

SOUTHWEST RESEARCH INSTITUTE

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AUTOMATION AND DATA SYSTEMS DIVISION
FAX: (210) 522-3396

October 12, 1998

Checkpoint Systems, Incorporated
101 Wolf Drive
Thorofare, NJ 08086

Attention: Mr. Calvin Waples

Subject: Answers to FCC Questions on:
1. Counterpoint VII Mode IV/VI Unit, and
2. Counterpoint VII Mode V Only Unit

Reference: 1. Southwest Research Institute Project 10-1853-001
2. Message to Checkpoint Systems From the FCC Dated August 27, 1998

Dear Mr. Waples:

The following are SwRI's responses to the questions asked by the FCC in a message to Checkpoint Systems from the FCC dated August 27, 1998.

1. On September 21 and 22, 1998, each of the antennas originally tested with the Counterpoint VII Mode IV/VI unit, and the Counterpoint VII Mode V Only unit were retested with the receive loop antenna positioned horizontally. The data sheets generated during the retest are attached. All emissions were under the FCC Part 15, paragraphs 15.223 and 15.209 limits. The following tables summarize the test results. (Note: The Spectra-Physics VS1000 Scanner, serial number X060771, that was originally tested was unavailable for the retest. An identical Spectra-Physics VS1000, serial number X008282, was used during the retest).

Counterpoint VII Mode IV/VI Unit

Antenna	Frequency (MHZ)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Passed By (dB)
12" x 12" Pad	8.33	37.22	50.0 (10 meters)	12.78
Symbol LS-9100-000AC	8.27	27.88	43.5 (20 meters)	15.62
Symbol LS-5700-1000GC	8.28	21.72	40.0 (30 meters)	18.28
Spectra-Physics VS1000 (sn X008282)	8.60	27.83	43.5 (20 meters)	15.67
Magellan SP Class: 251230-20150-000	8.71	29.4	50 (10 meters)	20.6



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Counterpoint VII Mode V Only Unit

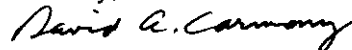
Antenna	Frequency (MHZ)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Passed By (dB)
12" x 12" Pad	8.40	40.52	50 (10 meters)	9.48
Symbol LS-9100-000AC	8.405	41.82	50 (10 meters)	8.18
Symbol LS-5700-1000GC	8.48	42.68	50 (10 meters)	7.32
Spectra-Physics VS1000 (sn X008282)	8.17	40.82	50 (10 meters)	9.18

2. During initial testing, some of the Counterpoint VII antennas did not radiate a fundamental emission that could be detected at the Part 15 specified distance of 30 meters. When this occurred, the receive loop antenna was moved in closer than 30 meters to be able to measure the fundamental emission above the ambient noise level. In these cases, a distance correction factor was applied to the Part 15 limit to compensate for the closer measurement distance. This distance correction factor was calculated using an inverse linear distance extrapolation factor of 20 dB/decade. For example, the Part 15, paragraph 15.223 limit at 30 meters is 40 dBuV/m. Using an inverse linear distance extrapolation factor of 20 dB/decade gives an equivalent limit at 20 meters of 43.5 dBuV/m. At a 10 meter measurement distance, the equivalent limit would be 30 dBuV/m.

3. Data plots of AC line conducted emissions show peak emissions over the quasi-peak Part 15, paragraph 15.207 limit. The quasi-peak emissions levels are provided in the plot on the same page, but below, the peak emissions plot. The data plots of AC line conducted emissions should have been marked to distinguish the peak and quasi-peak scans. In all cases, the quasi-peak emissions levels are under the Part 15, paragraph 15.207 limit.

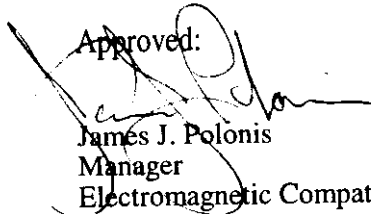
If you need any further information, please call me at 210/522-3592, or fax, 210/522-3396, or e-mail, dcarmony@swri.org.

Sincerely,



David A. Carmony
 Engineering Technologist
 Electromagnetic Compatibility Research Section

Approved:



James J. Polonis
 Manager
 Electromagnetic Compatibility Research Section

DAC/jh
 Enclosures

**Counterpoint VII Mode IV/VI Unit
Radiated Emissions Data**

Frequency (MHz)	8.71	17.3	26.8						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1						
Polarization (V,H) Ambient Noise(A)	H	HA	HA						
Signal Direction	180°	---	---						
Resolution/Video Bandwidth	100k/100k	100k/100k	100k/100k						
Meter Reading (dB μ V)	35.95	27.3	28.2						
Transducer Factor (dB)	38.55	34.10	26.60						
External Gain / Cable Loss (dB)	-25.10	-24.70	-24.20						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dB μ V/m)	29.4	16.70	10.6						
Limit (dB μ V/m)	50.00	40.00	40.00						

21 SEP 98 1552, 90F, 54% RH Detection Method: Peak Limit: FCC para 15.209 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: Magellan (4 Vdc) Mode 6

Conf: _____ Notes: No other spurious emissions or harmonics were detected.

Run _____ of _____ Fundamental not detected at 20 meters or 30 meters.

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Project No. : 10-1853-001

Test Category : FCC Part 15

Approved By: *David A. Carmony*

Frequency (MHz)	8.27	16.5	24.76	8.27					
Transducer	ALR25/9	ALR25/10	ALR25/10	ALR25/9					
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1	20 1					
Polarization (V,H) Ambient Noise(A)	H	HA	HA	H					
Signal Direction	0°	---	---	180°					
Resolution/Video Bandwidth	300k/300k	300k/300k	300k/300k	300k/300k					
Meter Reading (dBμV)	42	32.05	33.3	34.4					
Transducer Factor (dB)	38.58	34.30	28.95	38.58					
External Gain / Cable Loss (dB)	-25.10	-24.70	-24.20	-25.10					
Average Factor	-20.00	-20.00	-20.00	-20.00					
Corr'd Level (dBμV/m)	35.48	21.65	18.05	27.88					
Limit (dBμV/m)	50.00	40.00	40.00	43.50					

21 SEP 98 1113, 88F, 71% RH Detection Method: Peak Limit: FCC part 15.209 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: Symbol 9100 MODE 6

Conf: Notes: No other spurious emissions or harmonics were detected.

Run _____ of _____

Page 1 of 1

Project No. : 10-1853-001

Test Category : FCC Part 15

Approved By: *David A. Carmony*

Frequency (MHz)	8.28	16.5	24.76						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	30 1	30 1	30 1						
Polarization (V,H) Ambient Noise(A)	H	HA	H						
Signal Direction	180°	—	180°						
Resolution/Video Bandwidth	300k/300k	100k/100k	100k/100k						
Meter Reading (dBμV)	29.05	27.8	28.45						
Transducer Factor (dB)	38.58	34.27	29.00						
External Gain / Cable Loss (dB)	-25.10	-24.70	-24.20						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	22.53	17.37	13.25						
Limit (dBμV/m)	40.00	30.00	30.00						

21 SEP 98 1555, 90F, 62% RH Detection Method: Peak Limit: FCC Para 15.209 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: LS5700, Mode 6

Conf. _____ Notes: No other spurious emissions or harmonics were detected.

Run _____ of _____

Page 1 of 1

Project No. : 10-1853-001

Test Category : FCC Part 15

No ferrites.

Approved By: *David A. Carmony*

Frequency (MHz)	8.6	17.2	25.3						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	20 1	20 1	20 1						
Polarization (V,H) Ambient Noise(A)	H	HA	H						
Signal Direction	245°	—	180°						
Resolution/Video Bandwidth	100k/100k	100k/100k	100k/100k						
Meter Reading (dBμV)	34.35	28	28.95						
Transducer Factor (dB)	38.58	34.15	28.50						
External Gain / Cable Loss (dB)	-25.10	-24.70	-24.20						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	27.83	17.45	13.25						
Limit (dBμV/m)	43.50	33.50	33.50						

21 SEP 98 1513, 94F, 54% RH Detection Method: Peak Limit: FCC parts 15.209 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: ModVI with VS1000

Conf: _____ Notes: No other spurious emissions or harmonics were detected.

Run _____ of _____

Page 1 of 1

Project No. : 10-1853-001

Test Category : FCC Part 15

Approved By: *David A. Carmony*

Frequency (MHz)	8.4	16.8	25.22	8.4	16.8	25.22
Transducer	ALR25/9	ALR25/10	ALR25/10	ALR25/9	ALR25/10	ALR25/10
Transducer Distances from EUT(m)/Height(m)	20 1	20 1	20 1	10 1	10 1	10 1
Polarization (V,H) Ambient Noise(A)	HA	HA	HA	H	HA	HA
Signal Direction	—	—	—	180°	—	—
Resolution/Video Bandwidth	300k/300k	100k/100k	100k/100k	300k/300k	100k/100k	100k/100k
Meter Reading (dBμV)	40.1	33.1	27.4	43.8	30.5	28.05
Transducer Factor (dB)	38.52	34.25	29.57	38.52	34.25	29.57
External Gain / Cable Loss (dB)	-25.10	-24.70	-24.20	-25.10	-24.70	-24.20
Average Factor	-20.00	-20.00	-20.00	-20.00	-20.00	-20.00
Corr'd Level (dBμV/m)	33.52	22.65	12.77	37.22	20.05	13.42
Limit (dBμV/m)	43.50	33.50	33.50	50.00	40.00	40.00

21 SEP 98 1457, 95F, 54% RH
 Rec. Opr/Asst : D.Smith/D. Carmony
 Conf: _____
 Run _____ of _____
 Page 1 of 1
 Project No. : 10-1853-001
 Test Category : FCC Part 15

Detection Method: Peak
 EUT: Modem with Pad
 Notes: No other spurious emissions or harmonics were detected.
 Second set of readings were a retest at 1710, 96F, 56% RH.
 44 Vdc (VPA)

FCC para 15.209 and 15.223
 Limit:
 Approved By: David A. Carmony

**Counterpoint VII Mode V Only Unit
Radiated Emissions Data**

Frequency (MHz)	8.48	16.96	25.87						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1						
Polarization (V,H) Ambient Noise(A)	H	HA	HA						
Signal Direction	45°	—	—						
Resolution/Video Bandwidth	300k/300k	300k /300k	100k/100k						
Meter Reading (dBμV)	49.2	37.6	28.85 27.4						
Transducer Factor (dB)	38.58	34.17	27.40 28.60						
External Gain / Cable Loss (dB)	-25.10	-24.60	-24.30						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	42.68	27.17	11.95 11.7						
Limit (dBμV/m)	50.00	40.00	40.00						

22 SEP 98 1000, 75F, 80% RH

Detection Method: Peak

Limit: FCC para 15.205 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony

EUT: LS5700, Mode V

Notes: Could not see fundamental at 20 meters. No other spurious emissions or harmonics were detected.

Conf. _____

Run _____ of _____

Page 1 of 1

Project No. : 10-1853-001

Test Category : FCC Part 15

Approved By: *David A. Carmony*

Frequency (MHz)	8.405	16.8	25.2						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1						
Polarization (V,H) Ambient Noise(A)	H	HA	HA						
Signal Direction	90°	—	—						
Resolution/Video Bandwidth	300k/300k	100k/100k	100k/100k						
Meter Reading (dBμV)	48.4	33.7	29.02						
Transducer Factor (dB)	38.52	34.25	28.50						
External Gain / Cable Loss (dB)	-25.10	-24.60	-24.30						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	41.82	23.35	13.22						
Limit (dBμV/m)	50.00	40.00	40.00						

22 SEP 98 0900, 79F, 89% RH Detection Method: Peak Limit: FCC part 15.207 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: LS9100, Mode V

Conf: _____ Notes: Could not see fundamental at 20 meters. No other spurious emissions or harmonics were detected.

Run _____ of _____ No Ferrites.

Page 1 of 1

Project No. : 10-1853-001

Test Category : FCC Part 15 Approved By: *David A. Carmony*

Frequency (MHz)	8.17	16.6	24.66						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1						
Polarization (V,H) Ambient Noise(A)	H	H	HA						
Signal Direction	270°	270°	—						
Resolution/Video Bandwidth	300k/300k	100k/100k	100k/100k						
Meter Reading (dBμV)	47.35	30.75	27.5						
Transducer Factor (dB)	38.57	34.27	29.15						
External Gain / Cable Loss (dB)	-25.10	-24.60	-24.30						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	40.82	20.42	12.35						
Limit (dBμV/m)	50.00	40.00	40.00						

22 SEP 98 1058, 88F, 74% RH
 Rec. Opr/Asst : D.Smith/D.Carmony
 Conf: _____
 Run _____ of _____
 Page 1 of 1

Detection Method: Peak
 EUT: VS1000, Mode V
 Notes: Could not see fundamental at 20 meters; harmonic at 16.5 MHz was detected just above the noise. No other spurious emissions or harmonics were detected.

Limit: FCC Part 15.209 and 15.222

Approved By: David G. Carmony

Project No. : 10-1853-001
 Test Category : FCC Part 15

Frequency (MHz)	8.4	16.8	25.2						
Transducer	ALR25/9	ALR25/10	ALR25/10						
Transducer Distances from EUT(m)/Height(m)	10 1	10 1	10 1						
Polarization (V,H) Ambient Noise(A)	H	HA	HA						
Signal Direction	0°	—	—						
Resolution/Video Bandwidth	300k/300k	100k/100k	100k/100k						
Meter Reading (dBμV)	47.1	30.55	27.65						
Transducer Factor (dB)	38.52	34.25	28.60						
External Gain / Cable Loss (dB)	-25.10	-24.60	-24.30						
Average Factor	-20.00	-20.00	-20.00						
Corr'd Level (dBμV/m)	40.52	20.20	11.95						
Limit (dBμV/m)	50.00	40.00	40.00						

22 SEP 98 1000, 75F, 80% RH Detection Method: Peak Limit: FCC Para 15.209 and 15.223

Rec. Opr/Asst : D.Smith/D.Carmony EUT: 12x12 Pad, Mode V
 Conf. _____ Notes: Could not see fundamental at 20 meters. No other spurious emissions or harmonics were detected.

Run _____ of _____
 Page 1 of 1

Project No. : 10-1853-001
 Test Category : FCC Part 15
 Approved By: David A Carmony

CLASS TWO CHANGE MEASUREMENT AND TECHNICAL REPORT ON THE COUNTERPOINT VII

Southwest Research Institute
6220 Culebra Road
San Antonio, Texas 78238

Southwest Research Institute Project 10-1853-001
Report Number EMCR 98/046

Prepared for:

Checkpoint Systems, Incorporated
101 Wolf Drive
Thorofare, NJ 08086


July 1998

Prepared by:
David A. Carmony

The results of this test report apply only to the specific samples tested. If the manufacturer extends the test results to apply to other samples of the same model, or from the same lot or batch, the manufacturer should ensure the additional samples are manufactured using identical electrical and mechanical components.

This test report shall not be reproduced, except in full, without written approval of the Electromagnetic Compatibility Research Section, Southwest Research Institute.

Reviewed by:


Ismael Martinez, Jr.
Sr. Engineering Technologist
Electromagnetic Compatibility Research Section
Communications Engineering Department

Approved by:

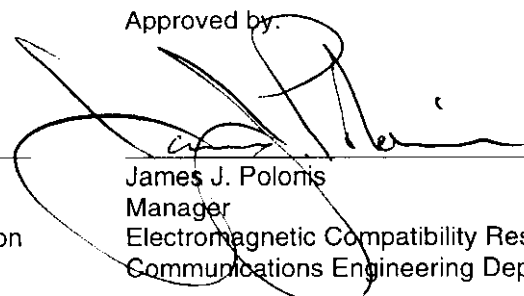

James J. Polonis
Manager
Electromagnetic Compatibility Research Section
Communications Engineering Department

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1.0 GENERAL INFORMATION

1.1 Product Description

The Counterpoint VII (CP VII) (FCC ID: DO4CP1700) is a product designed to detect and deactivate tuned circuit tags which are being used in an anti-pilferage system. The CP VII is a pulse type emission that is varied over a frequency range of 7.4 MHz to 9.0 MHz to detect and deactivate tuned circuit tags (soft tags), which operate under FCC Part 15, Subpart C, paragraphs 15.207, 15.209, and 15.223. The original CP VII operated in three modes: mode 4, 5 and 6. In mode 4, when the unit detects a tuned circuit tag, it increases the pulse signal level to deactivate the soft tag. In mode 6, the pulse signal operates at the pulse level to deactivate soft tags and gives an alarm for hard tags. In mode 5, the pulse signal will deactivate soft tags, but does not detect soft or hard tags.

The device tested for a Class Two Change was capable of operating in mode 5, only. Therefore, Class Two Change testing was performed to show continuous compliance with FCC Part 15, due to the:

- 1). removal of circuitry on the control circuit board associated with modes 4 and 6, with subsequent new board layout, and
- 2). addition of optional antennas.

A detailed description of the mode 5 Unit is provided in Checkpoint's technical documentation, Attachment A "Theory of Operation," Attachment B "Installation Manual," and Attachment C "Schematics."

In Part 15, Paragraph 15.205 gives restricted bands of operation that are within the bandwidth of 7.4 MHz to 9.0 MHz. Provisions are provided to sweep over these restricted bands. The provisions are that the sweep is never stopped with the fundamental emissions within the band, and the fundamental emission is outside this band more than 99% of the time the device is actively transmitting.

1.2 Related Grants

The CP VII was tested in a stand-alone configuration with no other host equipment used in the test configuration.

1.3 Tested System Details

The CP VII was tested with a pad antenna, mounted horizontal as in a normal installation. The CP VII was also tested with three different scanner antennas, all positioned vertically as in a normal installation. Figure 3.1 shows a block diagram of the pad test configuration. The model and serial numbers of the components used in the test configurations are listed in Table 1.1.

**TABLE 1.1
CPVII COMPONENTS**

Model and Serial Number	Cable Description
CP1700 Control Circuit Board SN (none); part no. 964258 Rev 02	1.8-meter unshielded cable connected to AC adapter (OEM Model TEAD-48-150900U)
12" x 12" Pad Antenna SN 068-13264-A	1.8-meter shielded cable
Symbol LS-9100-000AC Scanner SN B946089	1.8 meter shielded cable connected to existing scanner cable
Symbol LS-5700-1000GC Scanner SN SM404963	1.8 meter shielded cable connected to existing scanner cable
Spectra-Physics VS1000 Scanner SN X060771	1.8 meter shielded cable connected to existing scanner cable

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedure in ANSI C63.4_1992 and MP-1 1983. Radiated testing was performed at an antenna to EUT distance of 3 meters and 30 meters.

1.5 Test Facility

The Open Area Test Site and Conducted Measurement Facility used to collect data are located at Southwest Research Institute, 6220 Culebra Road, San Antonio, Texas. Details concerning these test sites are found in the report entitled, "Description of Measurement Facility," dated 28 April 1997, which is on file with the FCC Laboratory Division in Columbia, Maryland. On June 12, 1997, the FCC approved the sites for the purpose of providing test results for submission with equipment authorization applications under the Commission's Equipment Authorization Program.

2.0 PRODUCT LABELING

2.1 FCC ID Label

FCC ID label is provided with the Attachments.

2.2 Location of Label on EUT

The location of the label will be on the plastic enclosure for the control PCB. A drawing showing the location is provided with the Attachments.

3.0 SYSTEM TEST CONFIGURATION

3.1 Justification

The CP VII was tested with the antenna pad in the horizontal position as in a normal installation. The scanner antennas were tested in their position of normal use (vertical).

Radiated signature scans were made in a 3-meter shielded anechoic chamber over the frequency range of 5.5 MHz to 1000 MHz to determine the frequency of emissions and the worst case test configuration. The AC power to the CP VII was varied between 85% and 115% of the nominal 120 VAC. The fundamental was found to be slightly higher at 138 VAC (115%). Therefore, all measurements (both of fundamental and spurious emissions) were made using 138 VAC power.

3.2 EUT Exercise

The CP VII was operational when the AC power was turned on. A Checkpoint soft tag was used to show that the system would deactivate the tag.

3.3 Special Accessories

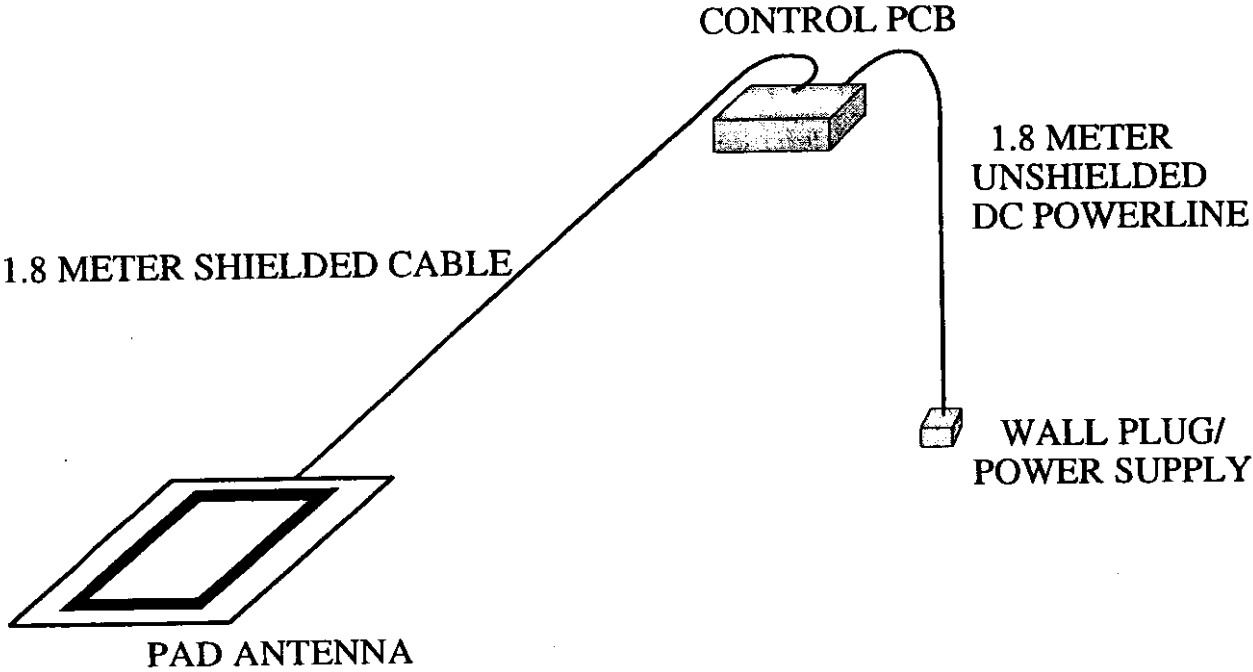
The CP VII uses a shielded antenna cable. The Control PCB's SW3 must be set for a VPA voltage of 44 or less. The VPA is measured between TP2 and GND on the PCB. VPA settings are covered in the installation procedures. Although ferrite beads were required on the antenna cable of the original CP VII in order to meet the FCC Part 15 requirements, Class Two Change testing revealed the beads were no longer required. Use of the remote/switch alarm, used with the original CP VII (see the original CP VII certification test report), has been discontinued and was not included as part of the test configuration.

3.4 Equipment Modification

The need for the special accessories noted in 3.3 above was determined during equipment evaluation.

3.5 Configuration of Tested System

Refer to Figure 3.1 for a block diagram of the test configuration.



NOTE: THE PAD ANTENNA MAY BE REPLACED BY ALTERNATE SCANNER ANTENNAS.

FIGURE 3.1
BLOCK DIAGRAM OF PAD ANTENNA TEST CONFIGURATION

4.0 BLOCK DIAGRAM OF CP VII

A block diagram of the CP VII is located in Attachment A.

6.0 CONDUCTED AND RADIATED EMISSION DATA

6.1 Conducted Emission Data

The initial step in collecting conducted data was to provide a spectrum analyzer peak scan of the measurement range to determine worst case. A computer-controlled spectrum analyzer was used to produce a peak measurement data plot. Then Quasi-Peak (QP) measurements were made with a quasi-peak adapter and spectrum analyzer on the highest conducted emission to show that the QP levels were below the limit. The QP measurements for the various antennas are listed in Tables 6.1a – 6.4a.

6.2 Radiated Emissions Data

The data in Tables 6.1b,c to 6.4b,c are the corrected highest level EME measurements taken from the following radiated data sheets. The data sheets include the emission frequencies, receiver reading, correction factor (including cable loss, amplifier gain if used, and antenna factor), corrected level, and the limit. Explanation of the field strength calculation is given in paragraph 6.7.

Measurements were made on the fundamental frequency with the CP VII in a normal operation at 30 meters, using the pad antenna and each of the three scanners. Measurements at the second and third harmonic frequencies showed the harmonics were suppressed and were not detectable at 30 meter limit of 29.5 dB(μ V/m). Refer to Tables 6.1b to 6.4b.

Measurements on spurious emissions above 30 MHz were made with the antenna at 3 meters. The worst case emissions are provided in Tables 6.1c to 6.4c.

12" x 12" Pad Antenna SN 068-13264-A

TABLE 6.1a
SUMMARY OF CONDUCTED DATA

Antenna	AC Line	Frequency (MHz)	Measured ¹ (dB μ V)	Limit (dB μ V)
12" x 12" Pad Antenna SN 068-13264-A	Neutral	7.5	44.5	48
	Line	7.5	43	48
Judgment: EUT Passed By 3.5 dB				

¹ All readings are QP measurements.

