NTS

Test Report 60251-94N-1
Revision 1

No. of Pages 183

TEST REPORT FOR POINT OF INSTALLATION ELECTROMAGNETIC INTERFERENCE (EMI) MAPPING OF CONTROL ROOMS, BRUNSWICK PLANT, UNITS #1, AND #2 FOR CAROLINA POWER AND LIGHT COMPANY ONE HANOVER SQUARE BUILDING RALEIGH, NC 27601

Contract No. XTA3000098

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NTS/Northeast

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Quality Representative
NTS/Northeast

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REVISION RECORD - 60251-94N-1

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1.0 PROGRAM SCOPE

This test report presents the data collected and describes the methods used for point of installation electromagnetic interference mapping of the Control Rooms at Carolina Power and Light's Brunswick Plant, Unit #1 and #2. Testing was performed in accordance with the methodology of this document, referencing IEC 801-3, Edition 1, SAMA Standard PMC 33.1-1978, MIL-STD-1399, MIL-STD-461C, and MIL-STD-462.

1.1 Data Collection

Data collection was performed to identify the potential radiators and receptors at the Brunswick Plant that could pose an EMI threat to the normal operating characteristics of the GE NUMAC Leak Detection Monitor (LDM) system. Numerous criteria was considered during the data collection phase of this program. These criteria included, but were not limited to:

- Physical proximity to the proposed GE NUMAC installation location.
- Operating frequency range or discrete frequencies of radiators.
- Power level of radiated or conducted signals.
- Direct primary power line connections to the GE NUMAC system.
- Direct signal line connections (ie. thermocouples, sensors, etc.).
- Primary power lines/signal lines exposed to the highest electric and magnetic fields.

1.2 Prediction

Spectrum emission and susceptibility signatures, coupling paths and control techniques were identified after data collection was performed to identify potential

1.2 Prediction (continued)

radiators and receptors at the Brunswick Plant. This information was identified by performing an engineering evaluation of the known or suspected EMI environment.

- Spectrum emissions of known sources, such as hand-held radios, have specific operating frequencies and output power levels. Evaluation of the fall-off rate versus distance for the signal strengths was performed to establish the expected electrical field threat.

- Typical susceptibility signatures of the GE NUMAC Leak Detection Monitor (LDM) system have been approximated by prior testing by the manufacturer on similar NUMAC application.

- Coupling paths may occur on power/signal lines due to direct connections to other devices or coupling due to adjacent cable runs or through physical apertures in the GE NUMAC system.

- Control techniques may be implemented by such mechanisms as administrative controls (ie. limit the use of hand-held radios near the GE NUMAC system) or configuring equipment installations to conform to the manufacturer's recommendations (ie. dedicated power lines, shielded cables, etc.).

1.3 Mapping

Similar NUMAC systems have had radiated susceptibility testing performed on them. This EMI mapping presents the actual EMI profile the system is exposed to, once it is installed, and was used to determine whether the susceptibility testing was performed at the appropriate levels.

The EMI mapping consists of points whose location were determined by agreement between NTS and Carolina Power and Light personnel to ensure that the

1.3 **Mapping** (continued)

actual Worst Case EMI Noise Profile for electric and magnetic field emissions was mapped. At each test point, the field strengths were measured in the X, Y, and Z axes and recorded in the orientation that presented the worst case emissions level. The frequency range for this testing was from DC to 1 GHZ.

Conducted and radiated frequency domain emissions data has the MIL-STD-461C, Part 4, test limits drawn on the data sheets. This is for comparison purposes only and is not related to any Pass/Fail criteria imposed.

