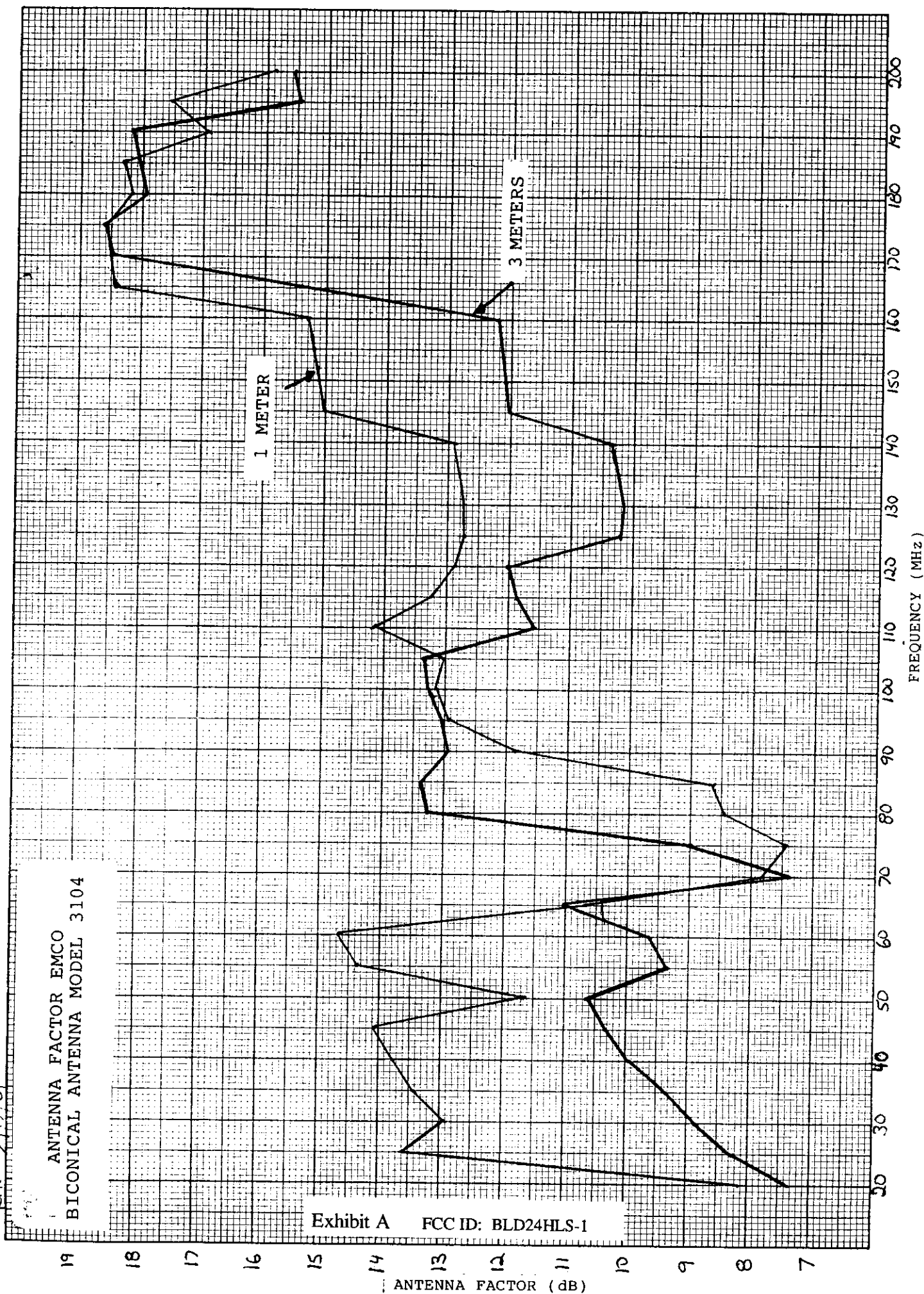
Coax Factors: RG-214/U Coax

10X TO THE 1/2 INCH 359.11
RECEIVED 8/10/84

KPK 7/10/84

ANTENNA FACTOR EMCO
BICONICAL ANTENNA MODEL 3104

Exhibit A FCC ID: BLD24HLS-1



ANTENNA FACTOR 1 AND 3 METERS
DISTANCE EMCO LOG PERIODIC ANTENNA