TABLE 6.1b
MEASUREMENT OF FUNDAMENTAL FREQUENCY

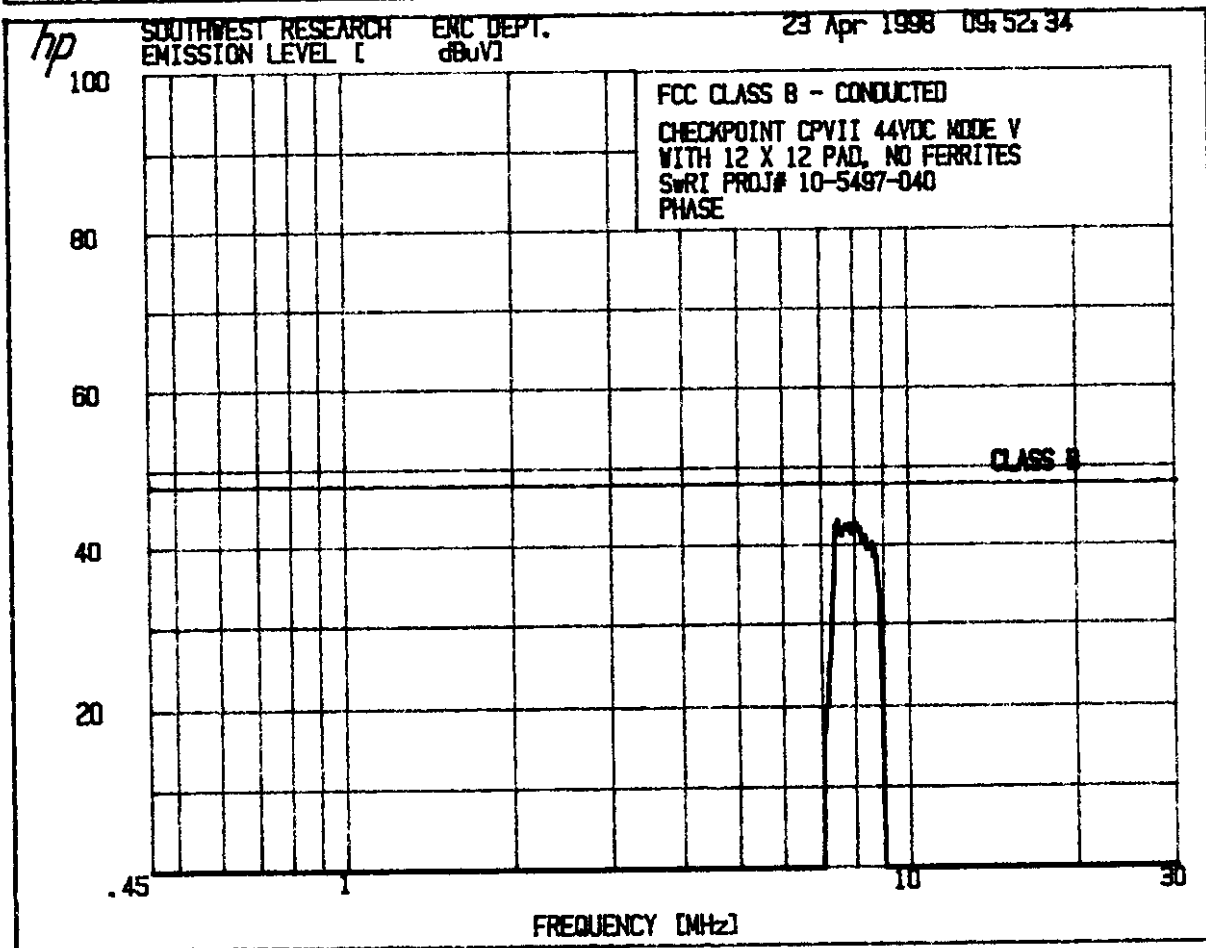
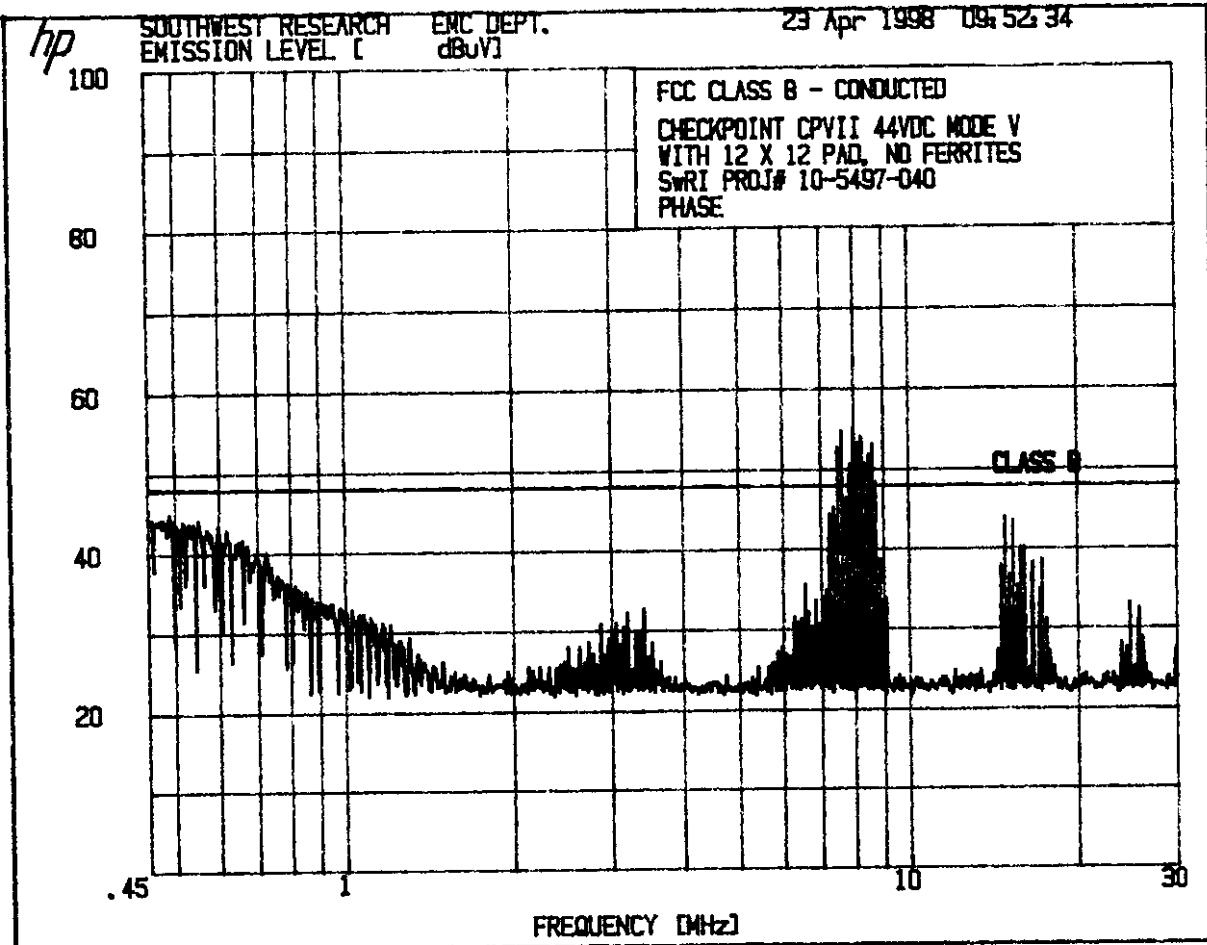
Antenna	Frequency (MHz)	Corrected Level ¹ DB(μ V/m)	Limit 30 Meters dB(μ V/m)
12" x 12" Pad Antenna SN 068-13264-A	8.14	36 ²	43.5 ²
Judgment: EUT Passed By 7.5			

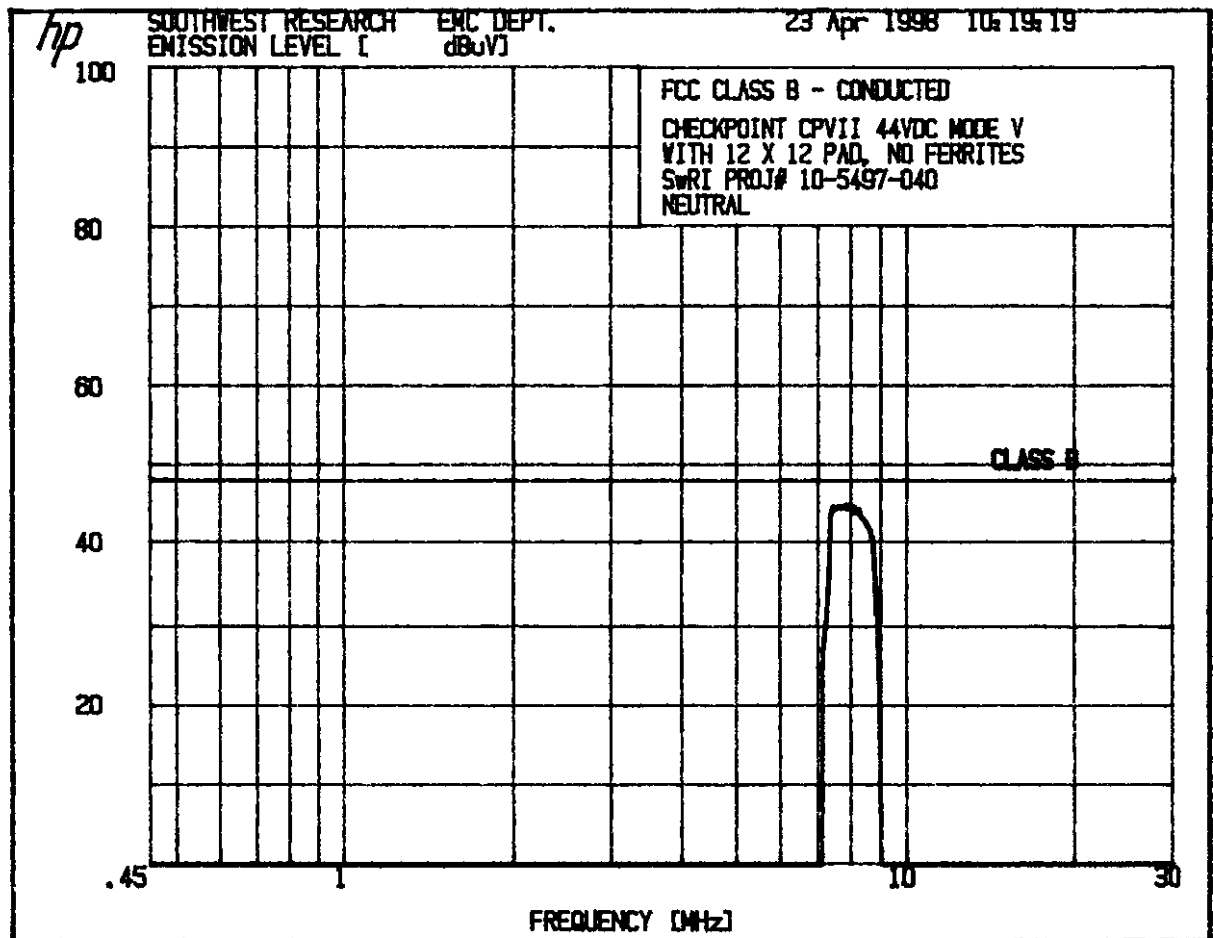
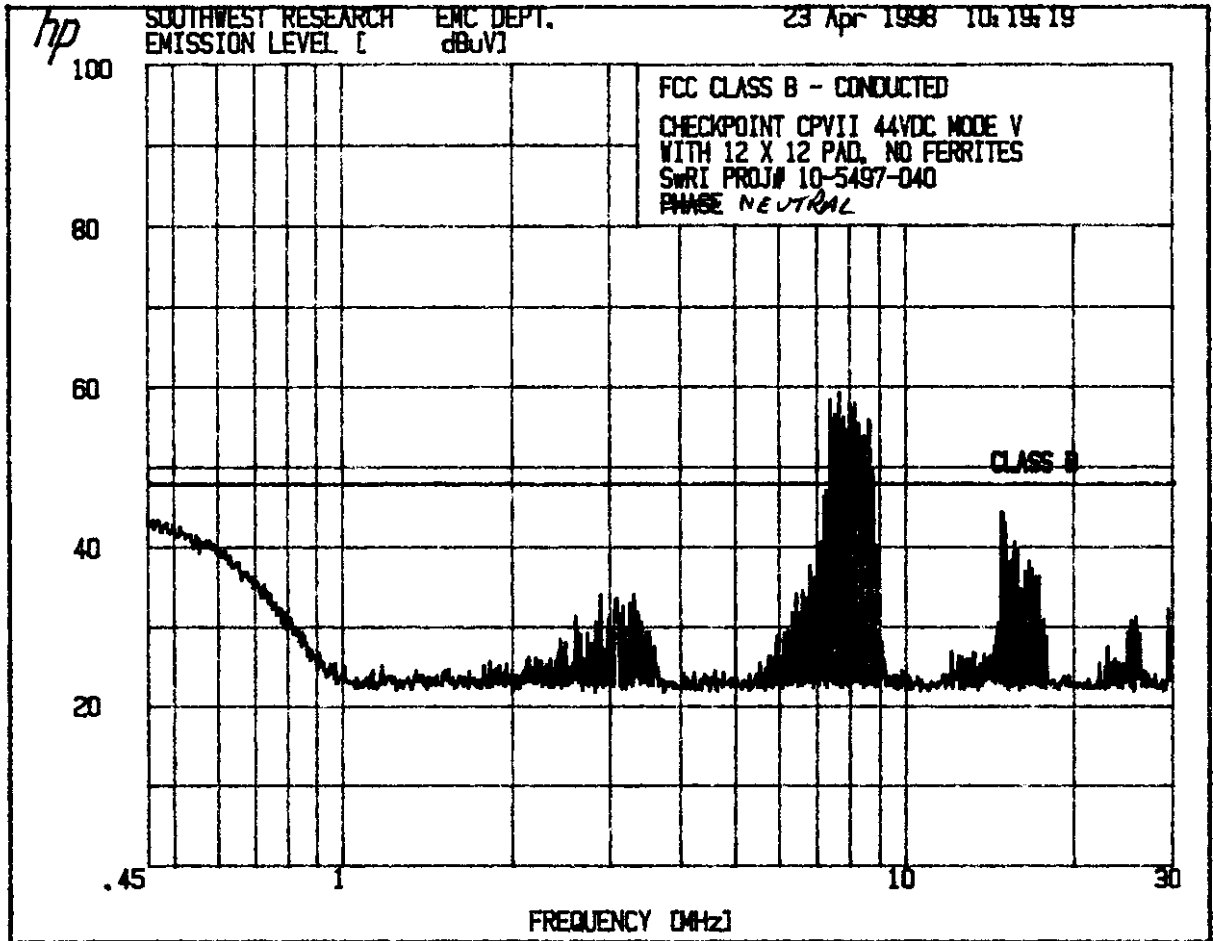
- 1 Measurements were made with a HP 8566B Spectrum Analyzer using a ALR 25 loop antenna, that was rotated around its vertical axis for highest signal level. A 100 kHz receive bandwidth was used on the spectrum analyzer to determine the highest pulse signal level and then the signal was averaged with a -20 dB averaging factor.
- 2 Measurement made at 20 meters because fundamental could not be seen at 30 meters.

TABLE 6.1c
MEASUREMENTS ON SPURIOUS EMISSIONS ABOVE 30 MHz

Frequency (MHz)	Corrected Level ² dB(μ V/m)	Limit dB(μ V/m)	Antenna
49.86	39	40	Pad
35.24	39.4	40	Pad
121.75	38.4	43.5	Pad
Judgment: EUT Passed By .6 dB			

- 2 All readings are quasi-peak manual measurements made with a receiver.





BAND 10 Band 10 Band 9 Band 9

FREQUENCY (MHz)	16.40	24.60	8.79	8.76
TRANSDUCER	AK25 / SV 86			
TRANSDUCER DIST. from EUT(m)/HEIGHT(m)	3 / 1	3 / 1	20 / 1	30 / 1
POLARIZATION (V,H) AMBIENT NOISE (A)	⊥ [EUT]	⊥ [EUT]	⊥ [EUT]	⊥ [EUT]
SIGNAL DIRECTION	MAX °	MAX °	MAX °	MAX °
RECEIVER B/W ATTENUATION (dB)	100K / 100K	100K / 100K	100K / 100K	100K / 100K
METER READING (dBμV)	20.2	19.6	42.3	26.9
TRANSDUCER FACTOR (dB)	34.17	28.81	38.75	38.75
EXTERNAL GAIN/ CABLE LOSS (dB)	.9 / -26	.9 / -26	.9 / -26	.9 / -26
CORRECTED LEVEL (dBμV/m)	29.27	23.31	35.95	20.55
LIMIT (dBμV/m)	49.5	49.5	43.5	40

Date: 28 APR 98 Detection Method: CISPR PEAK AVERAGE Other

OPR/Asst.: RAM EUT CP VII, Mode 5, 44VPA, 10 ferrites

Notes: (A) Ambient

Line voltage set to 138 VAC

Date: 28 APR 98

OPR/Asst.: RAM

Conf. Run of _____ of _____

Project No.: _____

Test Category: _____
Time, Temp., & % r.H.: 1052 / 64°F / 50%

Approved: David A. Carney

FREQUENCY (MHz)	49.86	50.22	35.24	35.096	104.08	121.75	167.19	324.85	284.39
TRANSDUCER	DIPOLE S/N 148	→	BDA	→	→	→	→	T-2	→
TRANSDUCER DIST. from EUT(m)/HEIGHT(m)	3 1.75	3 4.0	3 1.5	3 1.5	3 1.5	3 1.5	3 1.75	3 3.6	3 1
POLARIZATION (V,H) AMBIENT NOISE (A)	V	H	V	V	V	V	H	H	H
SIGNAL DIRECTION	0°	320°	70°	70°	0°	0°	70°	270°	270°
RECEIVER ATTENUATION (dB)	20	10	0	—	10	10	20	20	30
METER READING (dB μ V)	13	18	20	86 μ OB 20	10	11	19	14	11
TRANSDUCER FACTOR (dB)	3.5	3.5	17.4	17.4	11.3	13	16.9	19	19.1
EXTERNAL GAIN/ CABLE LOSS (dB)	2.5	2.5	2	2	3.9	4.4	-22.8	-20.4	-21.1
CORRECTED LEVEL (dB μ V/m)	39	34	39.4	39.4	35.2	38.4	33.1	32.6	39
LIMIT (dB μ V/m)	40	40	40	40	43.5	43.5	43.5	46	46

Date: 27 APR 98 Detection Method: CISPR PEAK AVERAGE Other
 OPR/Asst.: Ram EUT CP VII Mode 5 44VDC no ferrites

Conf. Run of HP 8640B S/N 1940A11888, SAUG98
 Page of

Project No.:

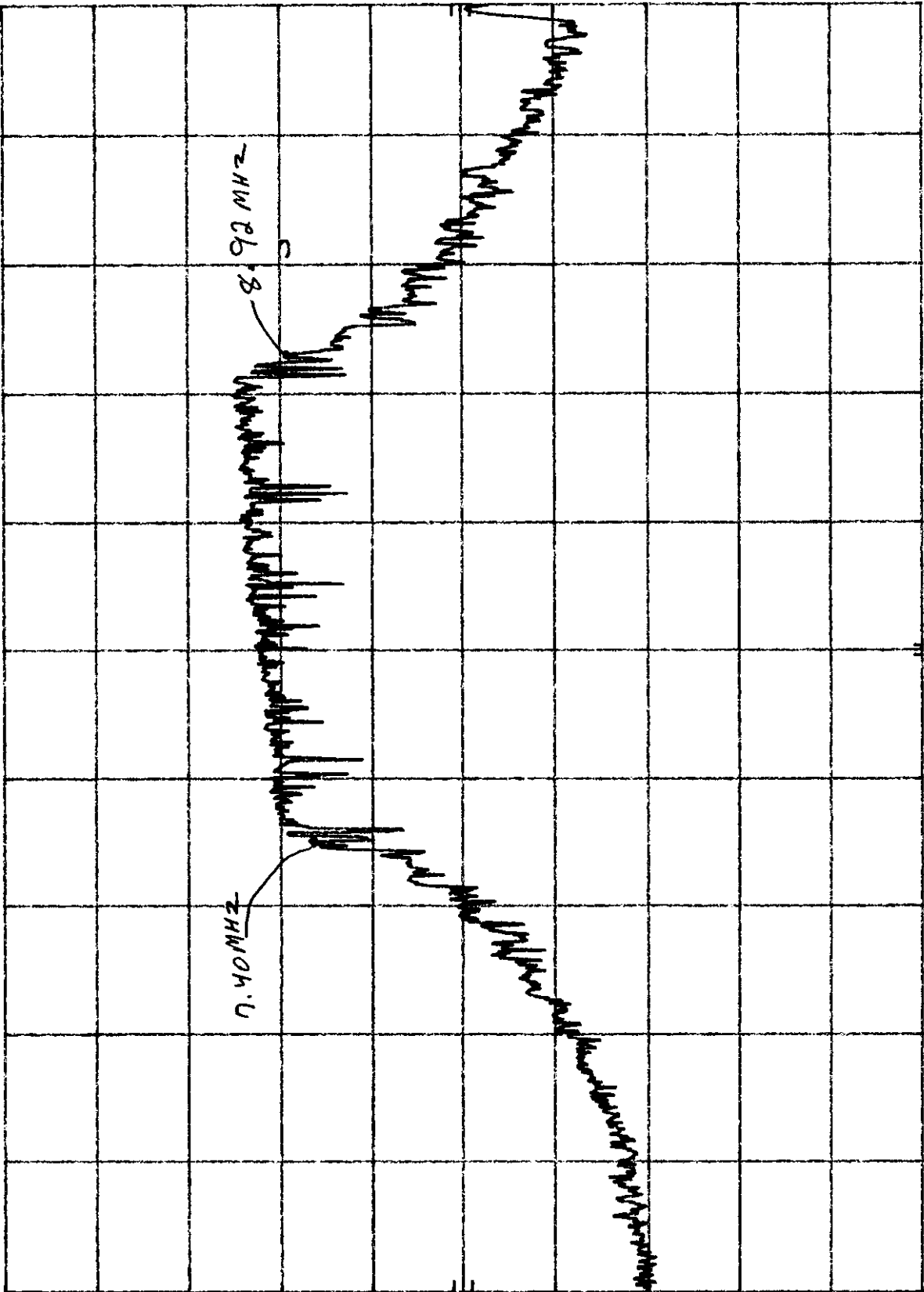
Test Category:
 Time, Temp., & % r.H.: 1125 / 70° / 50%
 Approved: David A Carmany

MKR 7.400 MHz
-43.50 dBm

HP REF -10.0 dBm
ATTEN 0 dB

10 dB/

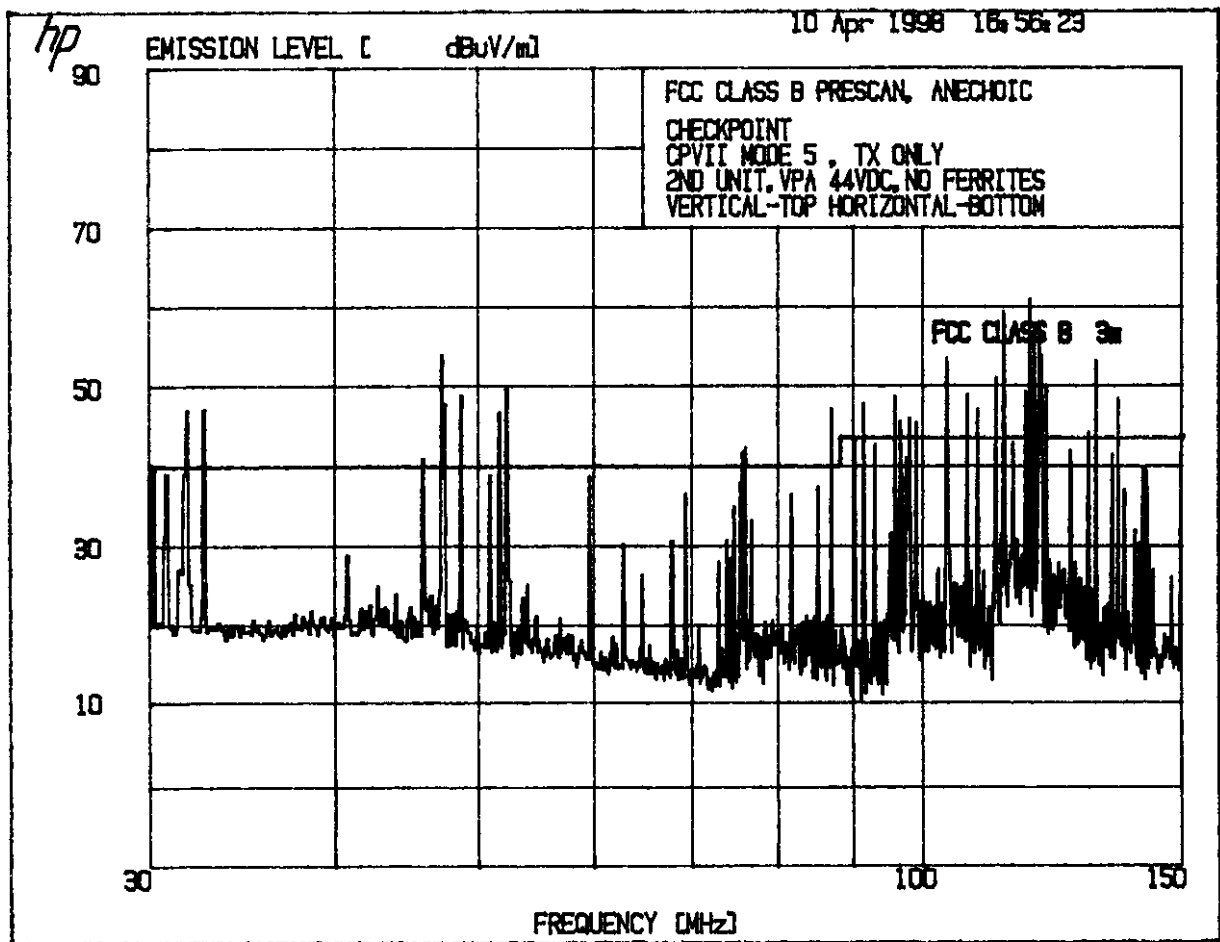
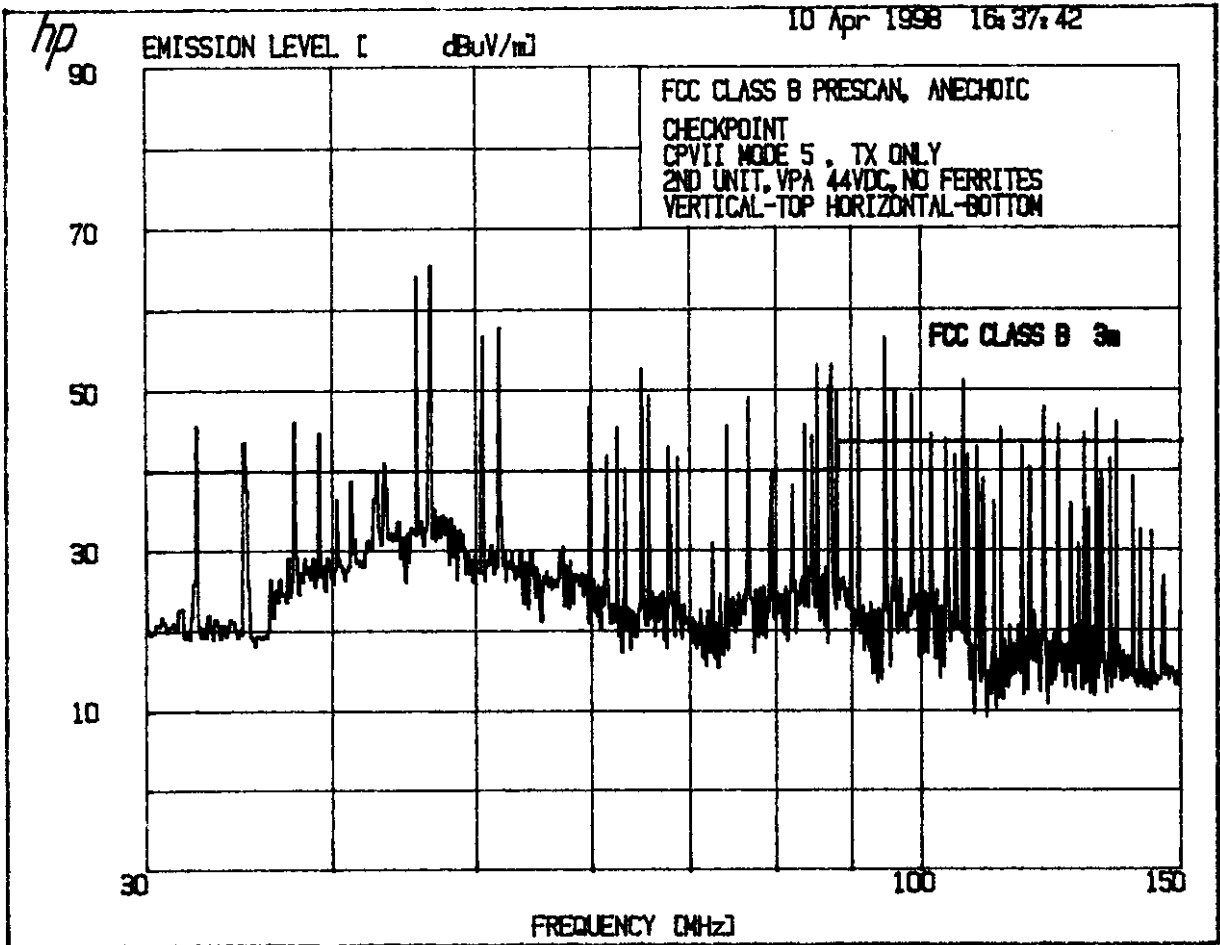
START 6.000 MHz
RES BW 30 KHz