2.0 APPLICABLE DOCUMENTS

NTS TP #60251-94N-1	Test Procedure for Point of Installation, EMI Mapping of Control Rooms, Brunswick Plant, Units #1 and #2, and NOD #1
IEC Standard 801-3	International Electrotechnical Commission IEC Standard, Edition 1, dated 1984
SAMA PMC33.1-1978	Electromagnetic Susceptibility of Process Control Instrumentation, Scientific Apparatus Makers Association
MIL-STD-461C	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference, dated 4 August 1986
MIL-STD-462	Electromagnetic Interference Characteristics Measurement of, dated 31 July 1967
MIL-STD-463	Definitions and System of Units, Electromagnetic Interference and Electromagnetic Compatibility Technology.
MIL-STD-45662A	Calibration Systems Requirements dated 1 August 1988
DI-EMCS-80201	Electromagnetic Interference Test Plan
MIL-STD-1399 Section 070, Part 1	Interface Standard for Shipboard Systems, DC Magnetic Field Environment, dated 26 February 1979
	Code of Federal Regulations, Title 10, Part 50, Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, January 1988
	Code of Federal Regulations, Title 10, Part 21, Reporting of Defects and Noncompliance, as of January 1988
	NTS/Northeast Quality Manual, Revision 3, dated 14 July 1992

2.0 APPLICABLE DOCUMENTS (continued)

IE Information No. 83-83	Use of Portable Radio Transmitters Inside Nuclear Plants
General Electric Report	EMI Analysis, NUMAC Leak Detection Monitor, dated January 1993.

3.0 GENERAL TEST REQUIREMENTS

3.1 Test Subcontractors

Testing was performed by NTS personnel.

3.2 Plant Operations Interface and Site Work Controls

Manipulation or operation of plant equipment was performed in accordance with Carolina Power and Light approved procedures by CP&L personnel. All connections of test equipment probes to operable plant components or wiring was made by CP&L personnel. The CP&L test coordinator obtained plant operation permission prior to connection of test equipment probes. Test equipment removal/disconnection was documented on the applicable test record.

4.0 APPLICABLE FIGURES

4.1 Description

The Control Rooms are located at Carolina Power and Light's Brunswick Plant, Unit #1 and #2, in Southport, North Carolina. The control room's physical layout is depicted in Figure 4-1 and shows all permanent equipment. The use of hand-held radios is allowed within the control room with specific permission from the shift supervisor, and is considered as part of the Control Room environment.

4.2 Identification

The control room equipment is listed in Figure 4-2.

4.3 Verification of Operation

The available Control Room equipment was powered on and allowed to stabilize. Earth ground interconnections were hard wired in their normal configuration and all EMI test equipment was hard wired to earth ground. Verification to ensure that the available equipment was fully operational was performed prior to, during, and after each EMI test, as necessary to confirm proper operation of available Control Room equipment.