MODEL 3146

1 METER

3 METERS

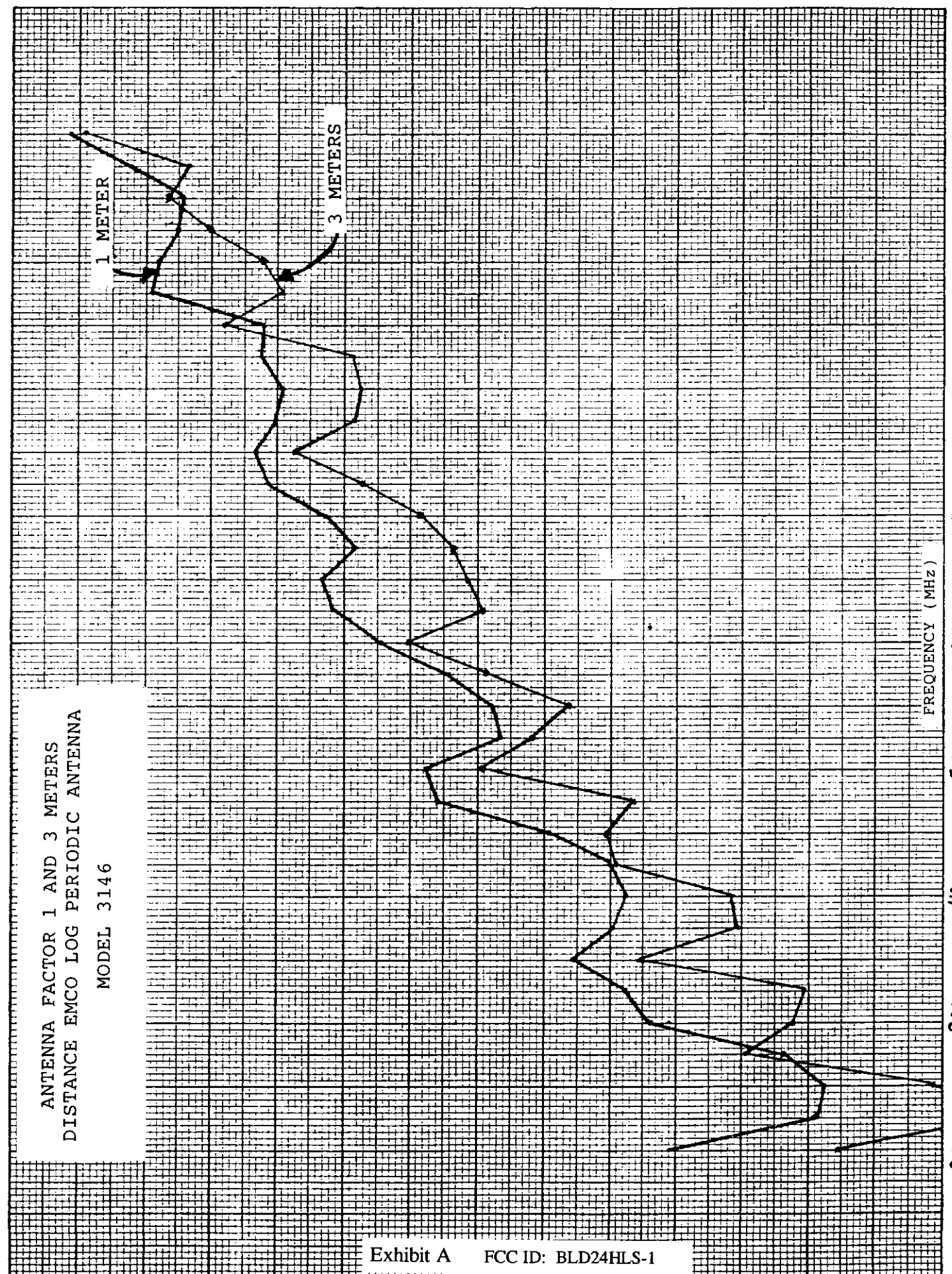
FREQUENCY (MHz)

200 300 400 500 600 700 800 900 1000

Exhibit A FCC ID: BLD24HLS-1

ANTENNA FACTOR (dB)

12 13 14 15 16 17 18 19 20 21 22 23 24 25



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