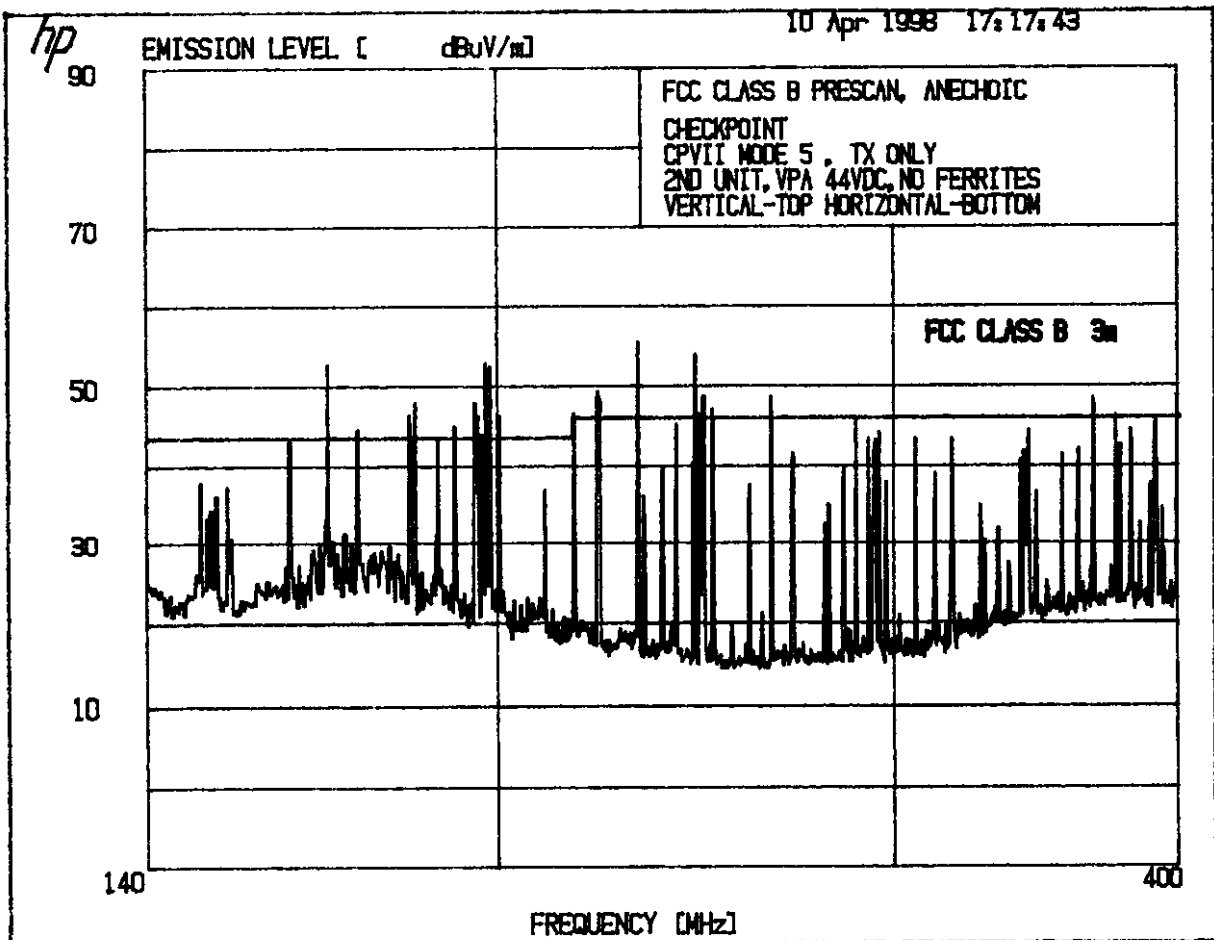
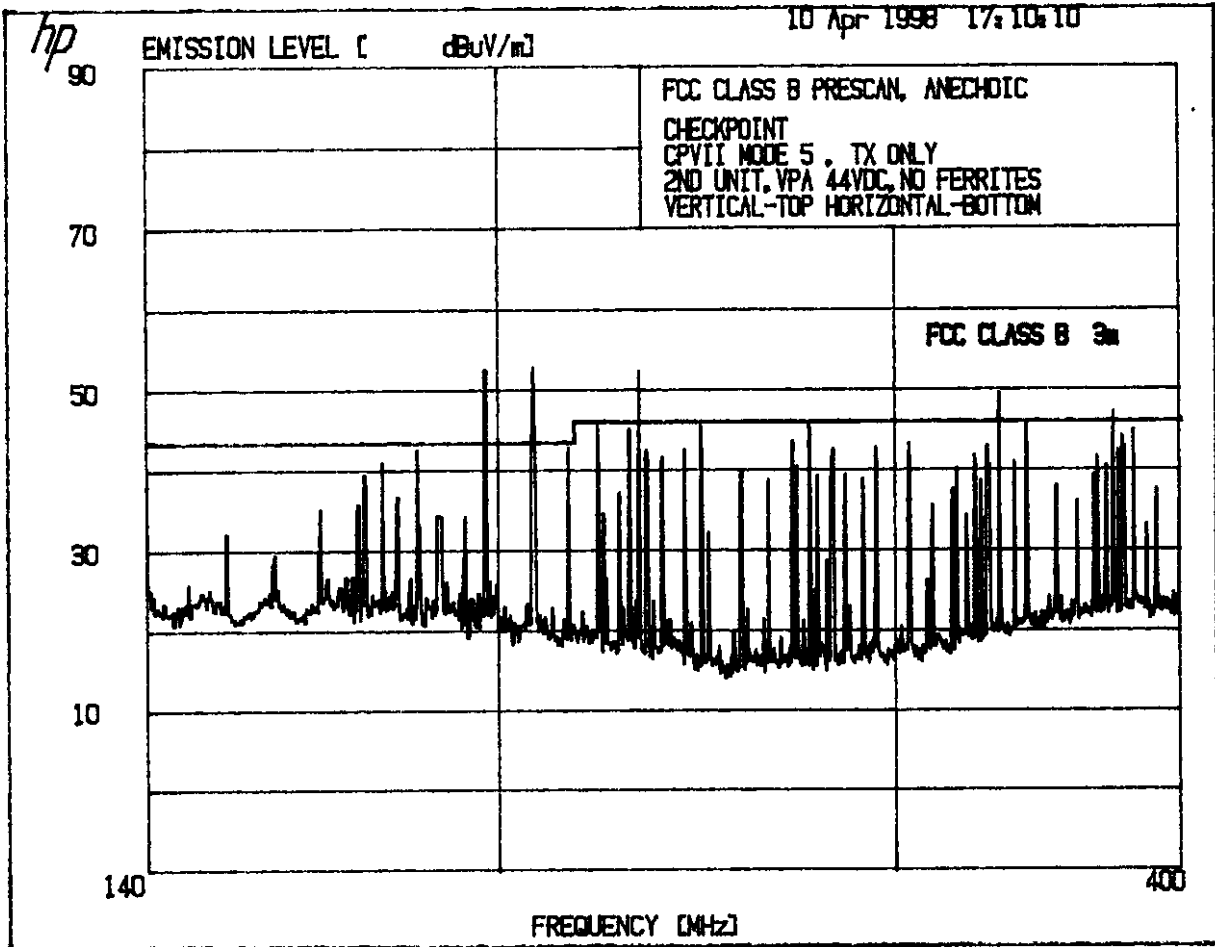


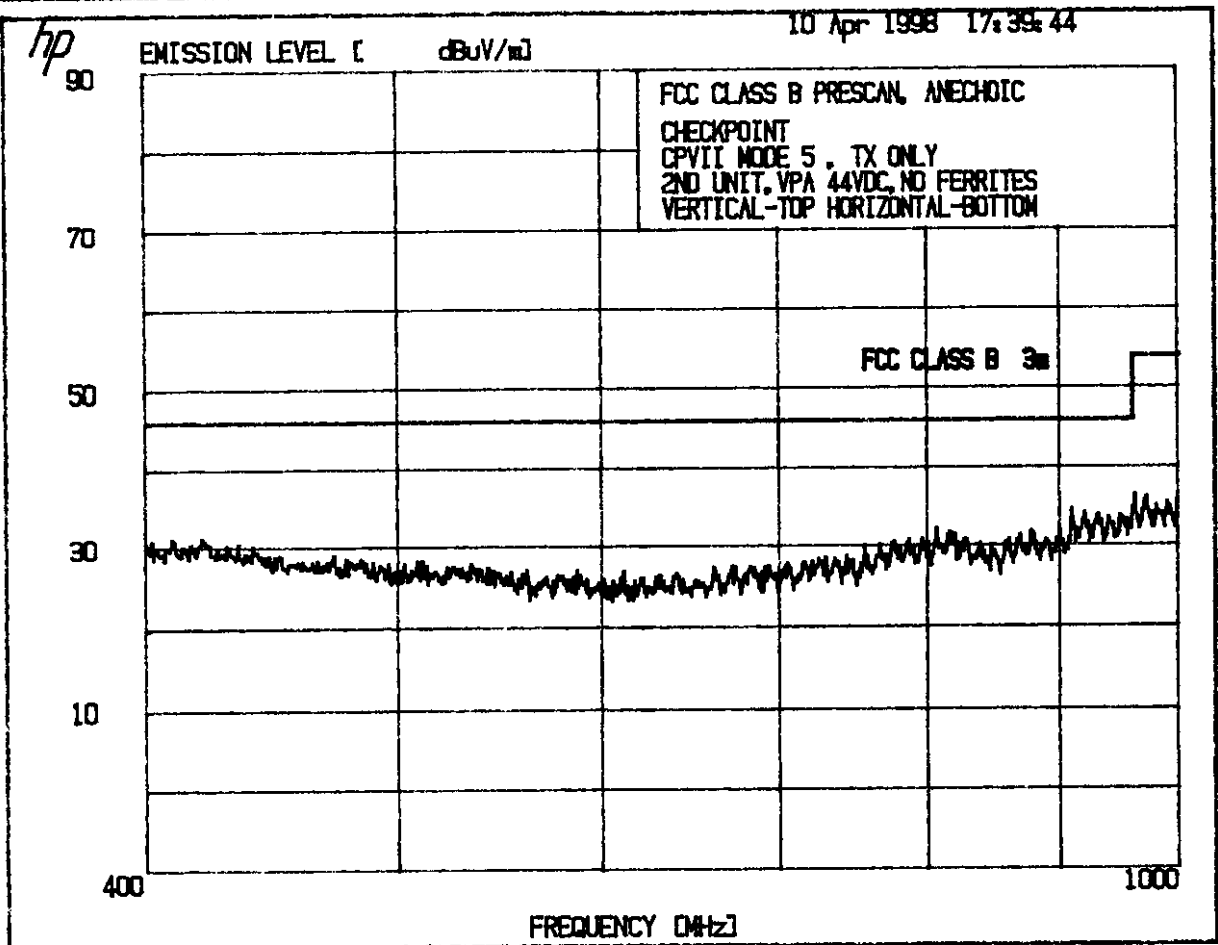
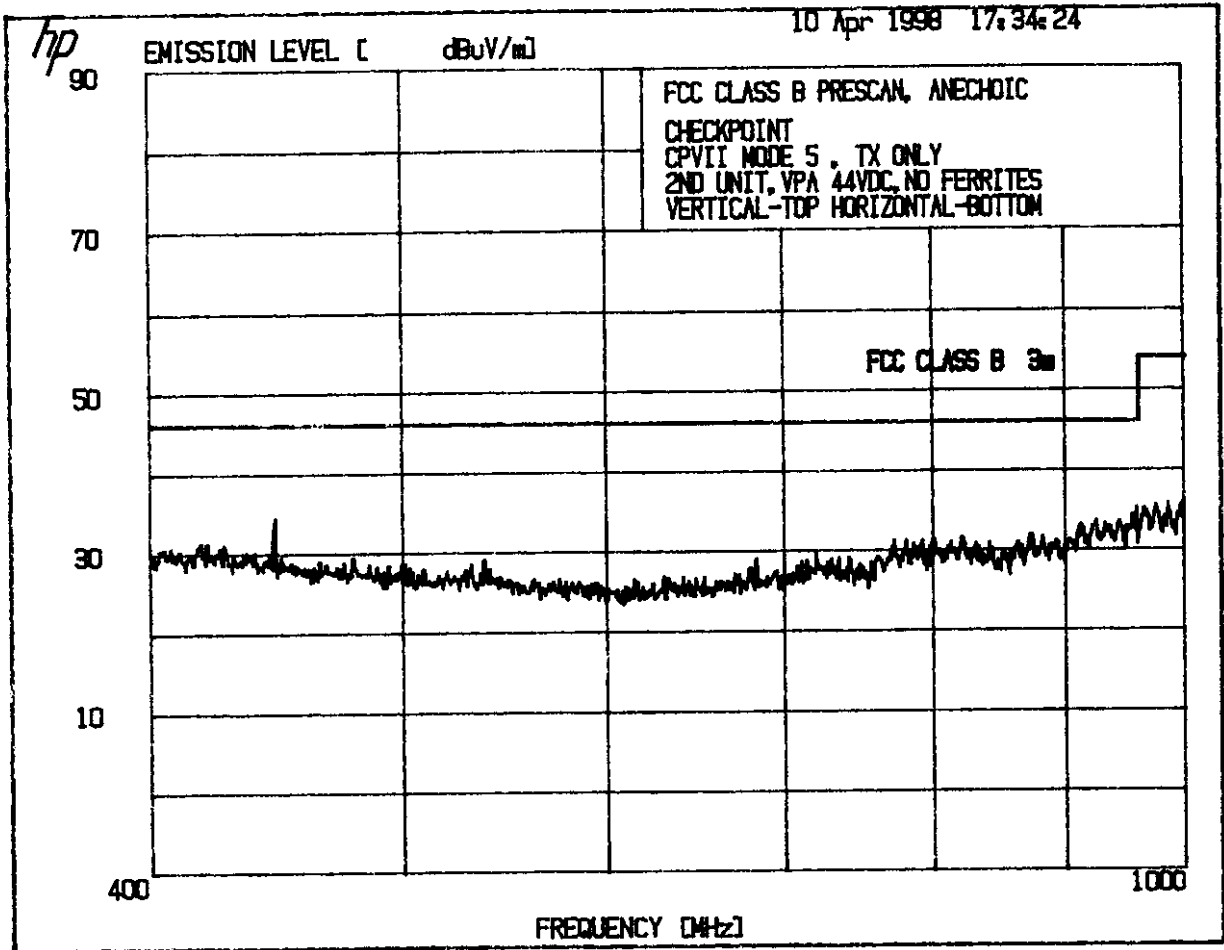
STOP 10.000 MHz
SWP 20 msec

VBW 30 KHz

START 6.000 MHz
RES BW 30 KHz







Symbol LS-9100-000AC Scanner SN B946089

**TABLE 6.2a
SUMMARY OF CONDUCTED DATA**

Antenna	AC Line	Frequency (MHz)	Measured ¹ (dB μ V)	Limit (dB μ V)
Symbol LS-9100-000AC Scanner SN B946089	Neutral	7.5	47.5	48
	Line	7.5	46	48
Judgment: EUT Passed By .5 dB				

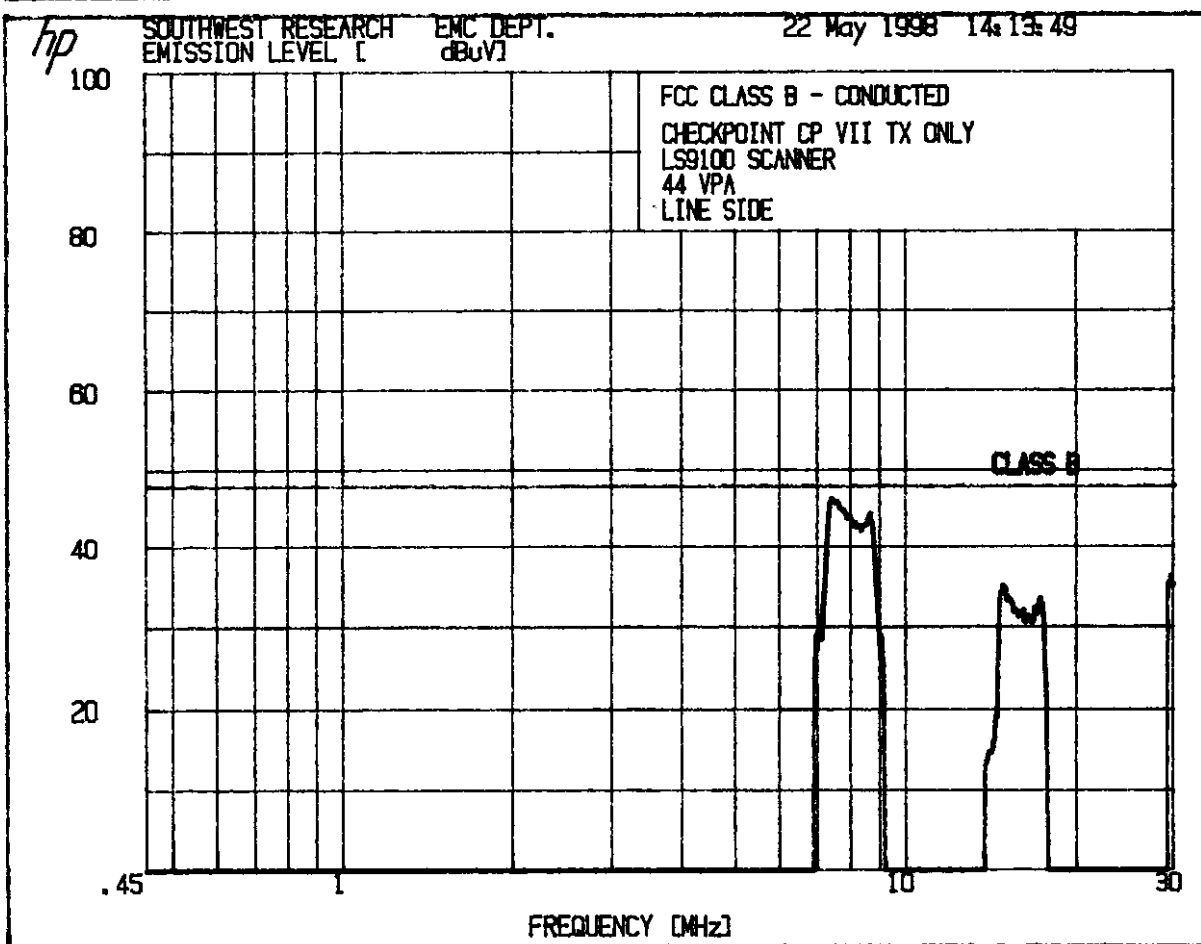
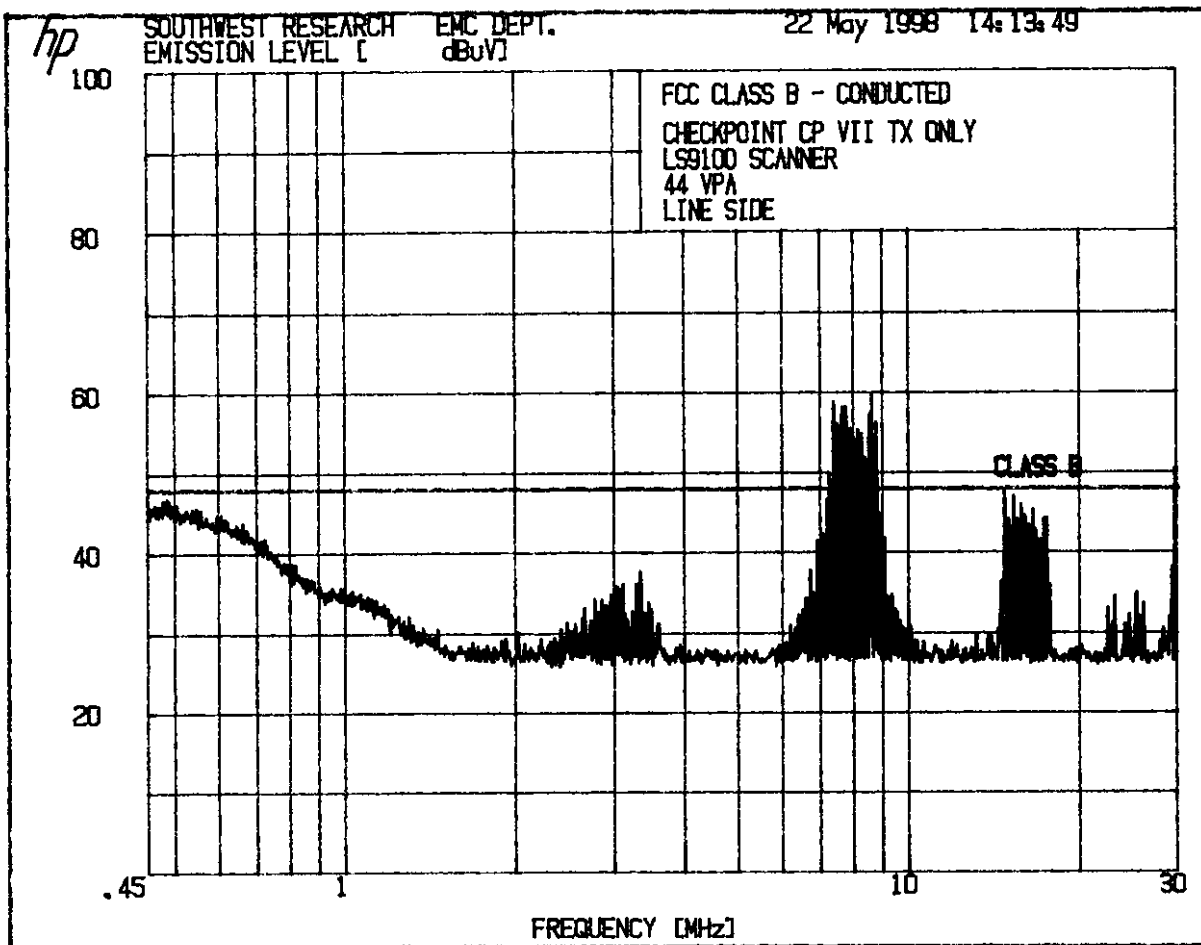
¹ All readings are QP measurements.

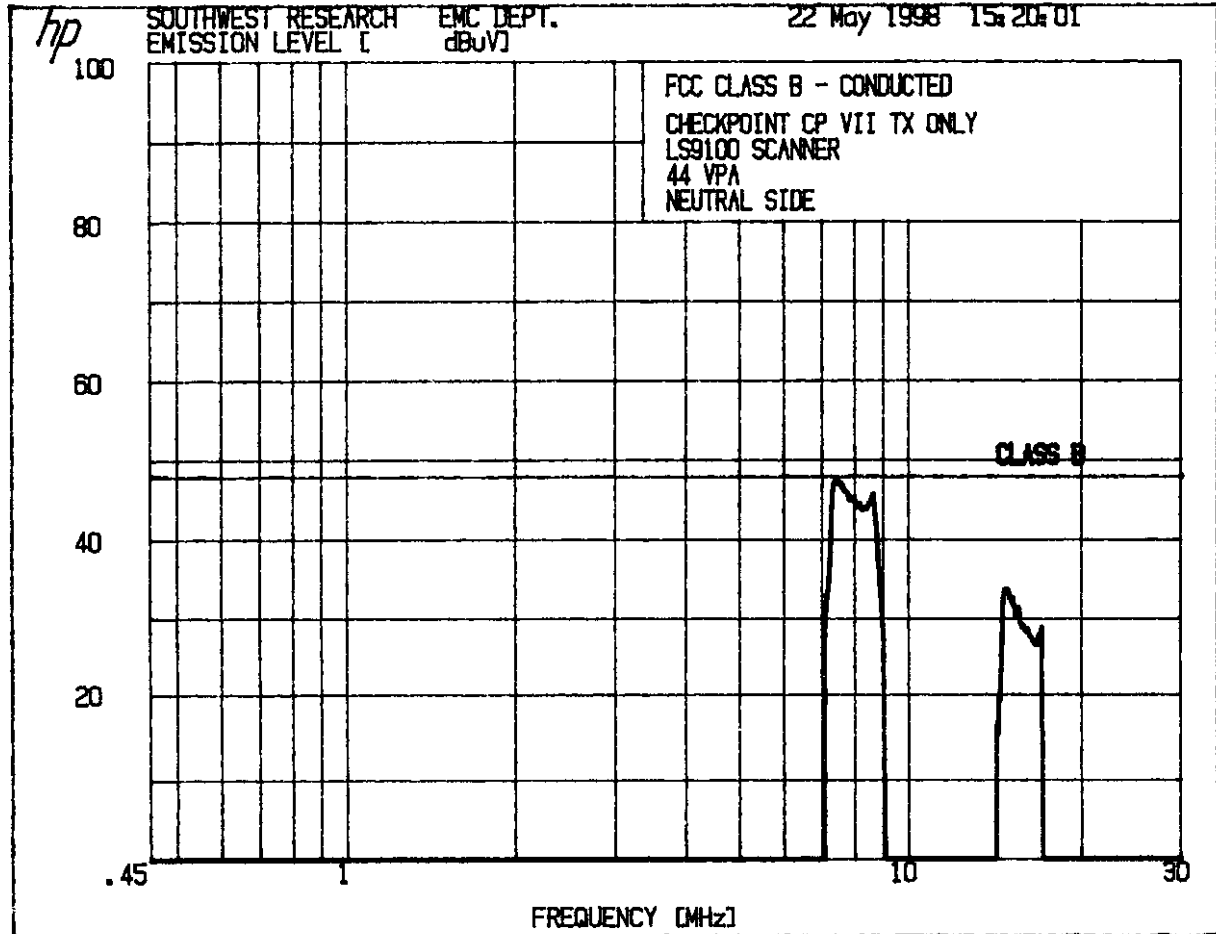
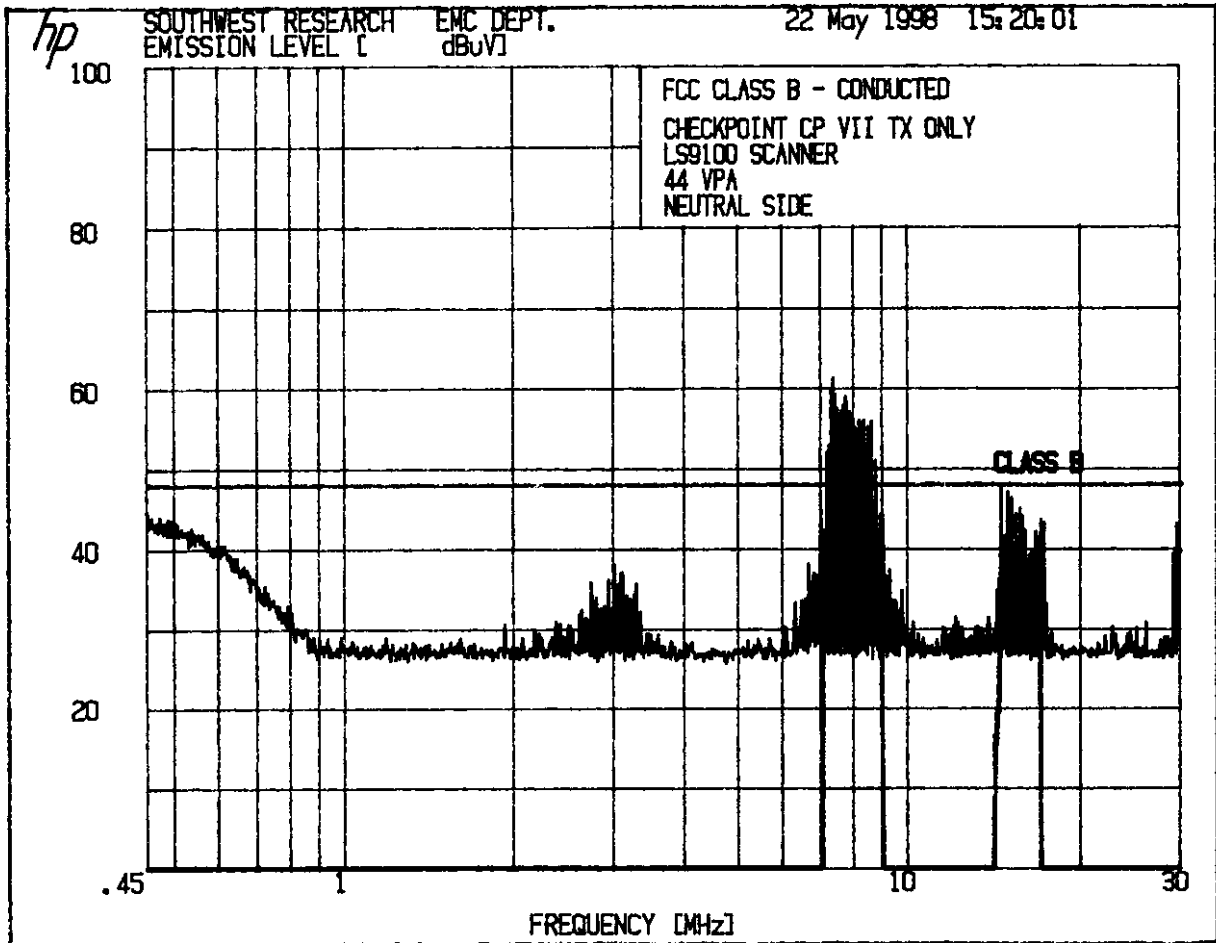
**TABLE 6.2b
MEASUREMENT OF FUNDAMENTAL FREQUENCY**