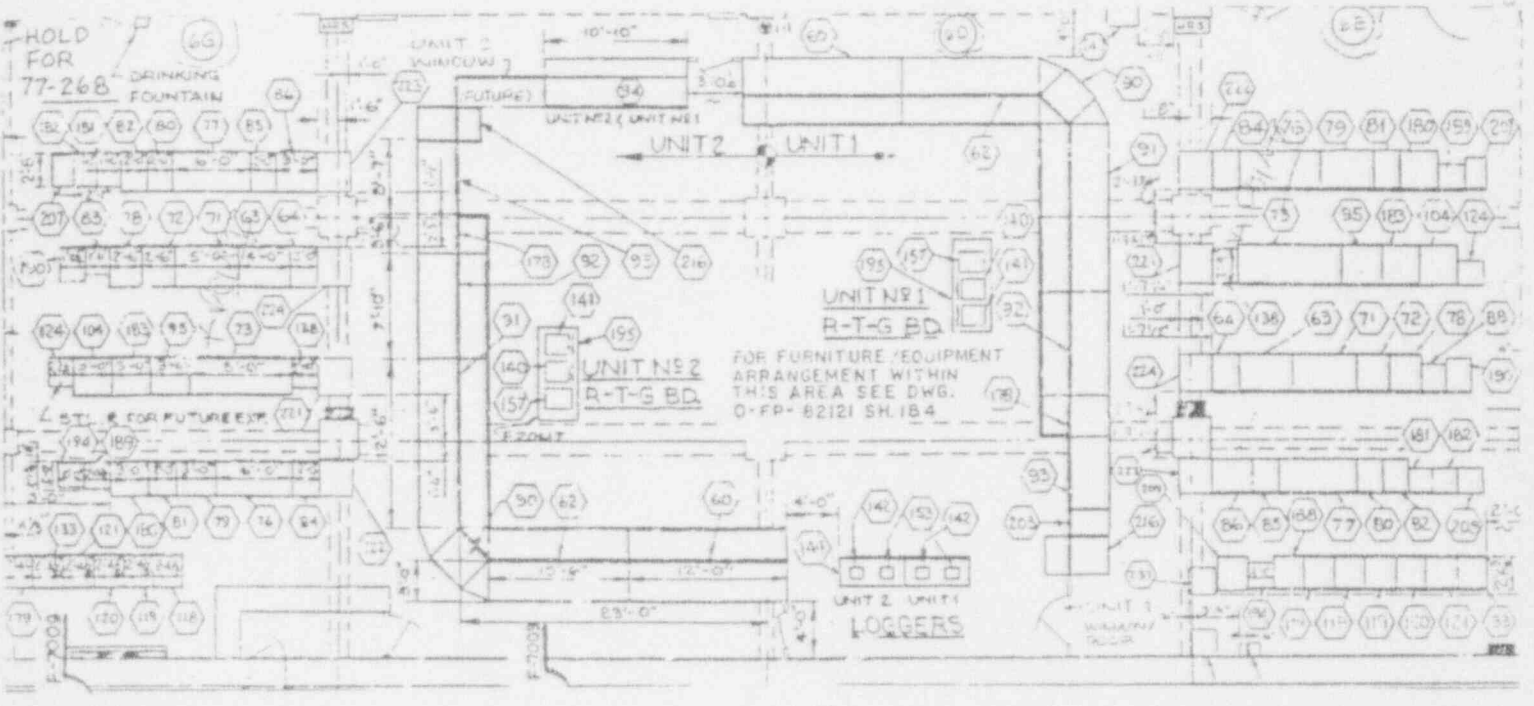


FIGURE 4-1: CONTROL ROOM PHYSICAL LAYOUT

FIGURE 4-2: CONTROL ROOM EQUIPMENT LIST IDENTIFICATION

The following EMI noise sources were reviewed for their impact on the GE NUMAC EMI environment:

1) Hand-held radios:

Operating Frequencies	Output Power
809.8625 MHz	2 watts
809.9125 MHz	2 watts
854.8625 MHz	2 watts
854.9125 MHz	2 watts

2) Equipment within the GE NUMAC "point of installation" cabinet H12-P614.

3) Equipment within the cabinets adjacent to H12-P614:

H12-P604	H12-P613	XU-56	C95-P654
H12-P616	H12-P622	C95-P651	D22-P600
H12-P612	H12-P614	TSI-XY-637	
H12-P620	H12-P626	XU-6	

Upon review, the following items were identified as potential EMI noise emitters:

- Control Relays
- AC Motorized Cycle Timers
- Multi-Point Recorders

Due to expressed interest by the NRC in the cycling of large loads, it was recommended that a load such as the following items be cycled:

- Control Building HVAC Fans

The following EMI noise sources were reviewed for their impact on the Yokogawa Controller EMI environment:

1) Hand-held radios:

Operating Frequencies	Output Power
809.8625 MHz	2 watts
809.9125 MHz	2 watts
854.8625 MHz	2 watts
854.9125 MHz	2 watts

2) Equipment within the Yokogawa controller "point of installation" cabinet H12-P601.

3) Equipment within the cabinets adjacent to H12-P601:

H12-P603
XU-5

Upon review, the following items were identified as potential EMI noise emitters:

- Control Switches
- Control Relays

5.0 TEST REQUIREMENTS

5.1 Quality Assurance

All work conducted for this program was performed in accordance with the requirements of NTS/Northeast's Quality Manual, Revision 3, dated July 14, 1992, and NTS/Northeast Standard Operating Procedure N-4, Revision 0, dated March 19, 1990, ensuring the program's compliance to the applicable provisions of 10 CFR, Part 21 and Part 50, Appendix B.

5.2 Testing

NTS performs a majority of its EMI testing for the military in accordance with MIL-STD-461 and MIL-STD-462. NTS is accredited by the National Institute of Standards and Technology (NIST) under the NVLAP program, to perform testing to these specifications (NVLAP Lab Code #0347). Full details of the accreditation are available upon request. The following tests were performed at Carolina Power and Light's Brunswick Plant, Unit #1, and #2.