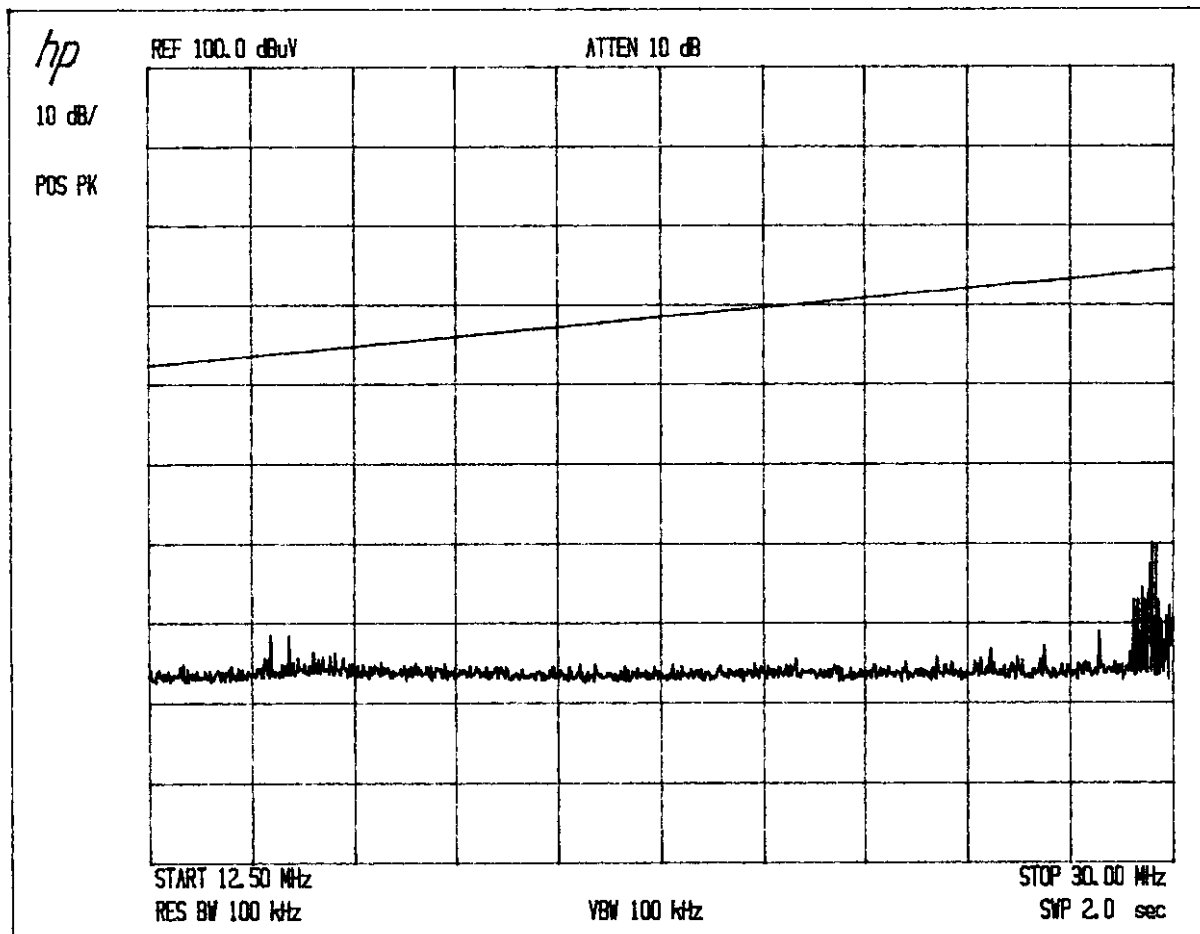
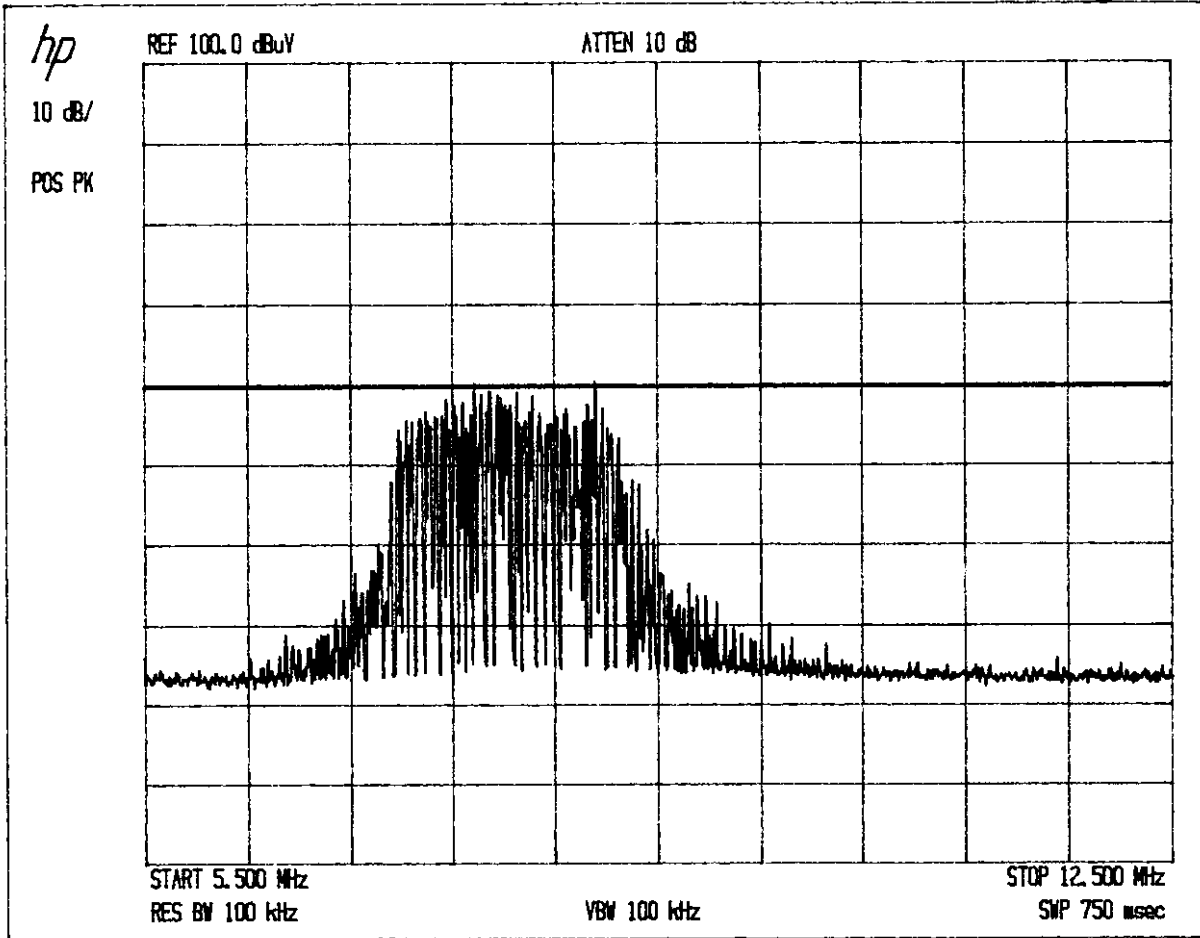
Antenna	Frequency (MHz)	Corrected Level DB(μ V/m)	Limit 30 Meters dB(μ V/m)
Symbol LS-9100-000AC Scanner SN B946089	Prescan data showed the level of the fundamental emission was below those of the other scanners tested. Therefore, no OATS measurement was made of this fundamental.		
Judgment: EUT Passed			

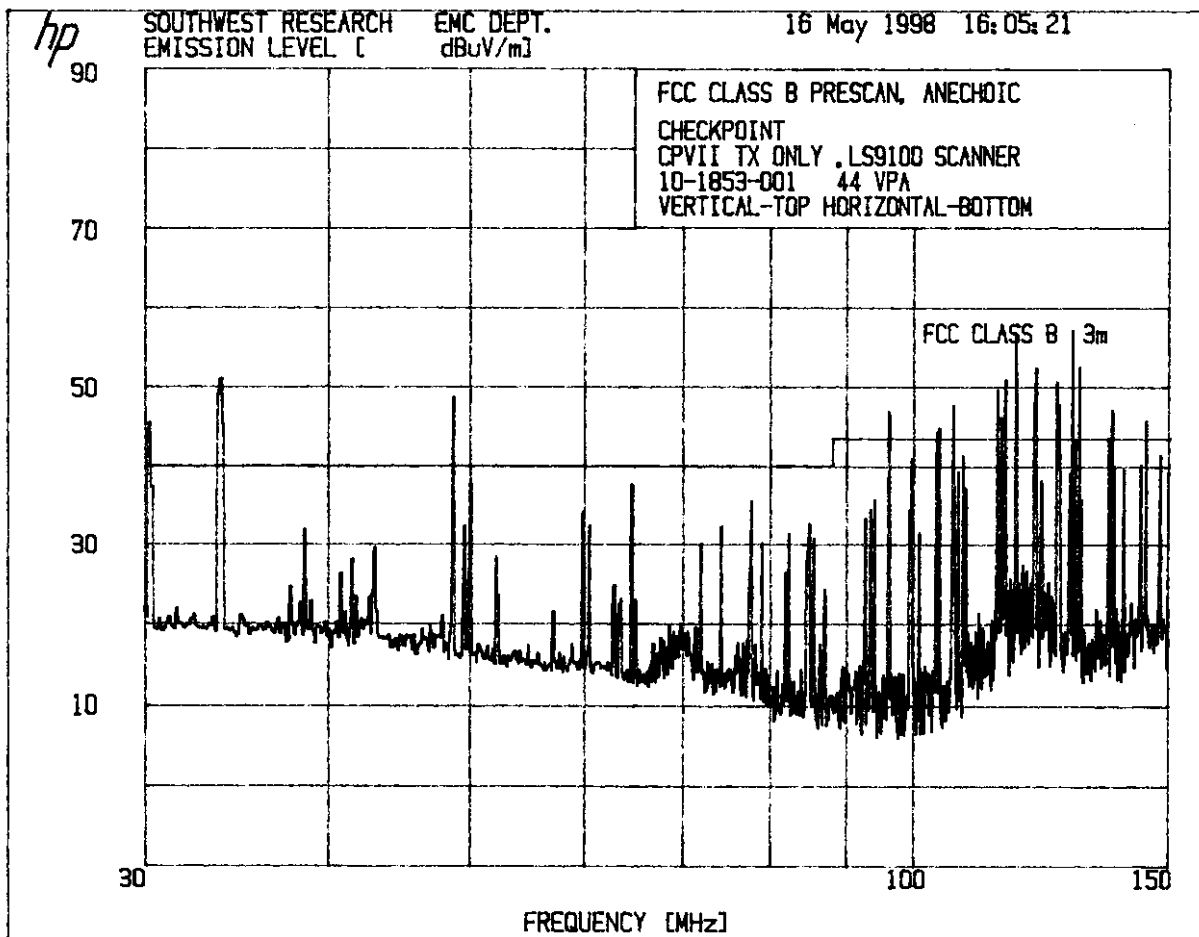
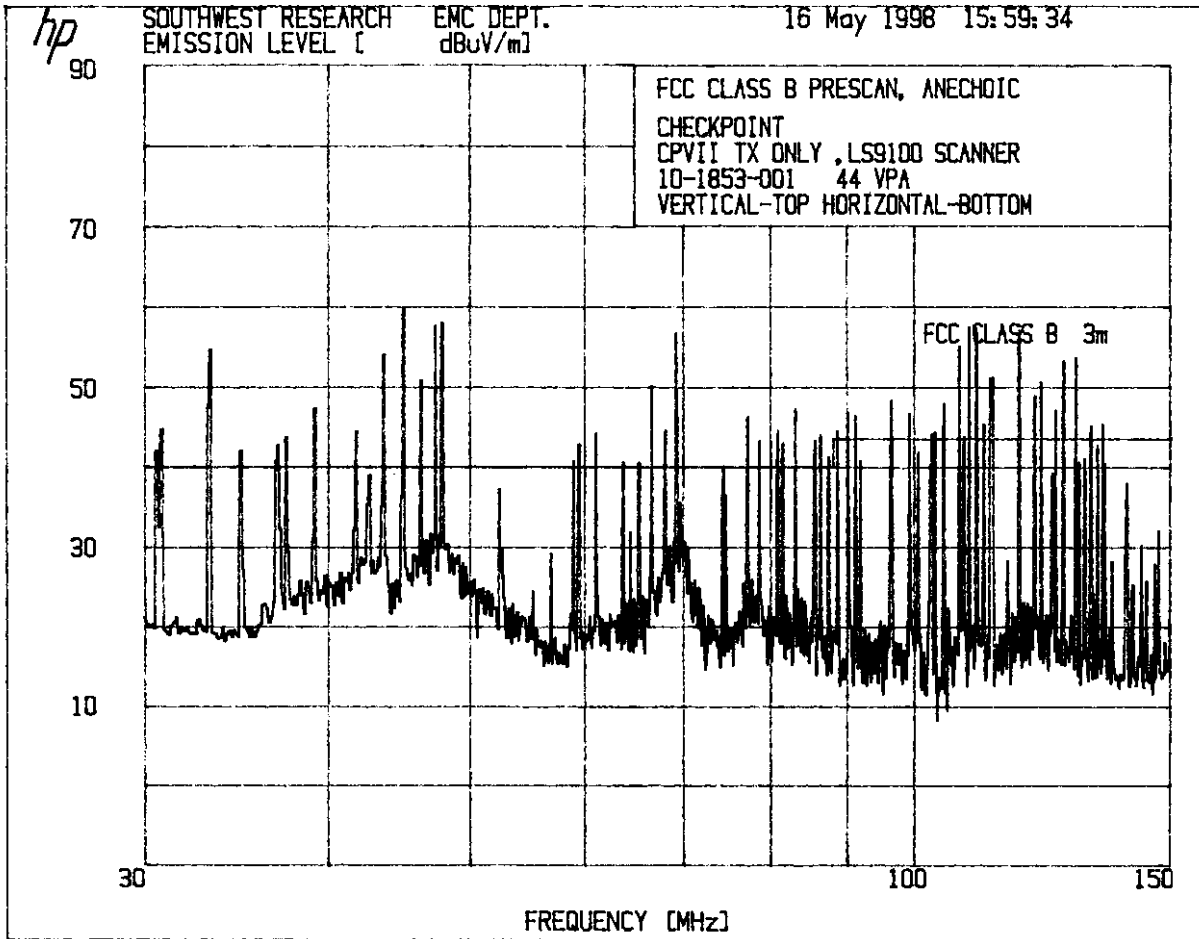
**TABLE 6.2c
MEASUREMENTS ON SPURIOUS EMISSIONS ABOVE 30 MHz**

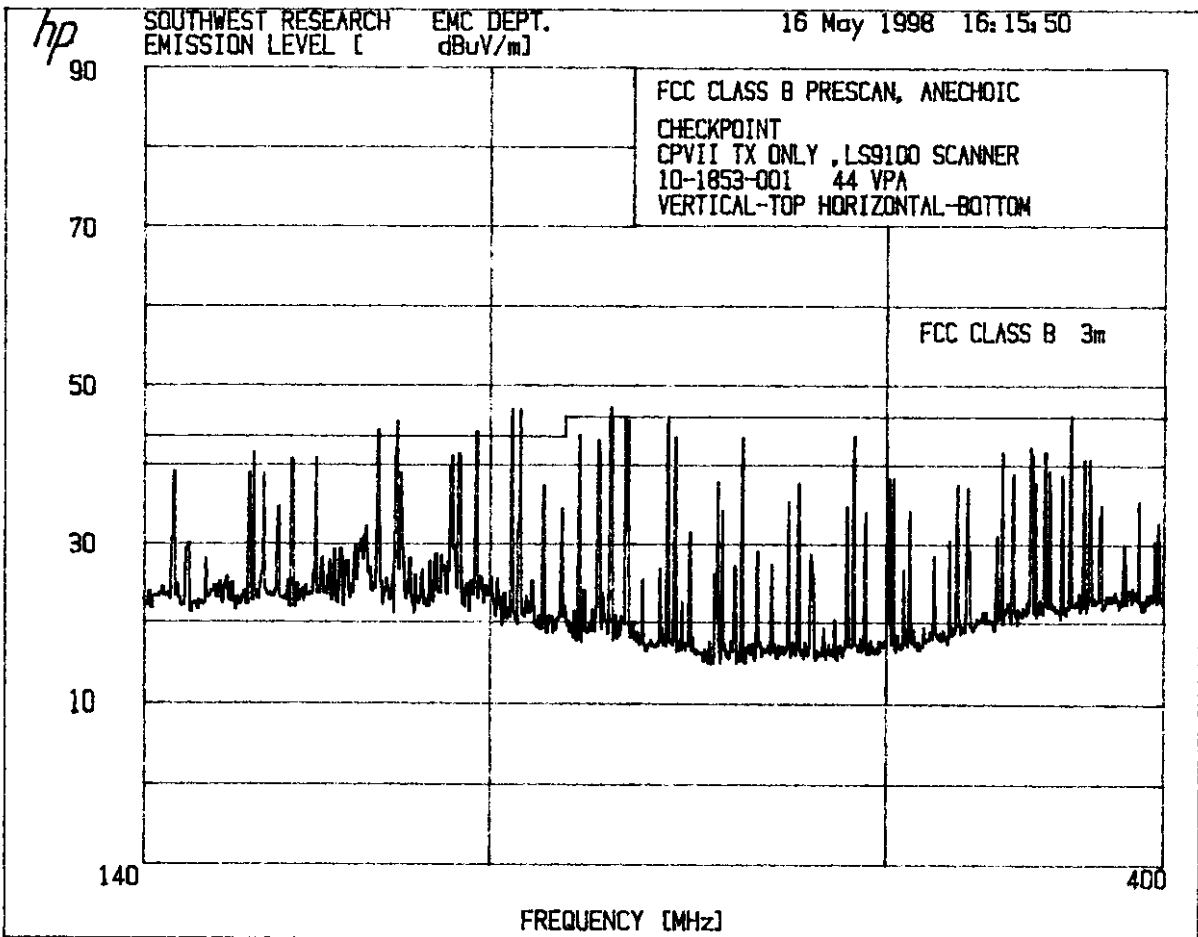
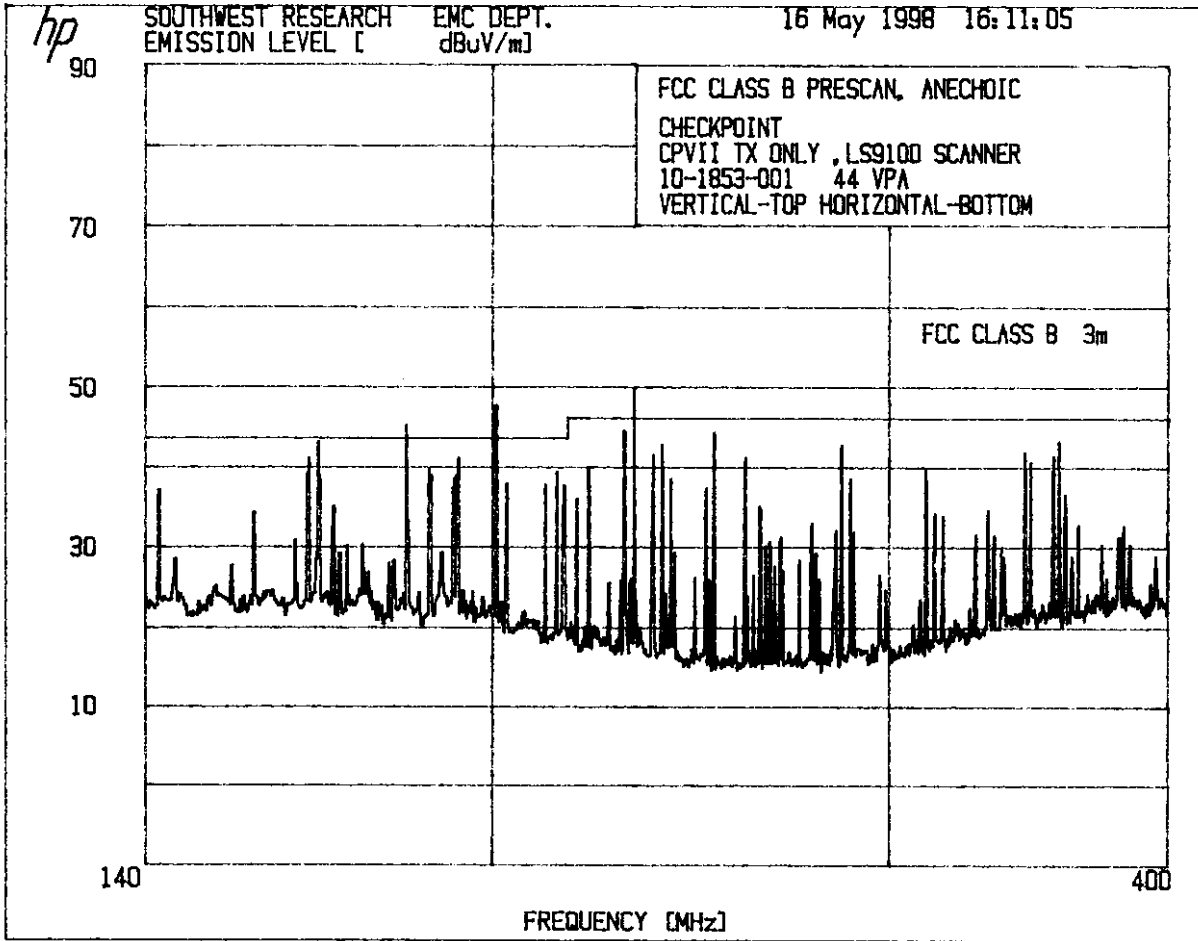
Frequency (MHz)	Corrected Level dB(μ V/m)	Limit DB(μ V/m)	Antenna
Prescan data showed 30 MHz – 1000 MHz emissions were below those of the other antennas tested. Therefore, no OATS measurements were made over this range.			LS9100
			LS9100
Judgment: EUT Passed			

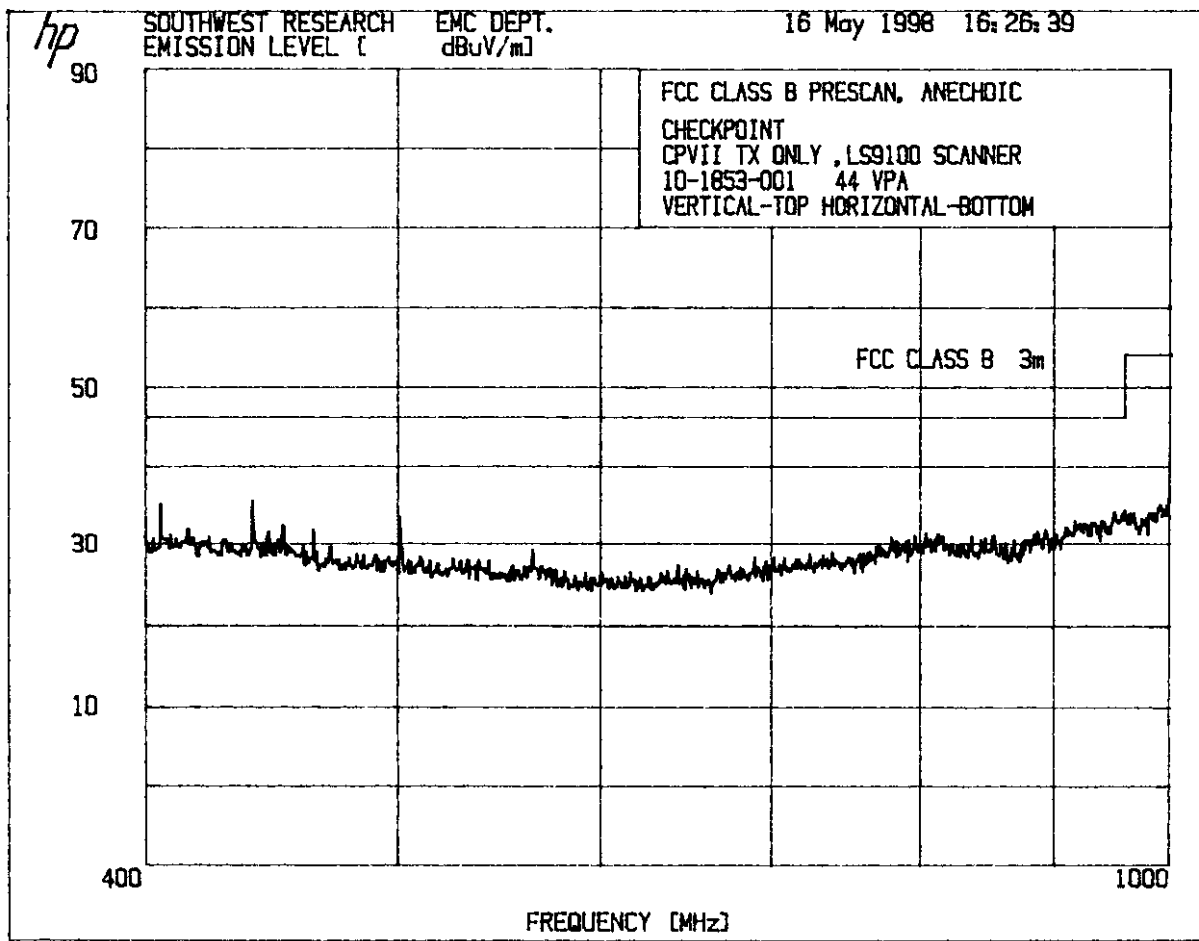
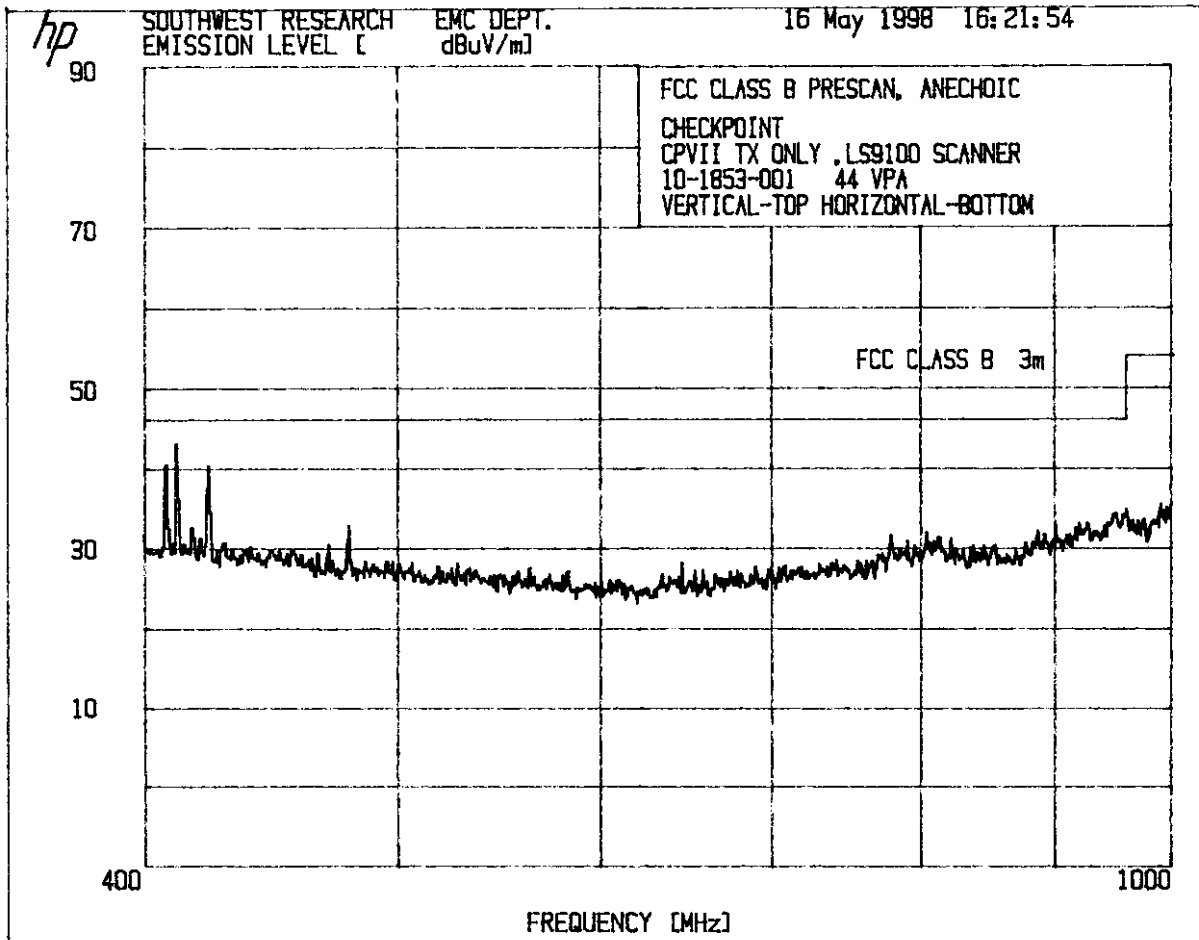












Symbol LS-5700-1000GC Scanner SN SM404963

**TABLE 6.3a
SUMMARY OF CONDUCTED DATA**

Antenna	AC Line	Frequency (MHz)	Measured ¹ (dB μ V)	Limit (dB μ V)
Symbol LS-5700-1000GC Scanner SN SM404963	Neutral	7.3	43.5	48
	Line	7.4	42	48
Judgment: EUT Passed By 4.5 dB				

¹ All readings are QP measurements.

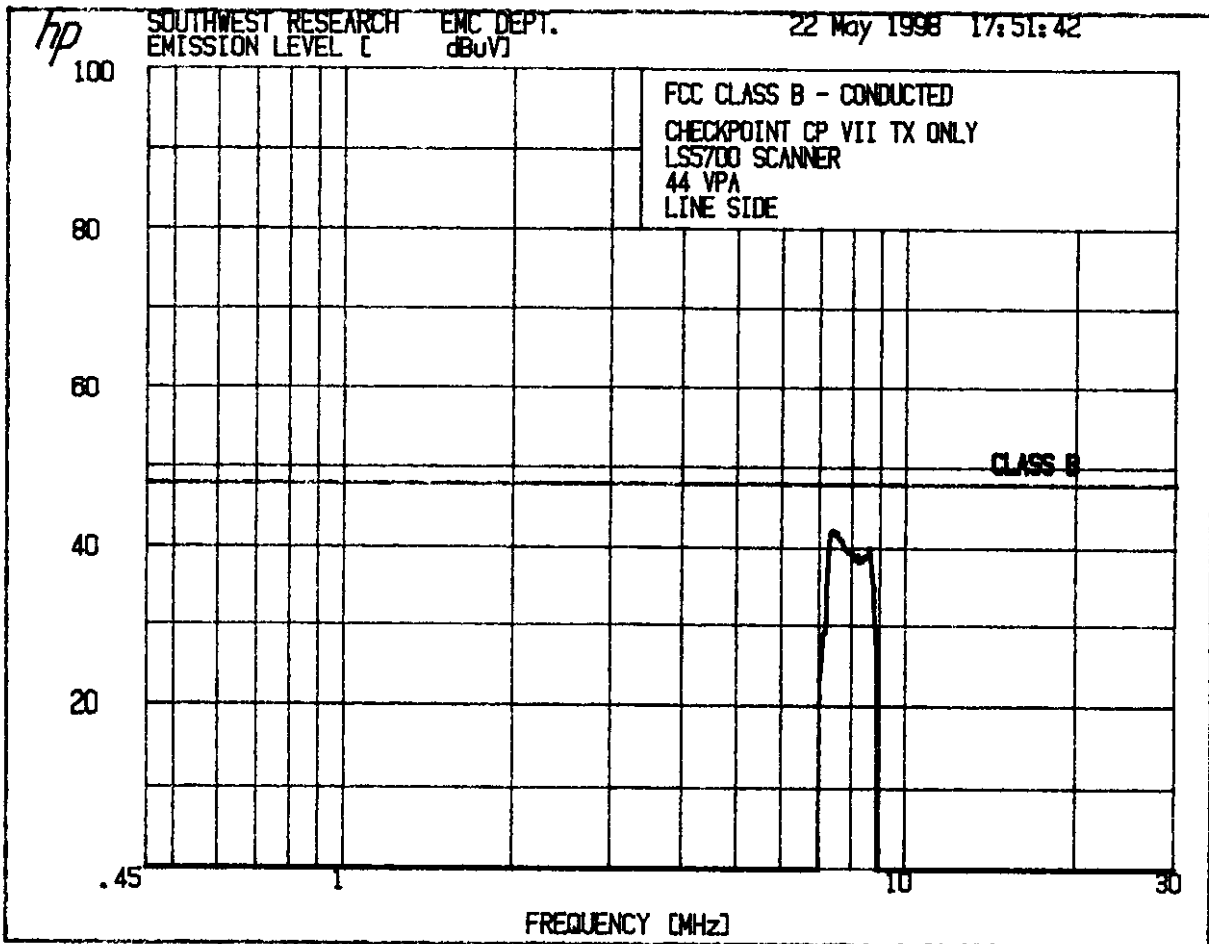
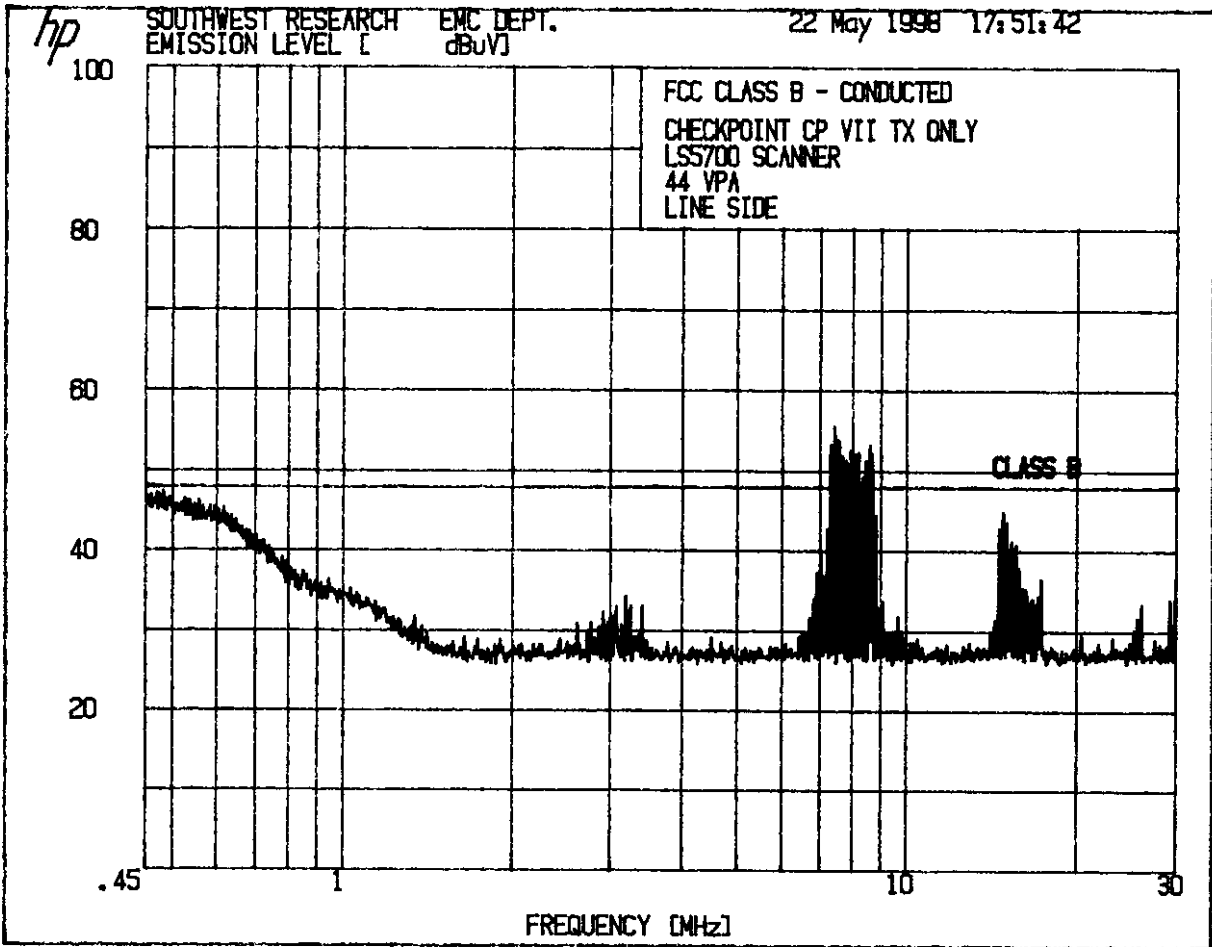
**TABLE 6.3b
MEASUREMENT OF FUNDAMENTAL FREQUENCY**

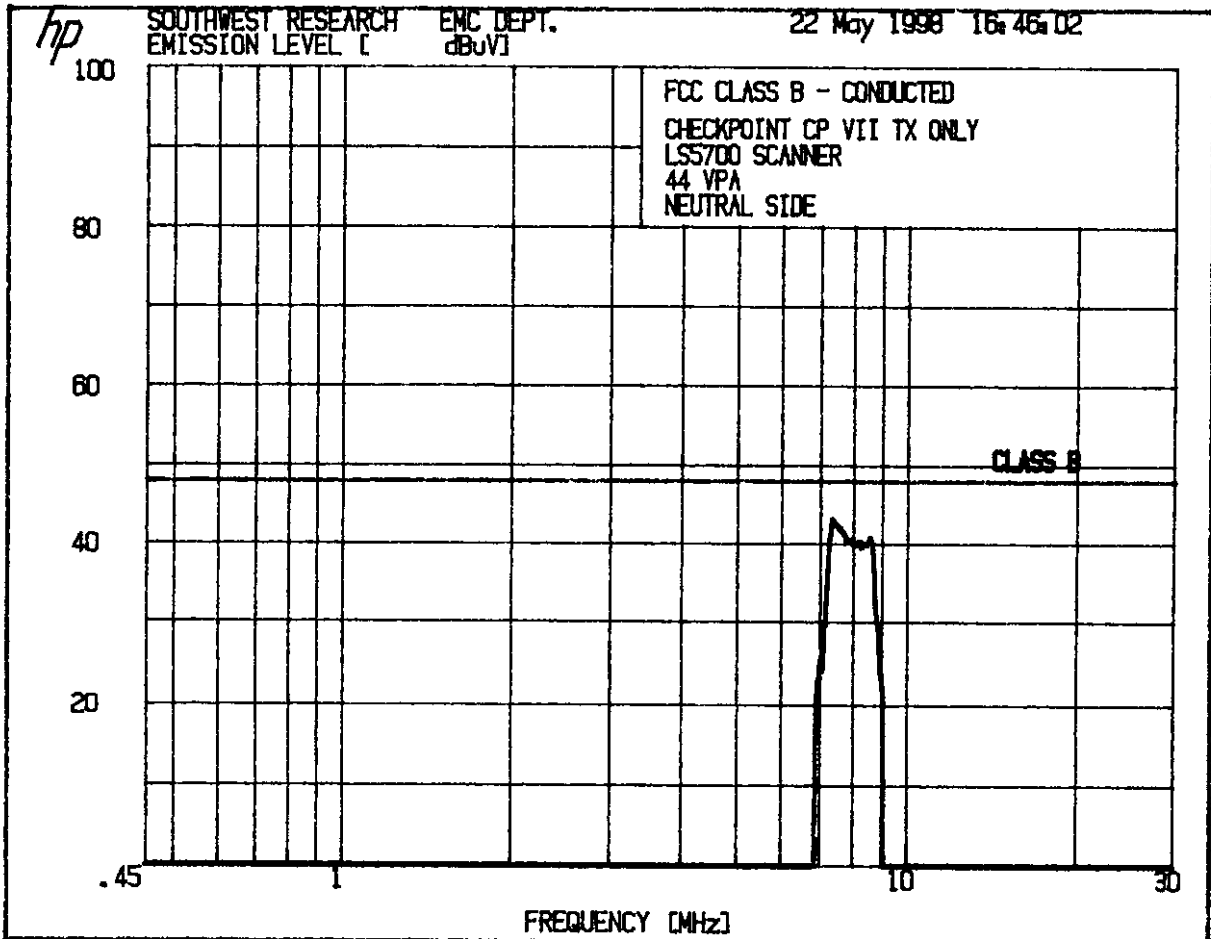
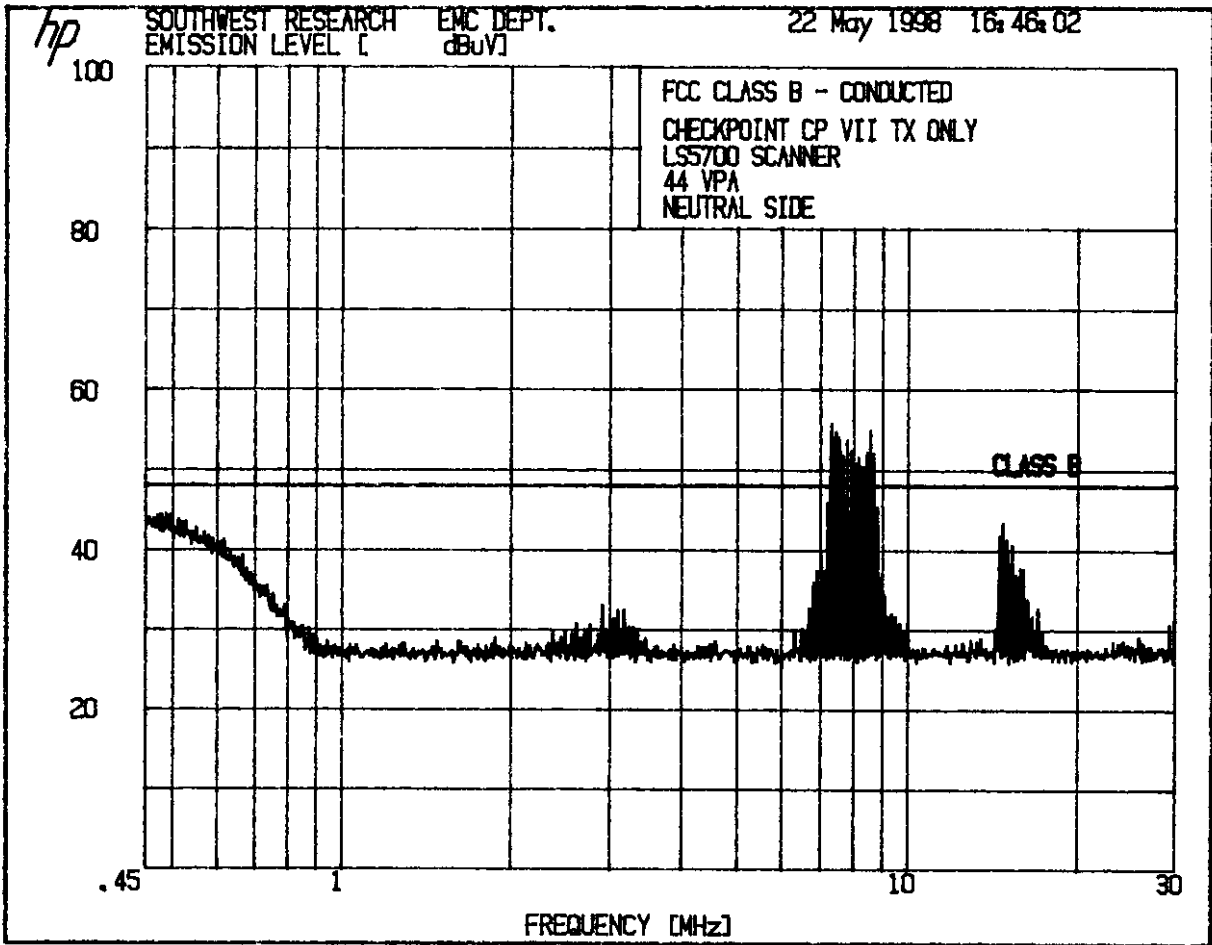
Antenna	Frequency (MHz)	Corrected Level ¹ DB(μ V/m)	Limit 30 Meters DB(μ V/m)
Symbol LS-5700-1000GC Scanner SN SM404963	8.62	34.6	43.5 ²
Judgment: EUT Passed By 8.9 dB			

- 1 Measurements were made with an HP 8566B Spectrum Analyzer using a ALR 25 loop antenna, that was rotated around its vertical axis for highest signal level. A 300 kHz receive bandwidth was used on the spectrum analyzer to determine the highest pulse signal level and then the signal was averaged with a -20 dB averaging factor.
- 2 Measurement made at 20 meters because fundamental could not be seen at 30 meters.

**TABLE 6.3c
MEASUREMENTS ON SPURIOUS EMISSIONS ABOVE 30 MHz**

Frequency (MHz)	Corrected Level dB(μ V/m)	Limit dB(μ V/m)	Antenna
Prescan data showed 30 MHz ~ 1000 MHz emissions were below those of the other antennas tested. Therefore, no OATS measurements were made over this range.			LS5700
			LS5700
			LS5700
			LS5700
Judgment: EUT Passed			





FREQUENCY (MHz)	8.62	8628							
TRANSDUCER	ALR 25 BAND 9								
TRANSDUCER DIST. from EUT(m)/HEIGHT(m)	20	30							
POLARIZATION (V,H) AMBIENT NOISE (A)	7 [E] [H]	7 [E] [H] (A)							
SIGNAL DIRECTION	MAX °	MAX °							
RECEIVER BW	100K	100K							
ATTENUATION (dB)	100K	100K							
METER READING (dB μ V) <i>spectrum analyzer</i>	42.9	37.2							
TRANSDUCER FACTOR (dB)	38.78	38.78							
EXTERNAL GAIN/ CABLE LOSS (dB)	-28	-28							
CORRECTED LEVEL (dB μ V/m) <i>average factor</i>	9	9							
	-20	-20							
	34.58	28.88							
LIMIT (dB μ V/m)	43.5	40							

Date: May 25, 1998 Detection Method: CISPR PEAK AVERAGE Other
 OPR/Asst.: RAM EUT LS 5700 CPVII Mode 5

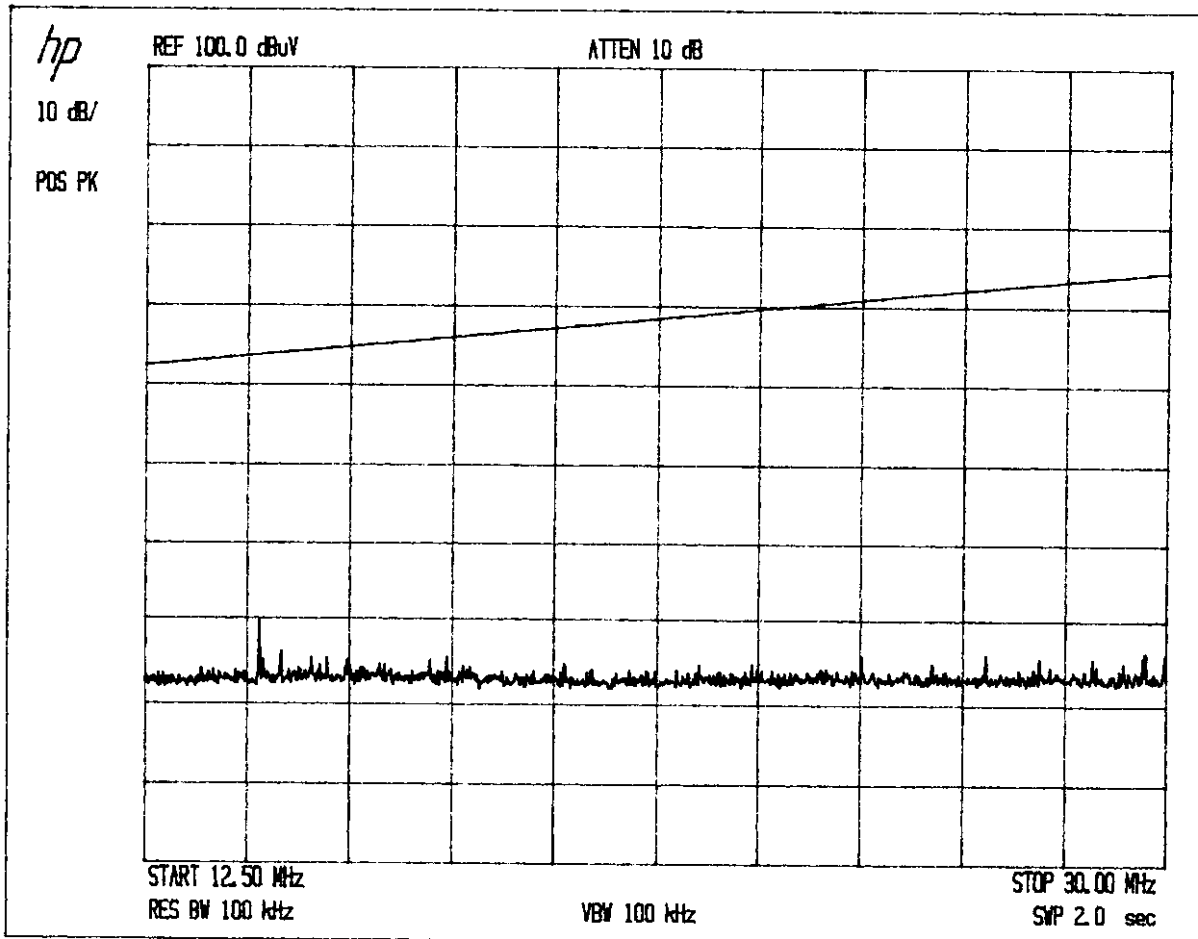
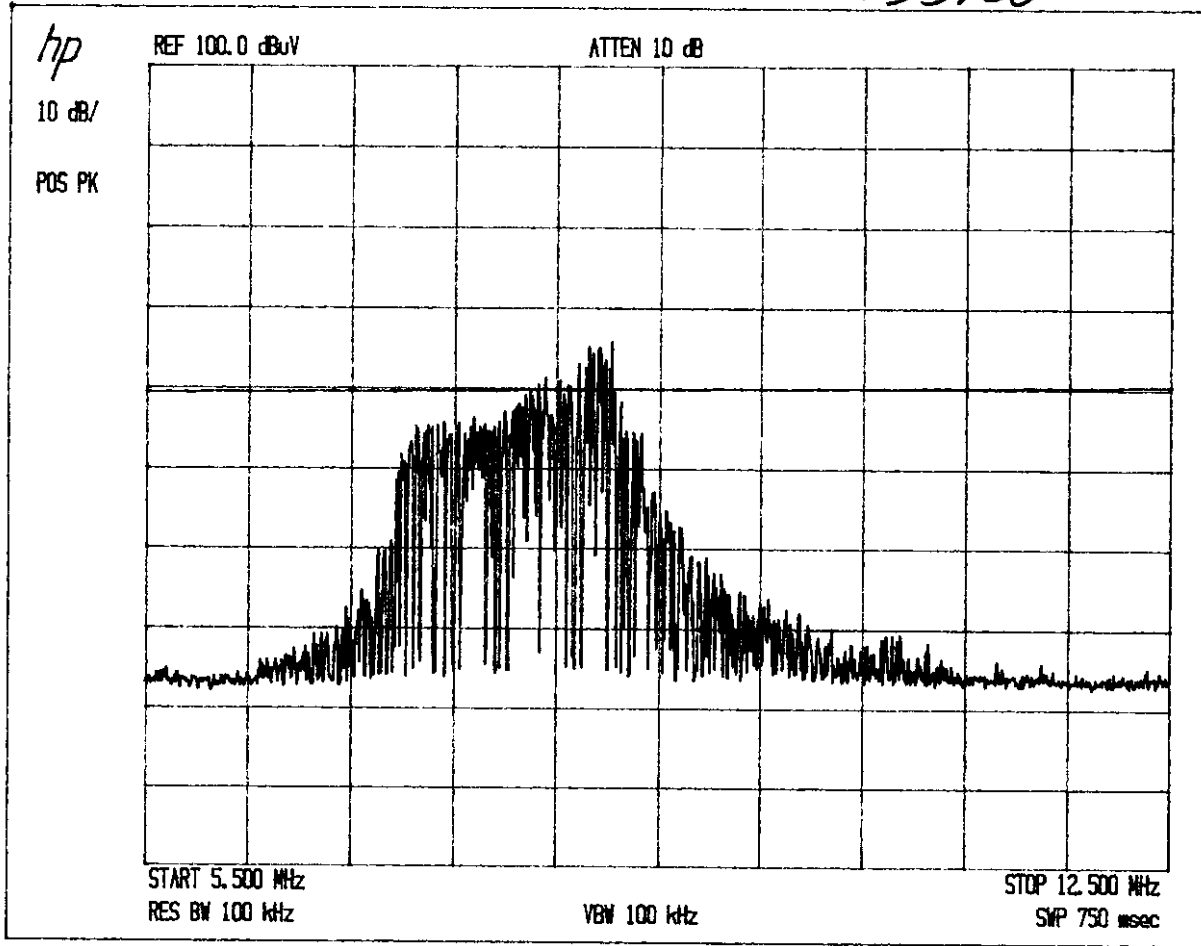
Conf. Run of Notes: (A) Ambient
 Page of

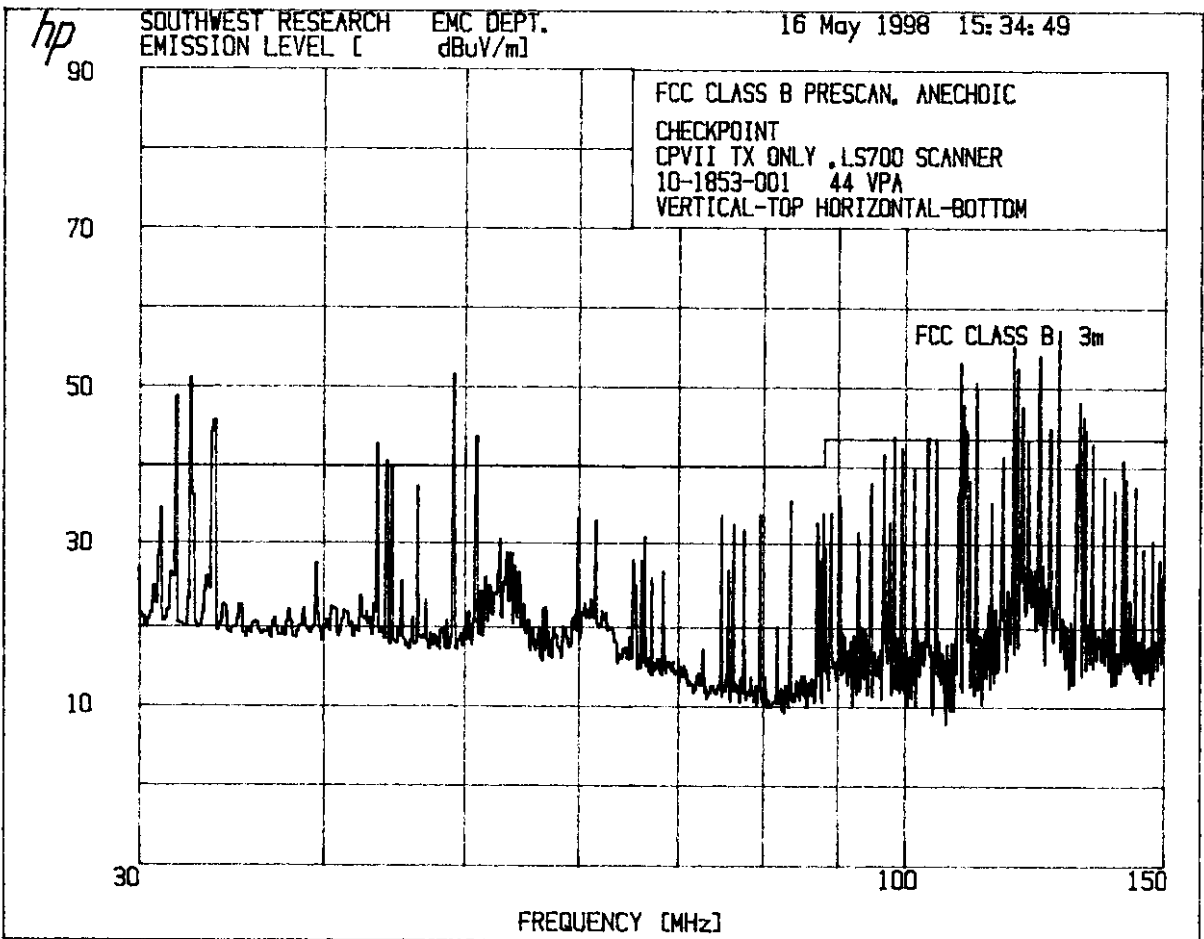
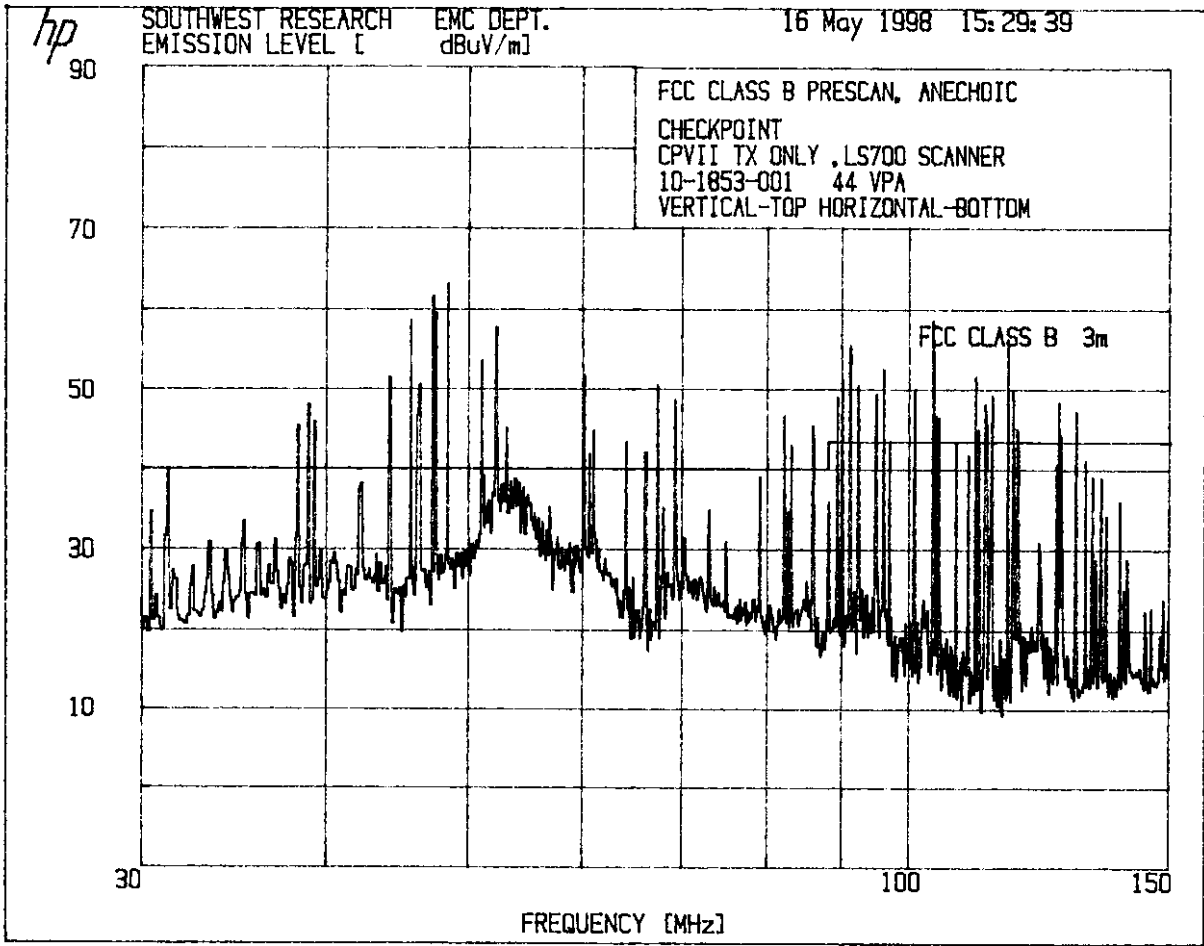
Project No.: 10-1853-001

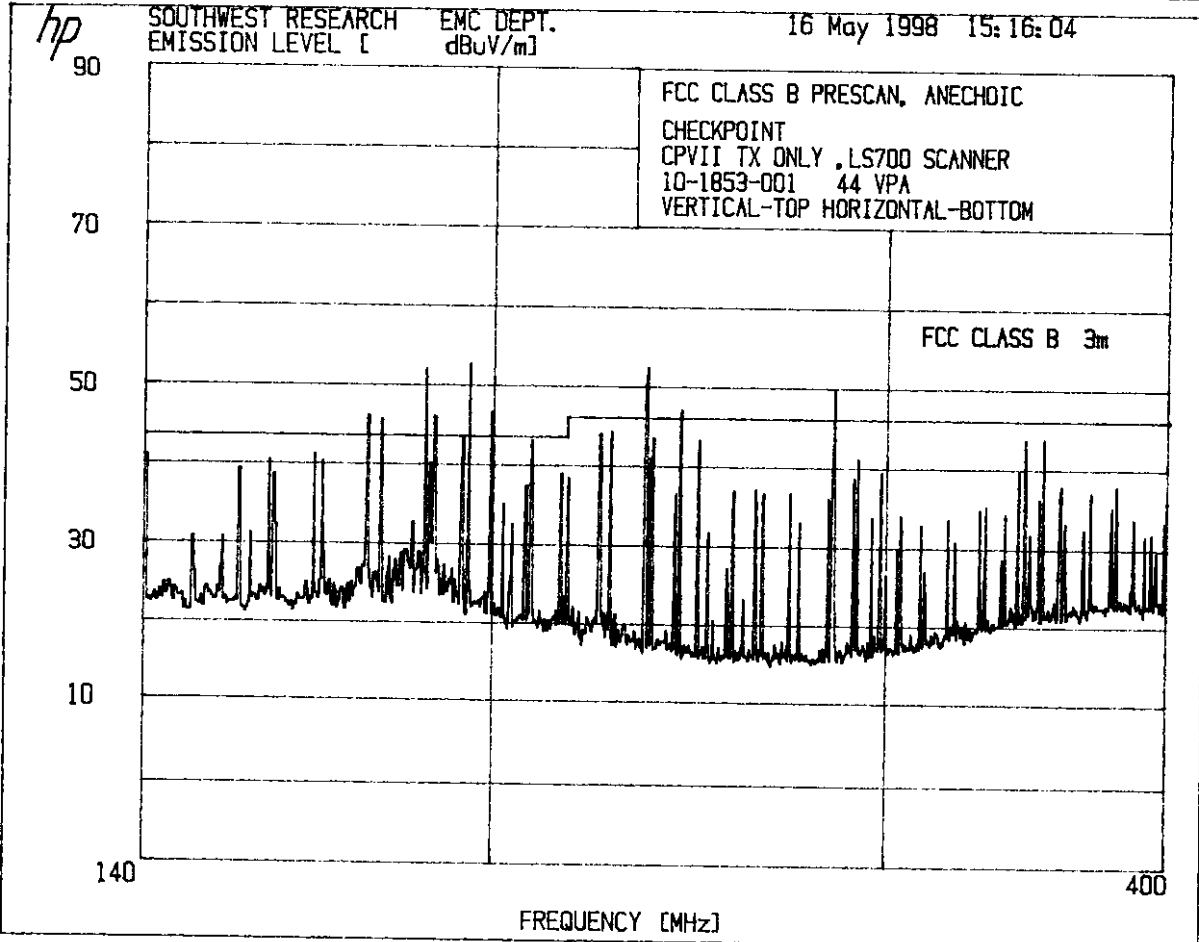
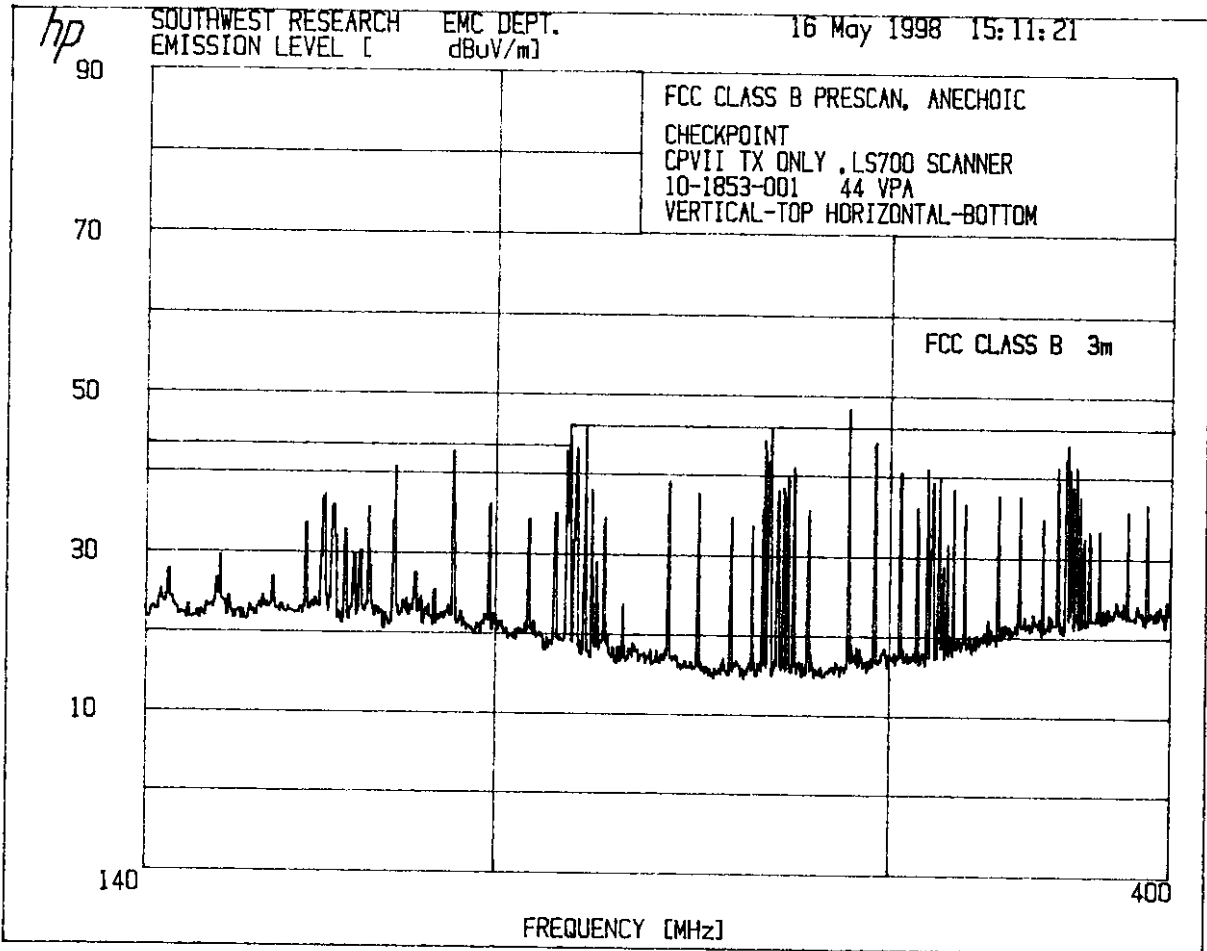
Test Category:

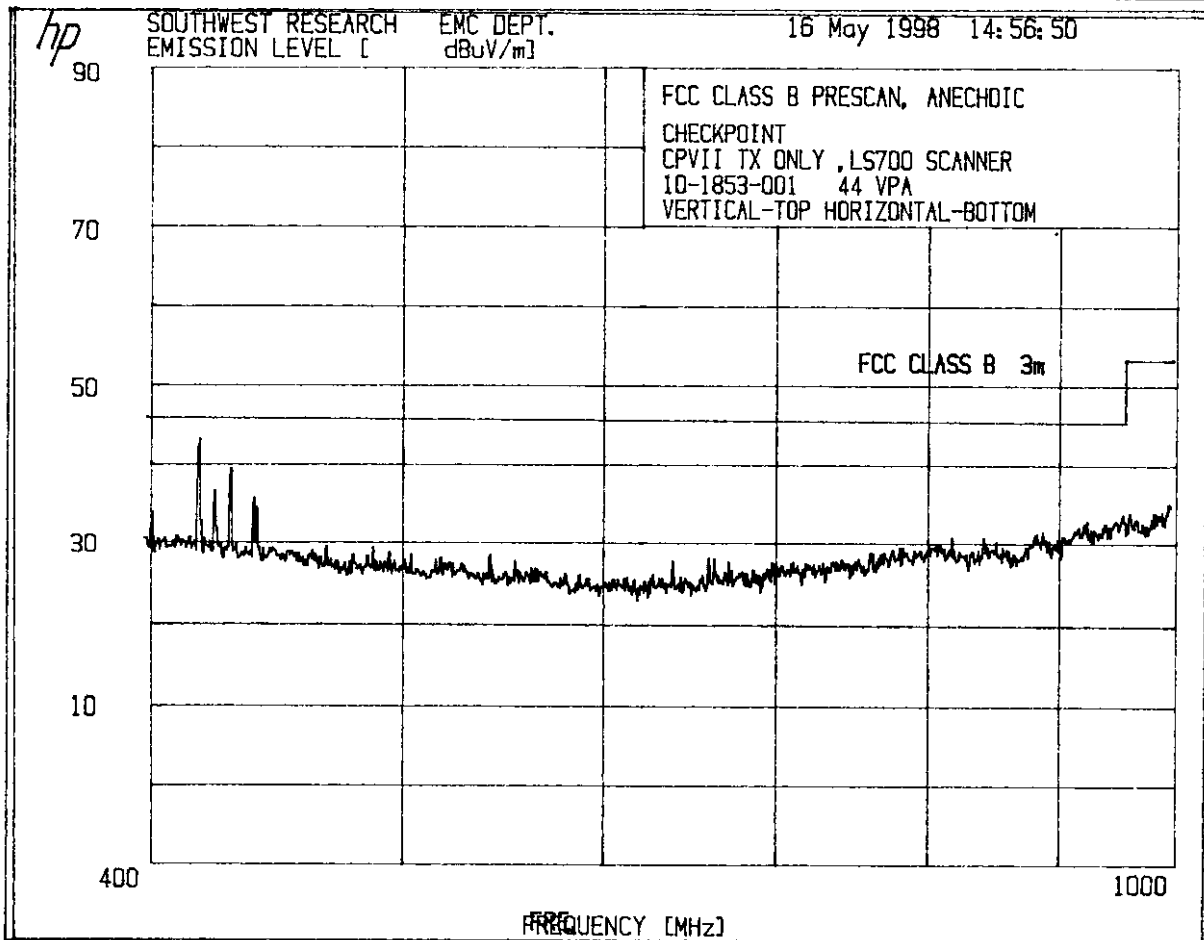
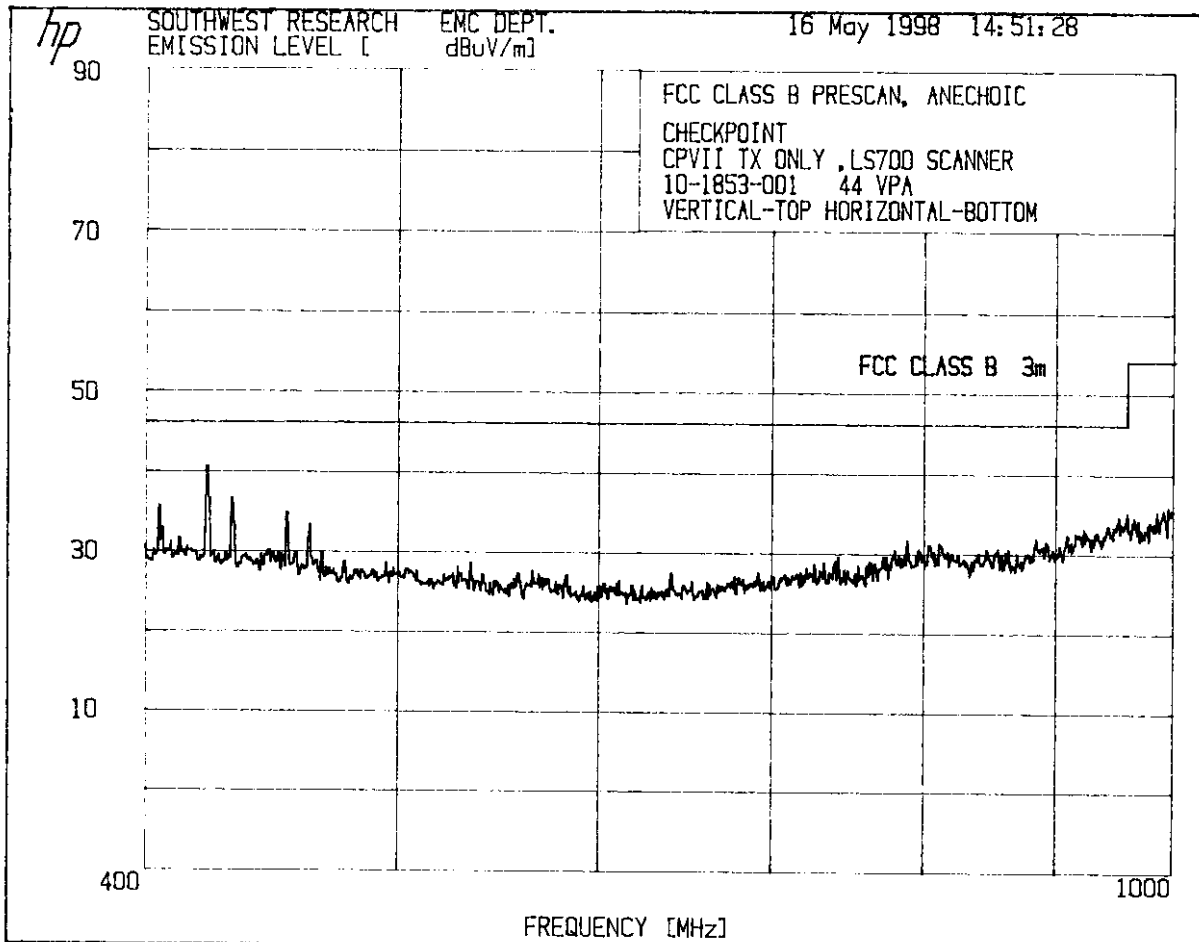
Time, Temp., & % r.H.: 1600 / 52% / 89°F

Approved: David A. Carmany









Spectra-Physics VS1000 Scanner SN X060771

TABLE 6.4a
SUMMARY OF CONDUCTED DATA

Antenna	AC Line	Frequency (MHz)	Measured ¹ (dB μ V)	Limit (dB μ V)
Spectra-Physics VS1000 Scanner SN X060771	Neutral	8.7	44.5	48
	Line	8.7	44	48
Judgment: EUT Passed By 3.5 dB				

¹ All readings are QP measurements.

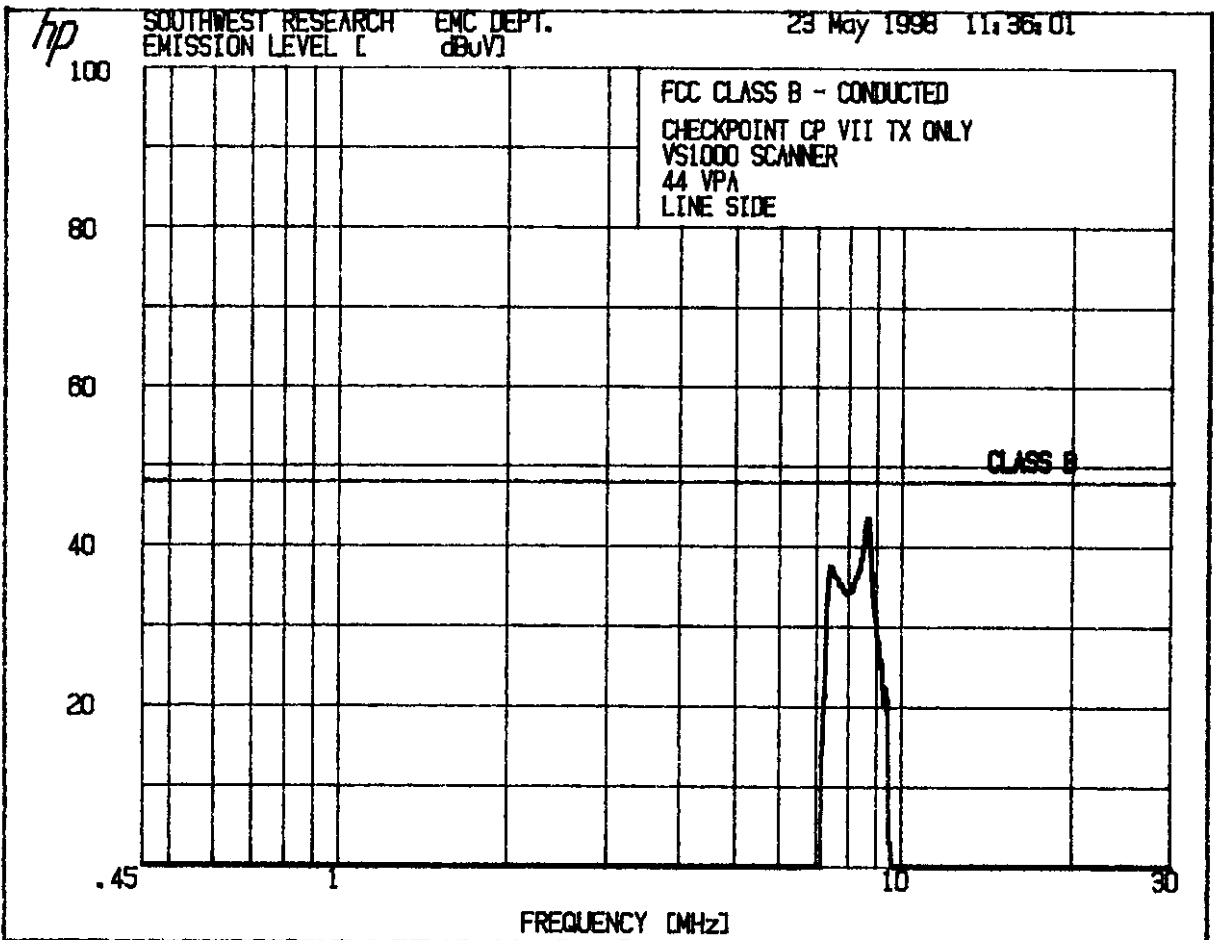
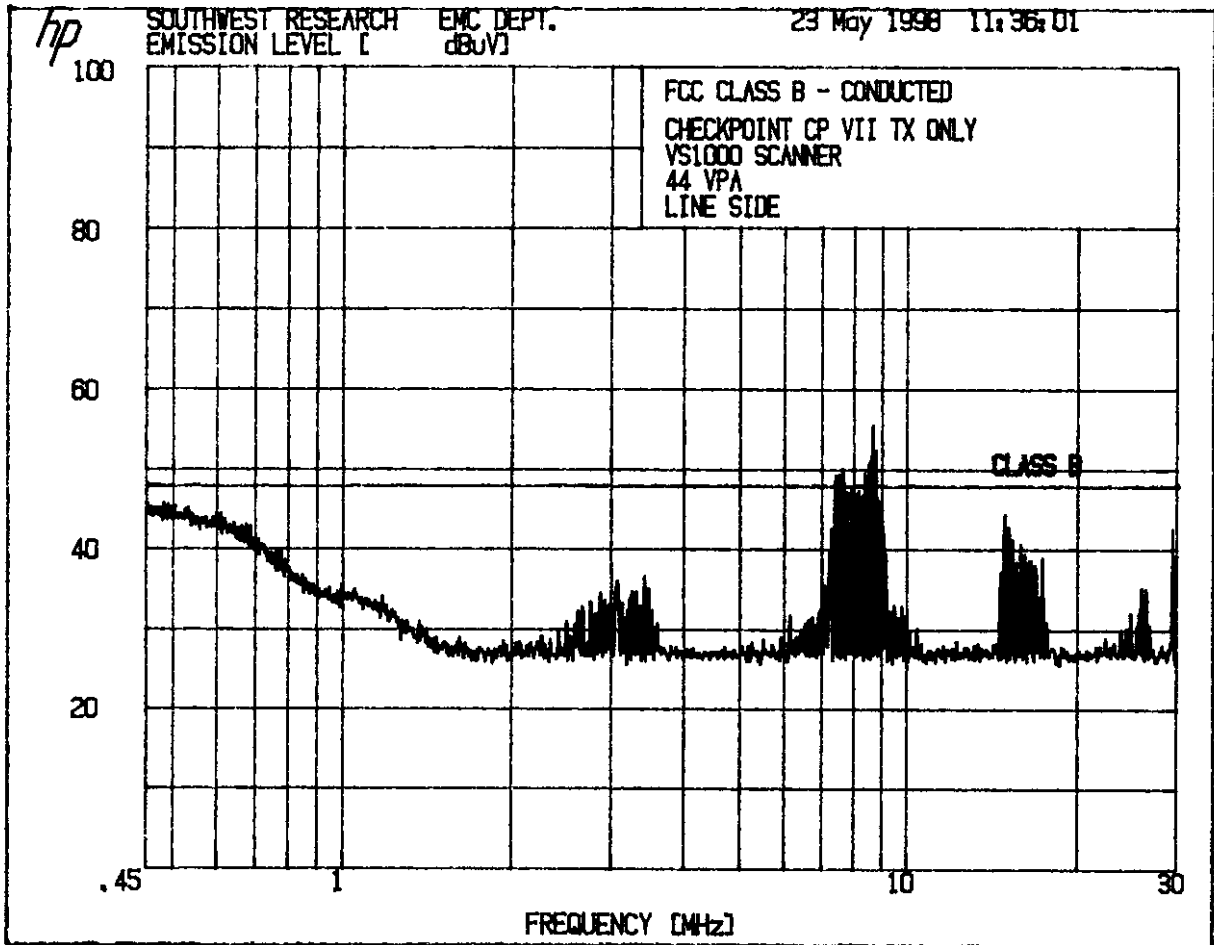
TABLE 6.4b
MEASUREMENT OF FUNDAMENTAL FREQUENCY

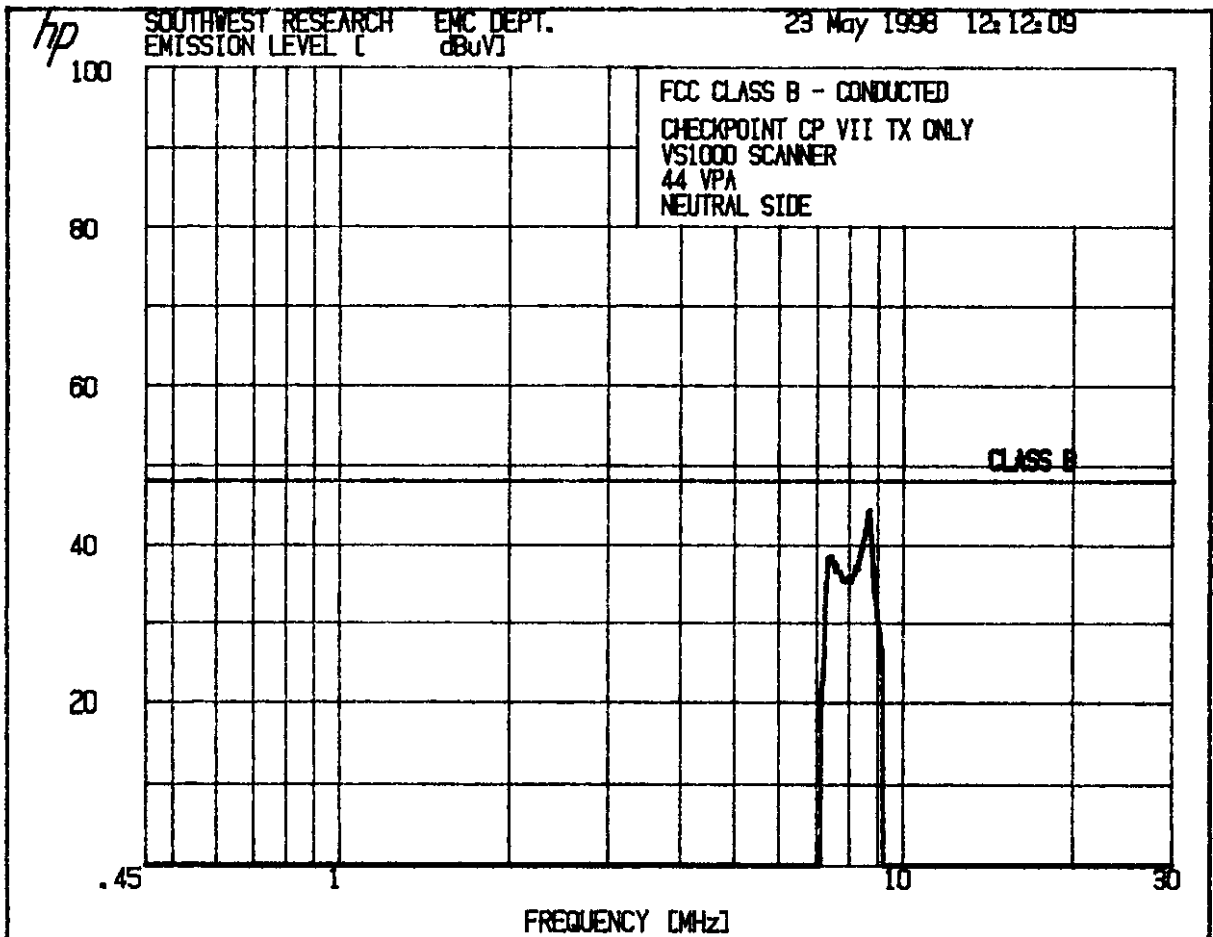
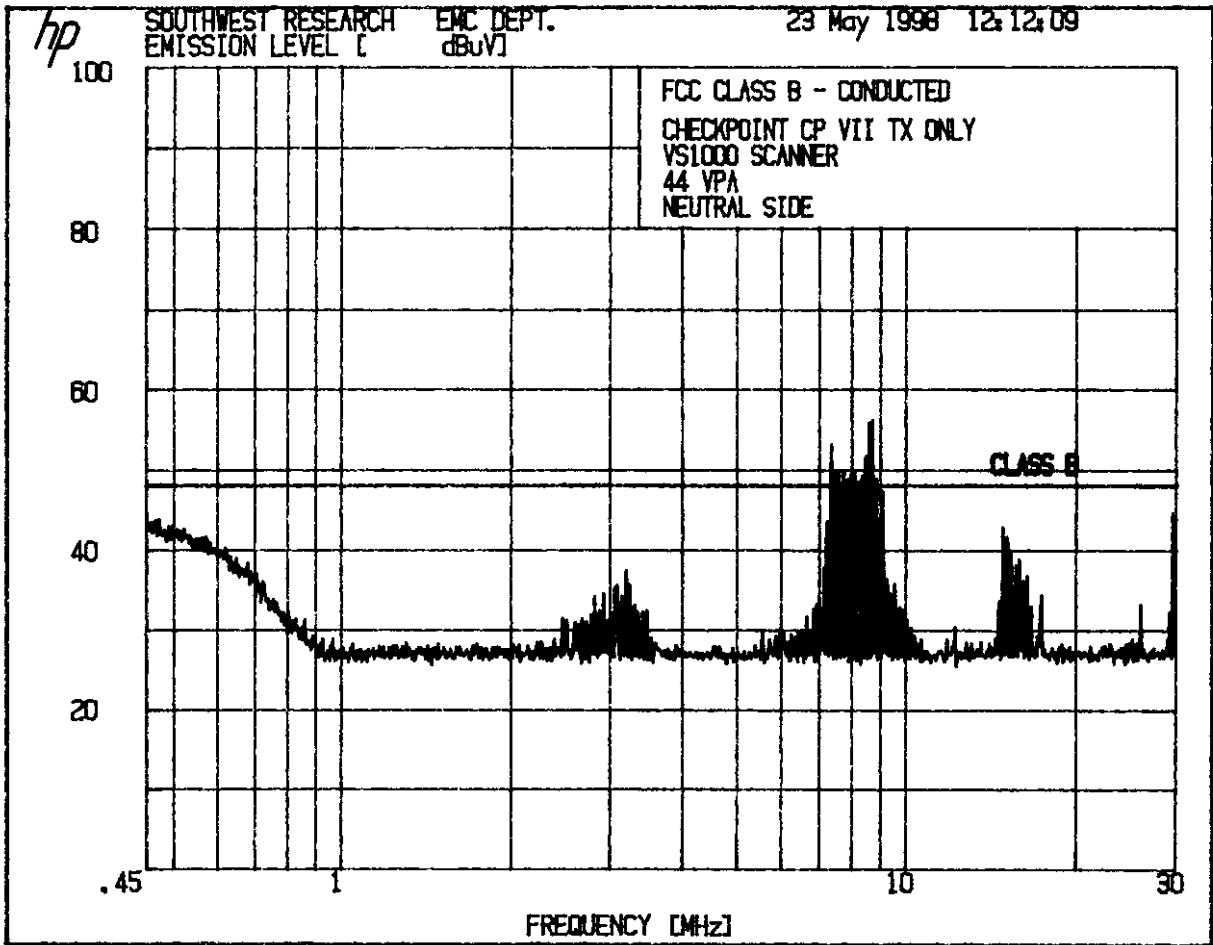
Antenna	Frequency (MHz)	Corrected Level DB(μ V/m)	Limit 30 Meters dB(μ V/m)
Spectra-Physics VS1000 Scanner SN X060771	Prescan data showed the level of the fundamental emissions was below those of the other scanners tested. Therefore no OATS measurement was made of this fundamental.		
Judgment: EUT Passed			

TABLE 6.4c
MEASUREMENTS ON SPURIOUS EMISSIONS ABOVE 30 MHz

Frequency (MHz)	Corrected Level ¹ dB(μ V/m)	Limit dB(μ V/m)	Antenna
51.83	38.8	40.0	VS1000
200.13	35.6	43.5	VS1000
Judgment: EUT Passed By 1.2 dB			

¹ All readings are quasi-peak manual measurements made with a receiver.





FREQUENCY (MHz)	51.83	122.31	69.01	51.81	174.96	200.13	234.2	235.32	274.71
TRANSDUCER									
TRANSDUCER DIST. from EUT(m)/HEIGHT(m)	3 / 1.3	3 / 1.3	3 / 1.3	3 / 4.0	3 / 1.0	3 / 1.0	3 / 1.0	3 / 1.0	3 / 1.0
POLARIZATION (V,H) AMBIENT NOISE (A)	V	V	V	H	H	H	H	H	H
SIGNAL DIRECTION	180°	0°	0°	0°	270°	270°	270°	270°	270°
RECEIVER ATTENUATION (dB)	10	0	0	0	20	20	20	20	20
METER READING (dBμV)	75	14.0	16.0	14.0	17.0	19.5	17.5	19.0	16.0
TRANSDUCER FACTOR (dB)	11.3	13.0	6.8	11.3	17.9	18.3	21.3	21.2	18.6
EXTERNAL GAIN/ CABLE LOSS (dB)	2.5	4.5	3.1	2.5	-22.4	-22.7	-21.7	-21.8	-20.8
CORRECTED LEVEL (dBμV/m)	38.8	31.5	25.9	27.8	32.5	35.6	37.1	38.4	33.8
LIMIT (dBμV/m)	40	43.5	40	40	43.5	43.5	46.0	46.0	46.0

Date: 26 MAY 98 Detection Method: CISPR PEAK AVERAGE Other

OPR/Asst.: Ben EUT: CP VIII, MODE 5, TX ONLY VS 1000

Conf. Run 1 of 1 Notes: _____

Page 1 of 1

Project No.: 10-1853-001

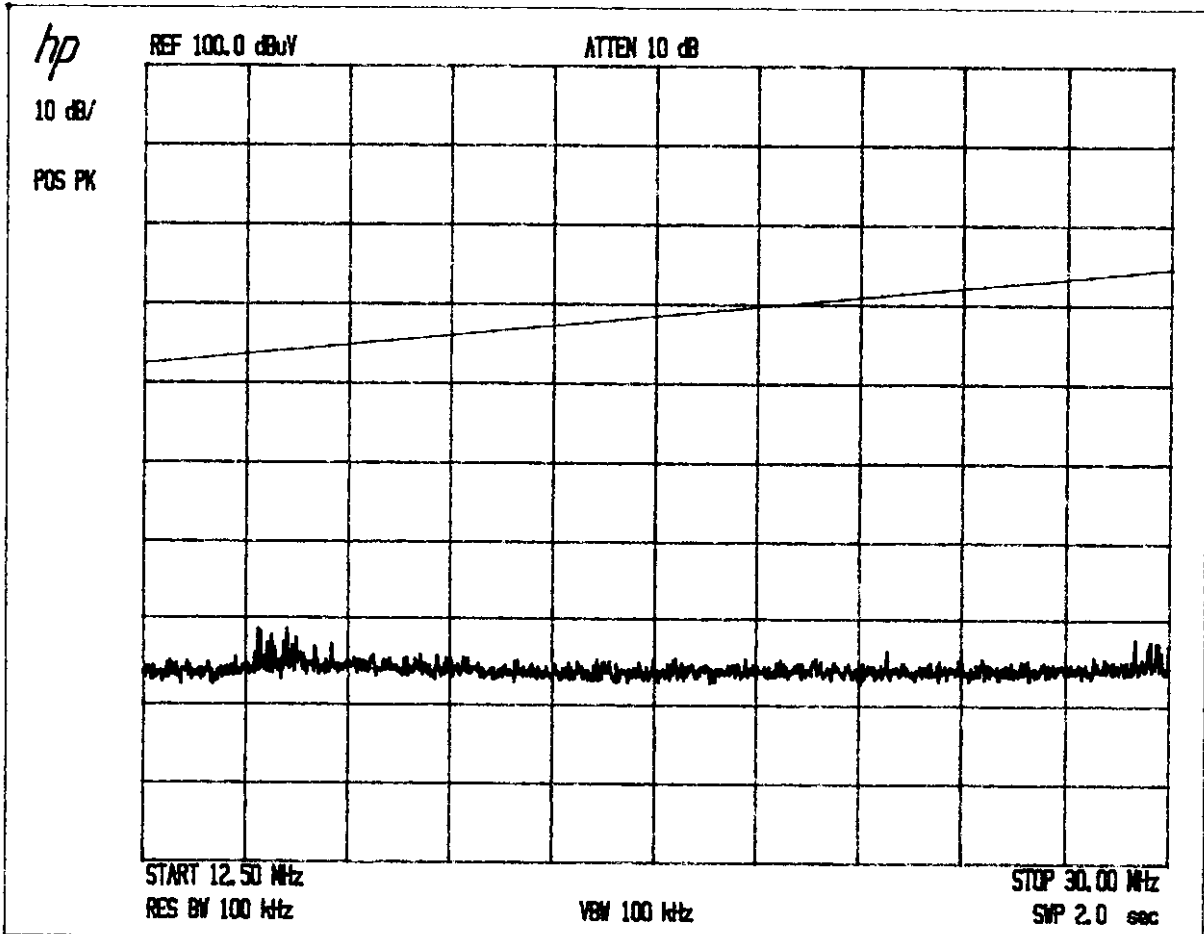
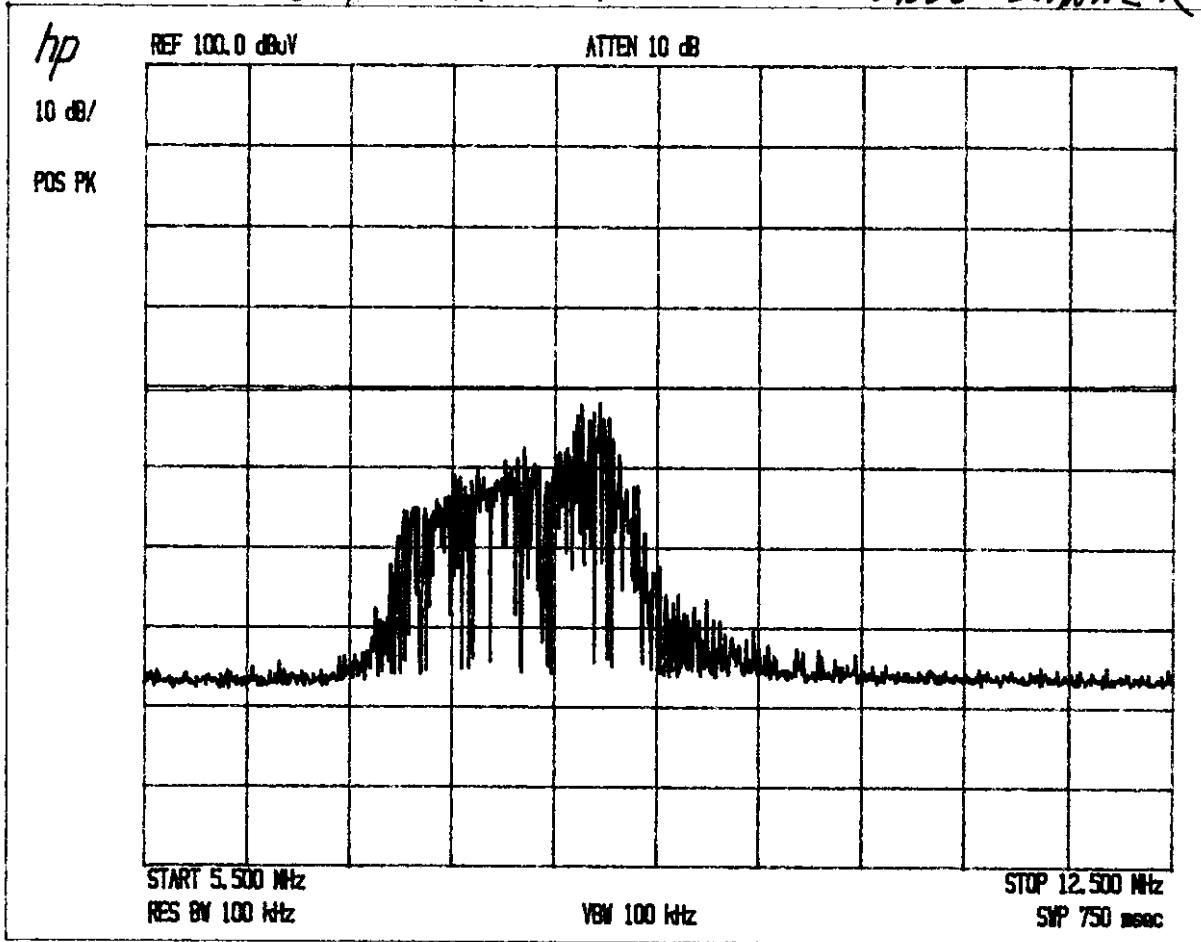
Test Category: FCC CLASS B

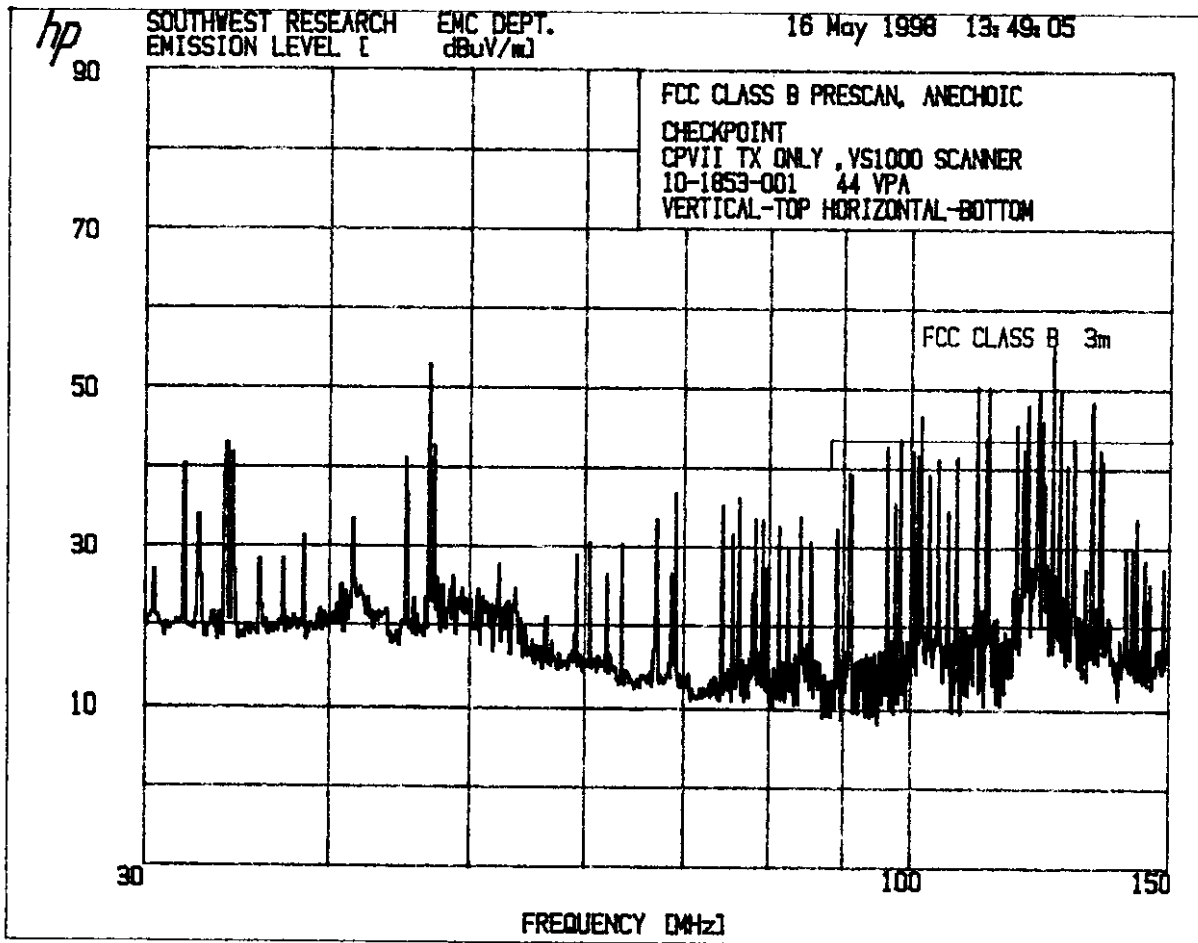
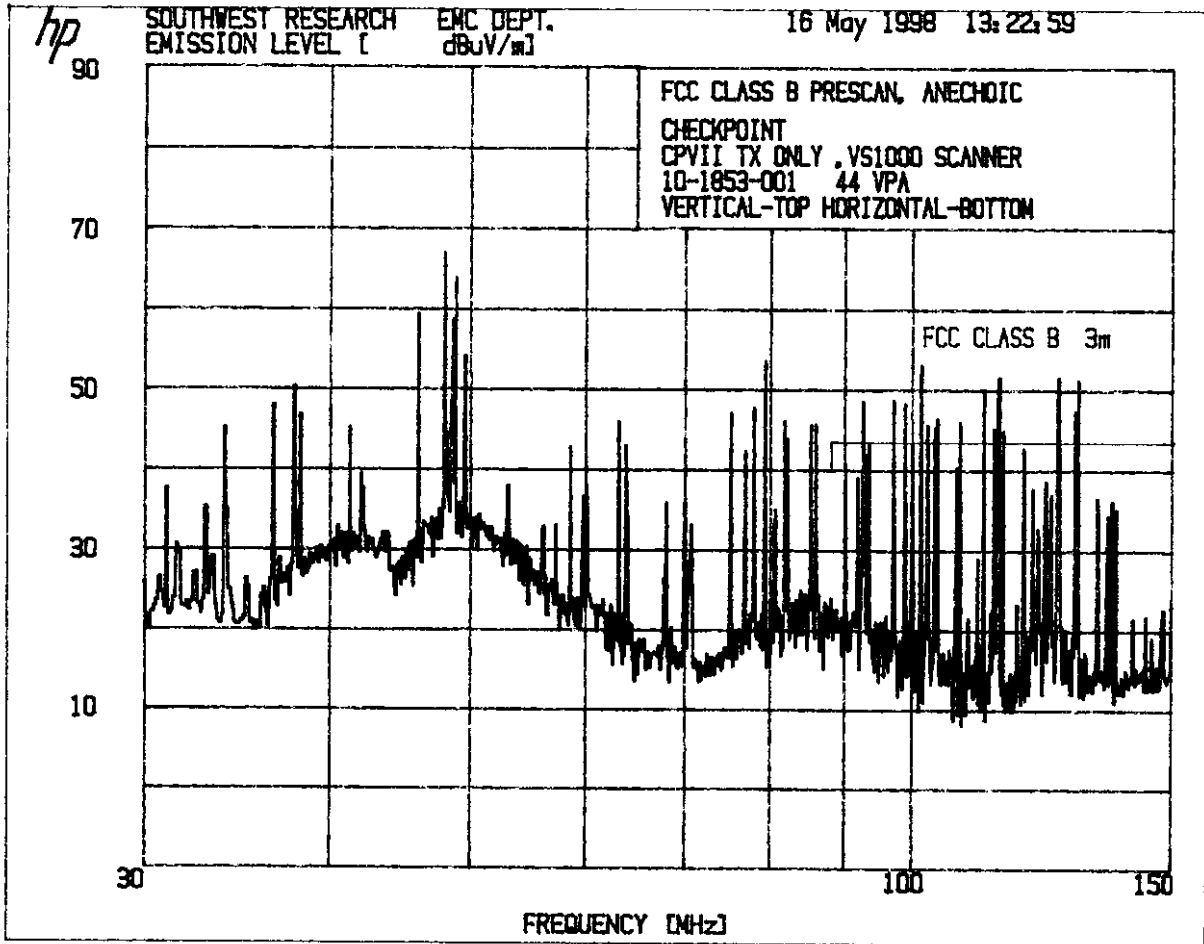
Time, Temp., & % r.H.: 62%, 1630, 94°F

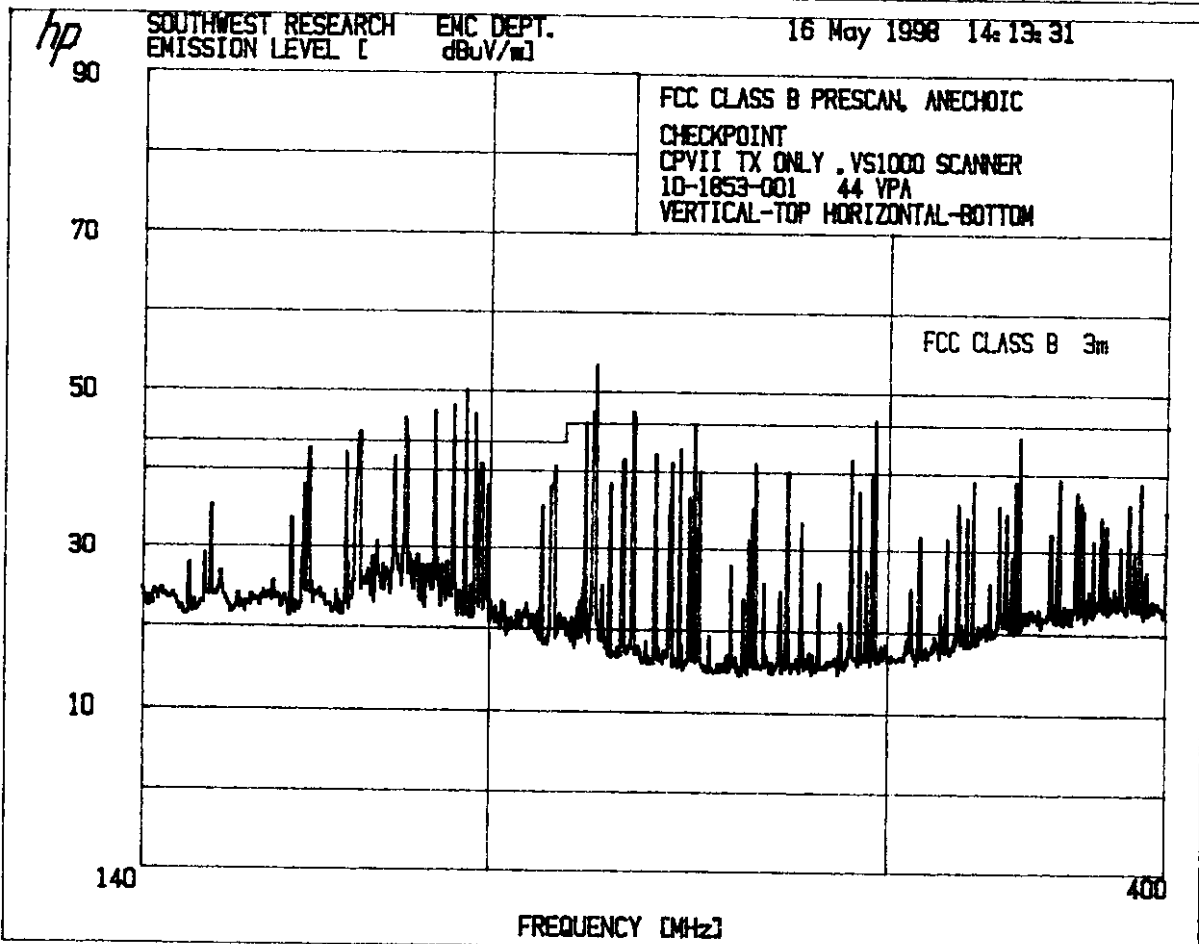
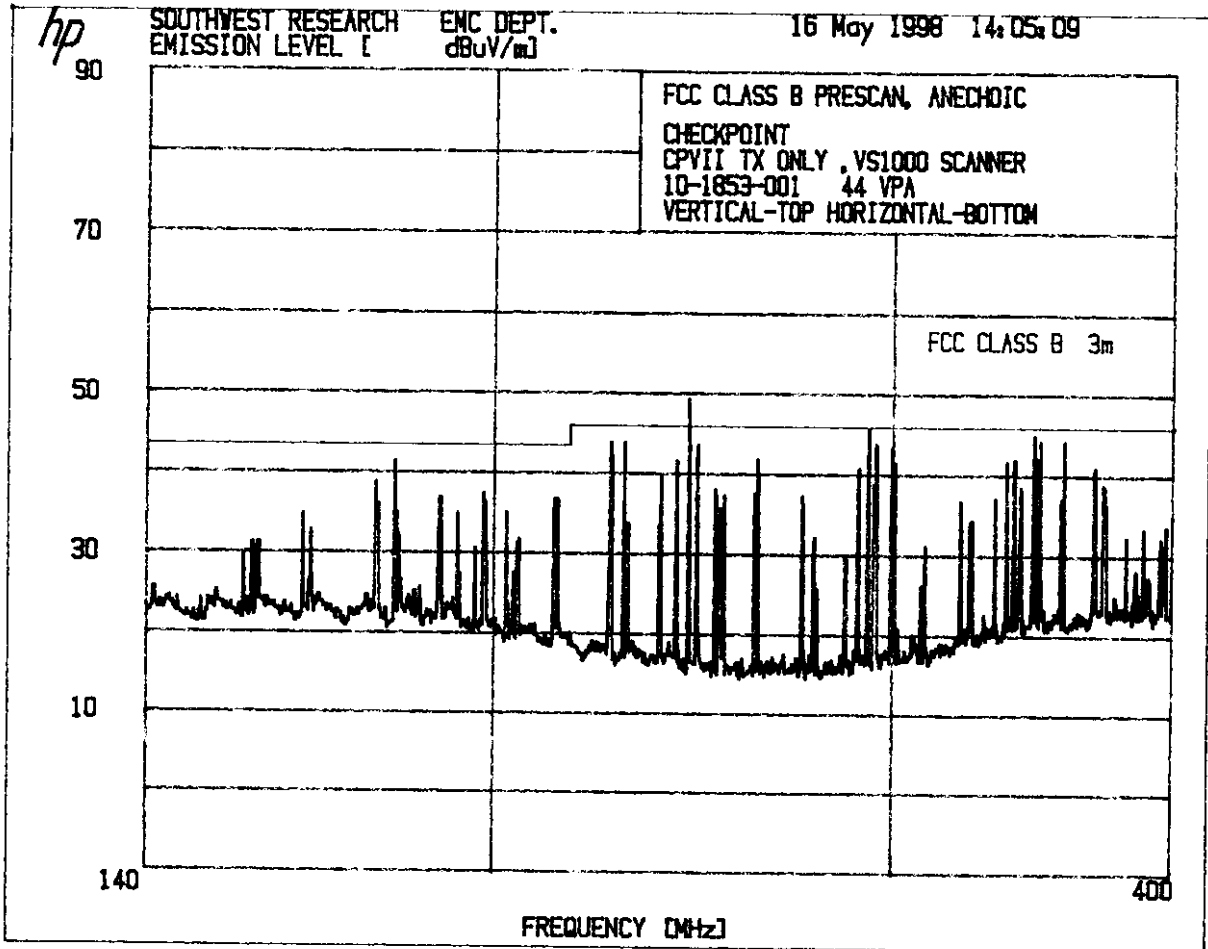
Approved: _____

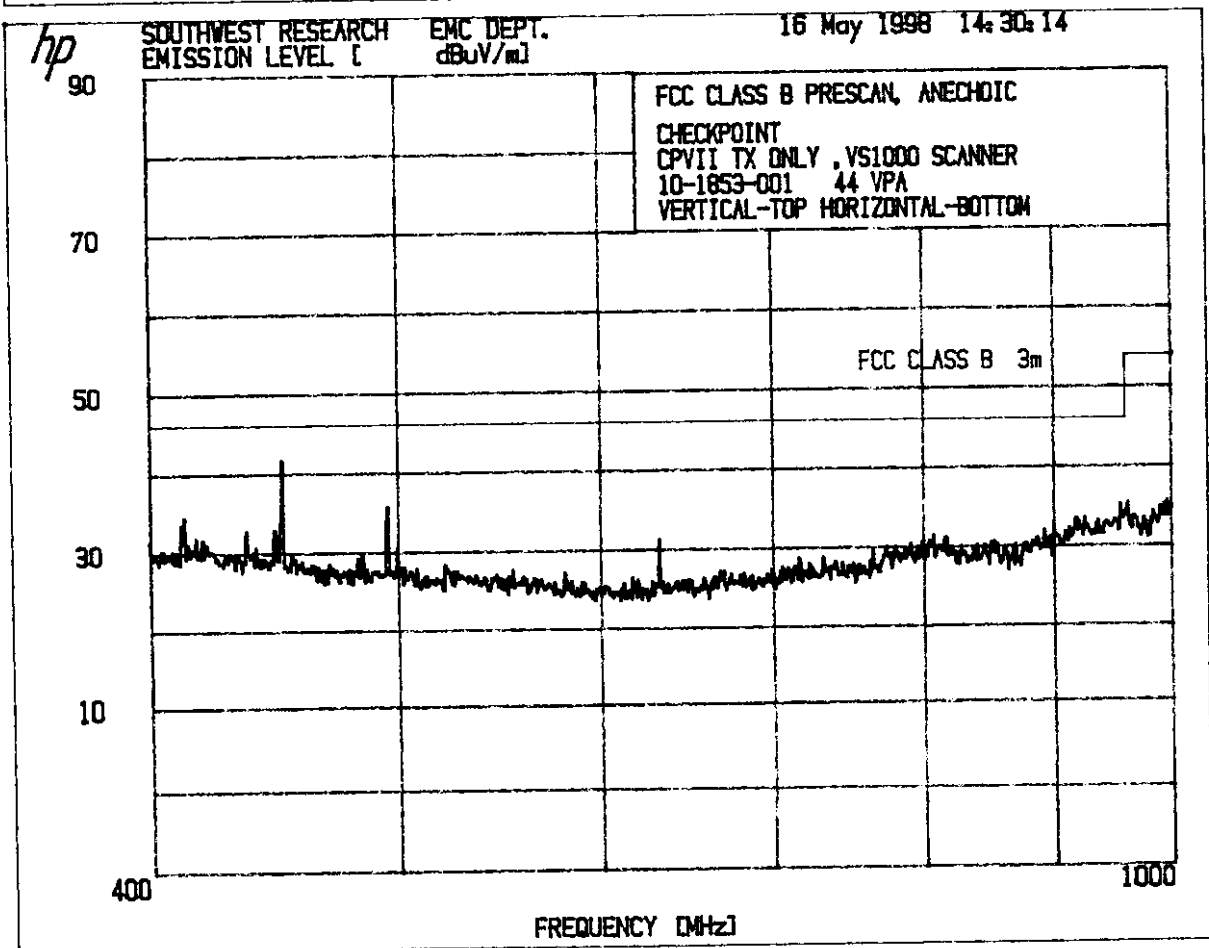
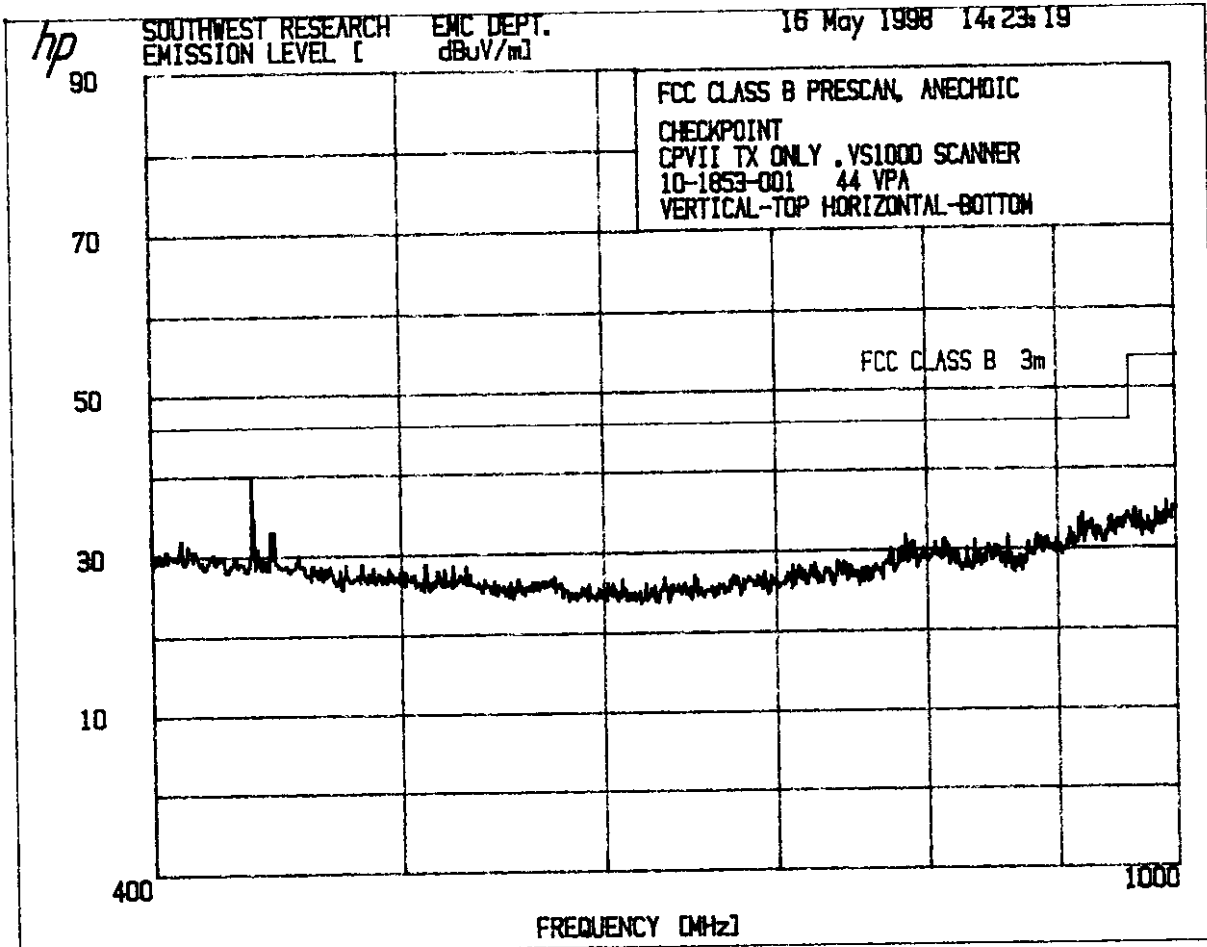
CP TX ONLY

FCC ID: DO4CP1700
V51000 SWANER









6.3 Test Instrumentation for Conducted Measurements

The test instrumentation used to make conducted measurements are listed in Table 6.6.

**TABLE 6.5
CONDUCTED TEST INSTRUMENTATION**

Type	Manufacturer/ Model No.	Serial No.	Cal Due
Spectrum Analyzer	HP 8568B	2517A09664 2503A01135	8 Oct 98
Quasi-Peak Adapter	HP 85650A	2043A00213	9 Aug 98
LISN	Rohde & Schwarz	872461/021	13 Feb 99
LIMITER	HP11867A	04555	Verified

6.4 Test Instrumentation for Radiated Measurements

Signature scans were made in an RF semi-anechoic chamber 28' long x 16' wide x 16' high with its interior lined on the ceiling and four walls with pyramidal absorber material up to four feet in length. Measurements were made with a spectrum analyzer with a quasi-peak adapter listed in Table 6.6. The test instrumentation used at the OATS is listed in Table 6.7.

**TABLE 6.6
RADIATED TEST INSTRUMENTATION**

Type	Manufacturer/ Model No.	Serial No.	Cal Due
Receiver	Polarad ESH2	879014/018	14 Nov 98
Receiver	Polarad ESV	872147/53	17 Nov 98
Loop Antenna	Electro-Metrics ALR-25	86	4 Dec 98
Dipole Antenna	Empire T-2	L-000176B	24 Mar 99
Dipole Antenna	Electro-Metrics BDA 255	535	24 Mar 99

6.5 Radiated Sweep Bandwidth

The following data plot of the spectrum analyzer display shows the sweep bandwidth to be 7.4 MHz to 9.0 MHz.

6.6 Average Factor

The average factor (AF) was determined by measuring the maximum transmit time during a 100 msec period. The CP VII transmits an 8.8 μ sec pulse emission in bursts for a total of 0.14 msec. It is possible to have two burst in 100 msec for a total 0.28 msec. The measurement data plots are provided starting on page 51. The calculated AF is greater than -20 dB, so the maximum permitted average factor -20 dB was used.

$$AF(\text{db}) = 20 \log .28/100 = -51.0 \text{ dB}$$

MODE S

MKR Δ 1.600 MHz
.30 dB

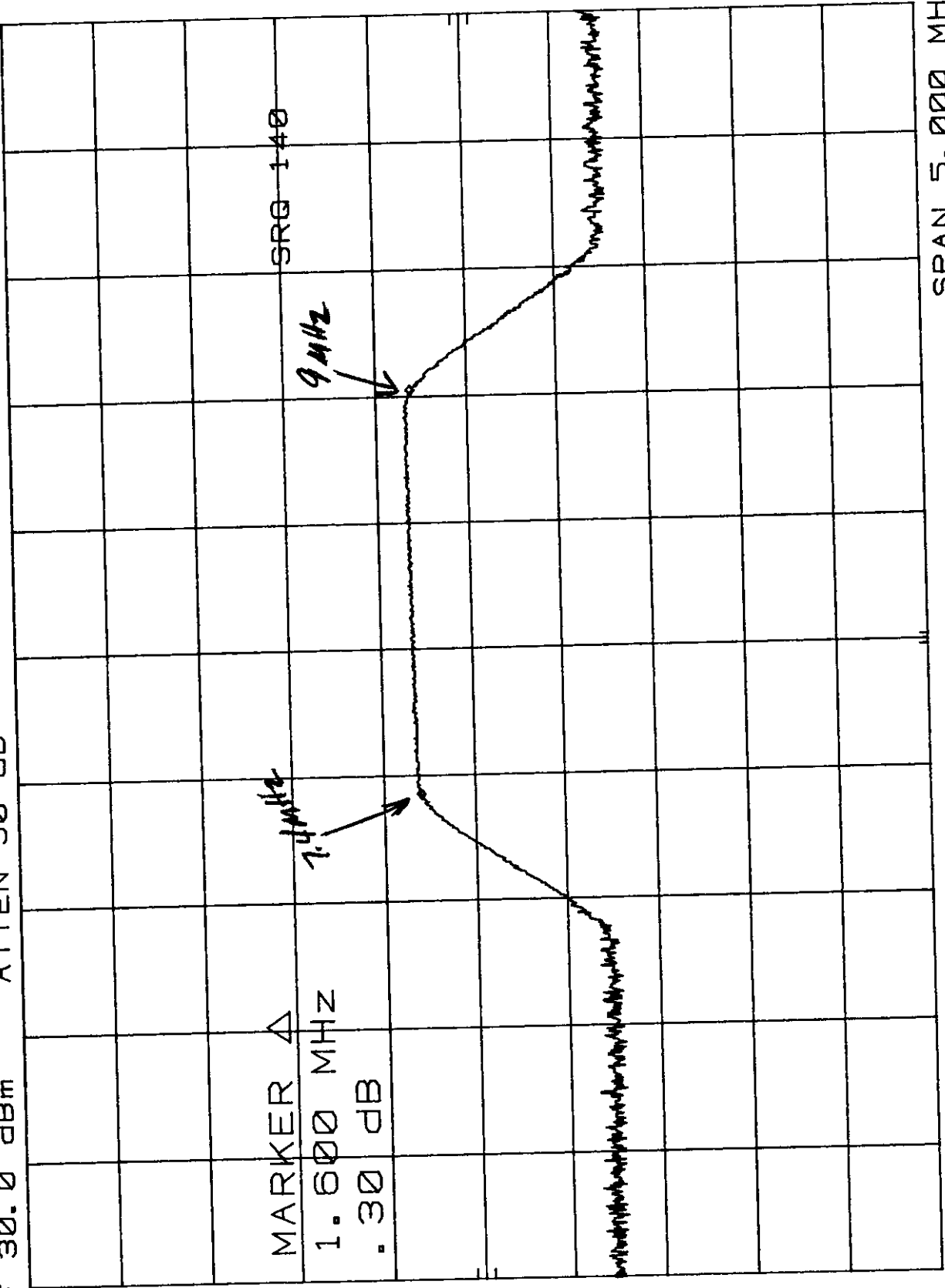
ATTEN 50 dB

REF 30.0 dBm

HP

10 dB/

TP6
AFTER
ADJUSTMENT



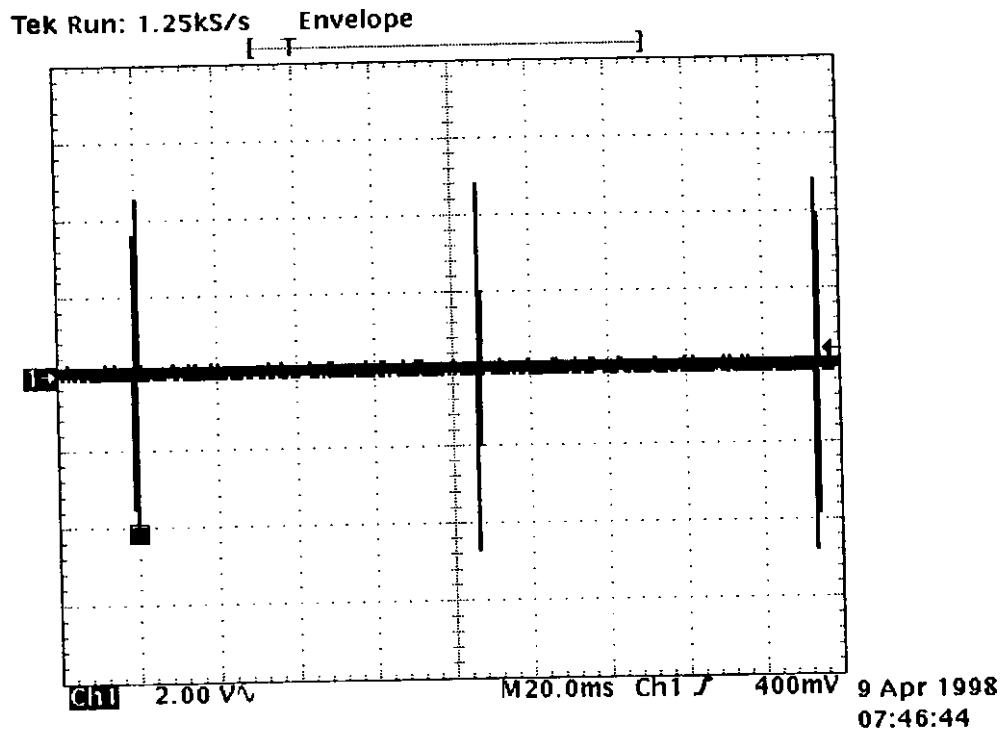
SPAN 5.000 MHz

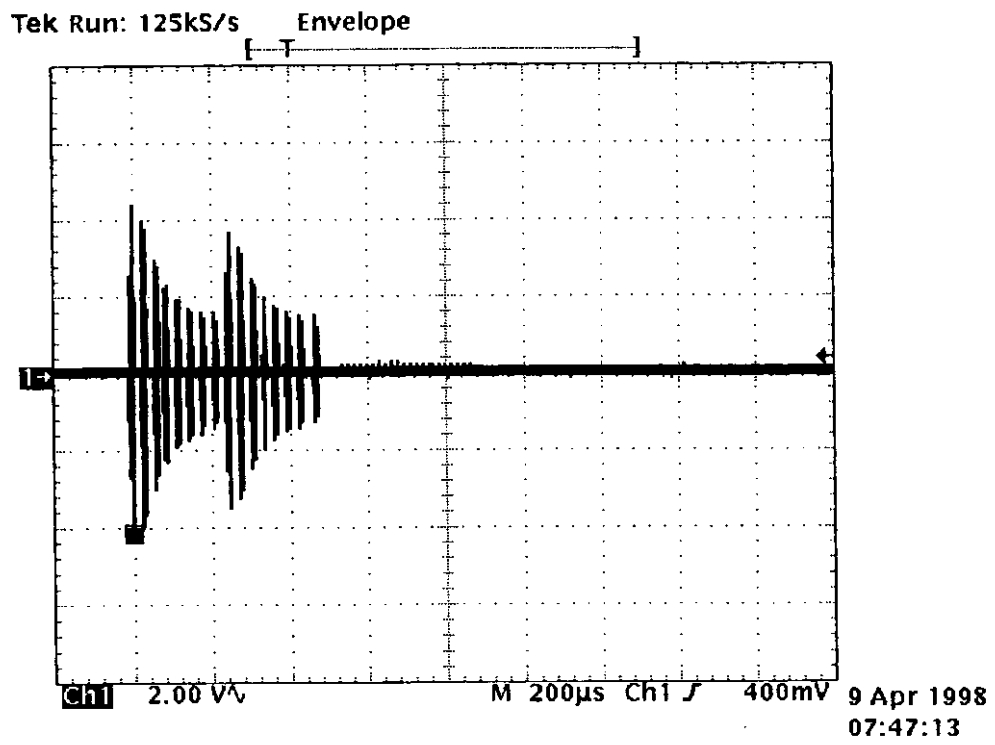
SWP 75 msec

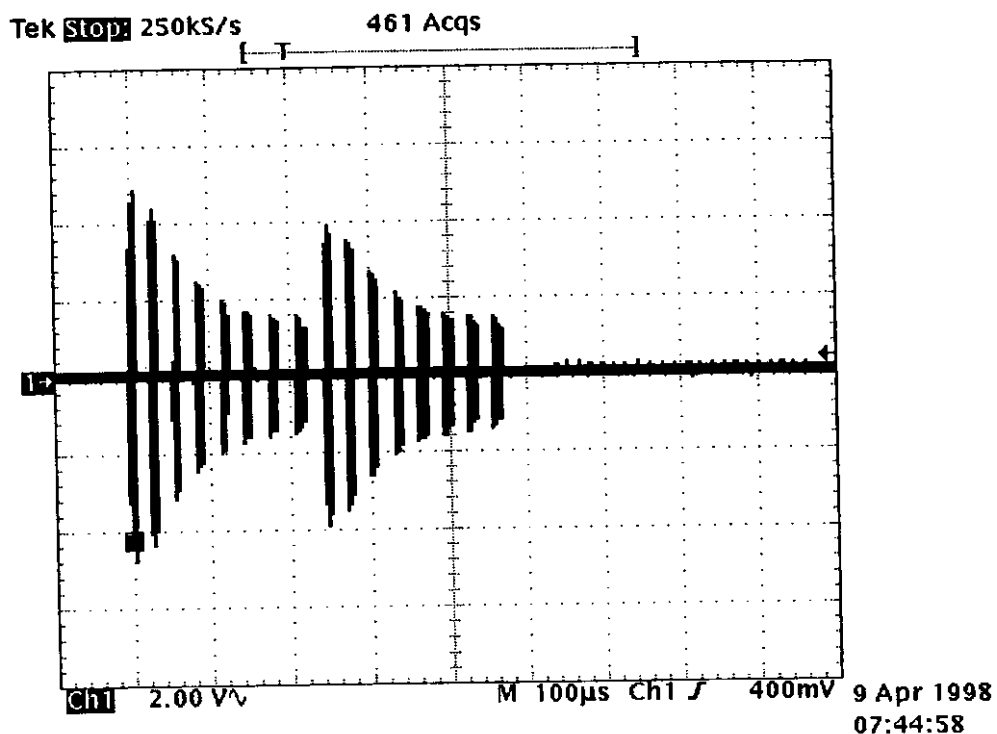
VBW 300 KHz

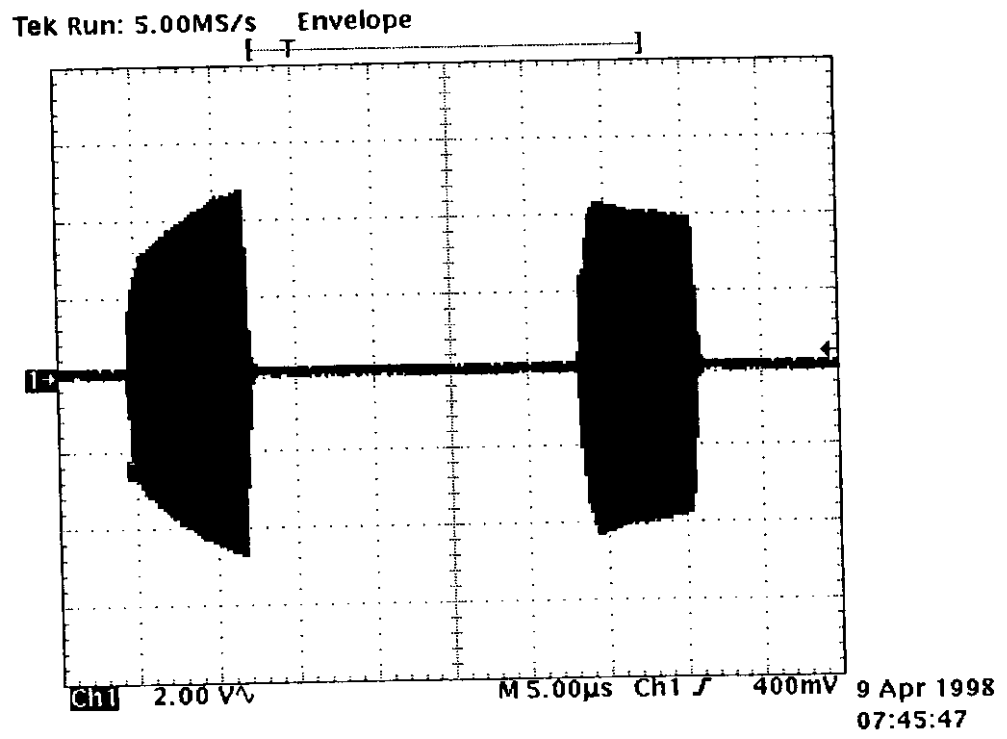
CENTER 8.000 MHz

RES BW 300 KHz









6.7 Field Strength Calculation

For measurements from 200 MHz to 1 GHz, a preamplifier is used.

The field strength is calculated by adding the antenna factor and cable factor, and subtracting the amplifier gain (when used) from the measured reading. The basic equation with a sample calculation is provided below:

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

Where FS = Field Strength
 RA = Receiver Amplitude
 AF = Antenna Factor
 CF = Cable Attenuation
 AG = Amplifier Gain

For example, reducing the first column of the enclosed radiated data sheet on page 21, 167.19 MHz yields:

$$\begin{array}{r}
 20.0 \text{ dB} \\
 19.0 \text{ dB}(\mu\text{V}) \\
 16.9 \text{ dB}(1/\text{m}) \\
 \hline
 -22.8 \text{ dB (CF/AG FACTOR)} \\
 \hline
 FS = 33.1 \text{ dB}(\mu\text{V}/\text{m})
 \end{array}$$

To equation convert the dB($\mu\text{V}/\text{m}$) value to its corresponding level in $\mu\text{V}/\text{m}$ is as follows:

$$\text{Level in } \mu\text{V}/\text{m} \text{ Common Antilogarithm } [(33.1 \text{ dB}\mu\text{V}/\text{m})/20] = 45.19\mu\text{V}/\text{m}$$