5.2.1 Conducted

- Conducted Emissions, Method CE01, Power and Signal Leads, 30 Hz to 15 KHz, Common and Differential Mode
- Conducted Emissions, Method CE03, Power and Signal Leads, 15 KHz to 50 MHz, Common and Differential Mode
- Conducted Emissions, Method CE07, Power and Signal Leads, Switching Transients, Time Domain, Common and Differential Mode

When performing common mode conducted emissions measurements on signal cables, the current probe was placed around as many conductors as possible in the cable bundle. Similarly, when performing common mode measurements on power leads,

5.2.1 Conducted (continued)

the probe was placed around as many conductors as possible including the ground wire (where applicable).

When performing differential mode conducted emissions measurements on signal leads, the current probe was placed around the conductors in the cable bundle that are most exposed to electric and magnetic fields. These are typically the conductors that break out of the bundle and run the greatest distance to the point of termination, and or signal leads in close proximity to power leads within the cabinet.

5.2.2 Radiated

- Radiated Emissions, Method REXX, DC Magnetic Field
- Radiated Emissions, Method RE01, 30 Hz to 50 KHz
- Radiated Emissions, Method RE02, 14 KHz to 1 GHz
- Radiated Emissions, Method RE02.1, Hand-Held Radio Profile

When performing radiated emissions testing, the field strengths were measured in the X, Y and Z axis and recorded in the orientation that presented the worst case emissions level.

5.3 Post Measurement Data Analysis (Emission Tests)

The Hewlett Packard (HP) 8566S Automated Microwave Measurement System is software controlled and is used for making automated commercial and military emissions measurements. The EMI measurement system is comprised of a spectrum analyzer, RF pre-selector, CPU, display unit, printer/plotter, disk drive, keyboard and

5.0 TEST REQUIREMENTS (continued)

5.3 Post Measurement Data Analysis (Emission Tests) (continued)

control knob as listed in Section 7.0.

Output from the current probe or antenna in the shielded test chamber is fed through the appropriate preamplifier to the HP8566B Spectrum Analyzer. The HP310 CPU controls the bandwidth and scanning speed of the spectrum analyzer and ensures a continuous scan of all frequencies in the desired range.

The basic scheme of the measurement is that the CPU processes the trace data from the spectrum analyzer at the end of a sweep, initiates the next sweep, and processes the data from the previous sweep while the current sweep is occurring. Processing of trace data involves corrections for transducer correction factor, preamplifier gain and external attenuation and then plotting it on the display unit for visual feedback of the tests' progress. Test results are displayed in log frequency format. Test results can be stored in the library disc for future reference or creating a hard copy.

When measuring radiated emissions, the program will automatically signal the spectrum analyzer to halt the measurement process when the upper frequency range limit of the current antenna is reached. A message is then displayed on the Display unit instructing the operator to change the antenna and/or amplifier for the next frequency sweep range.

The system program consists of four major sections: the Test Library, the Data Library, the Measurement section and the Test Setup table. The Test Setup table includes the Transducer and Limit Libraries which are used for storing transducer factor values and commonly used emission limits.

5.0 TEST REQUIREMENTS (continued)

5.4 Narrowband/Broadband Discernment

The Narrowband/Broadband emissions determination is made by manually tuning to the frequency of interest (center frequency) and recording the frequency and amplitude.

The analyzer or receiver will then be tuned over a range of +/- 2 Impulse Bandwidths (IBW) around the center frequency.

A change in peak response of 3 db or less indicates a Broadband emission. Any change of greater than 3 db indicates a Narrowband emission.

5.5 Measurement Accuracy

All measurements were made in accordance with MIL-STD-462 and have the following accuracies (Reference Section 7.0 - Test Equipment List).

A. Frequency Accuracy: Where specified limits are exceeded, the frequency accuracy of the measurements shall be accurate to within $\pm 0.1\%$. Verification with a frequency counter or other measuring device was required.

B. Amplitude Accuracy: Amplitude accuracy shall be ± 2 db.

6.0 TEST PROCEDURE

6.1 Conducted Emissions, Method CE01, Power and Signal Leads, 30 Hz to 15 KHz

Requirements

Conducted emission measurements, from 30 Hz to 15 KHz, were made in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method CE01 of MIL-STD-462. Reference Section 6.1, Test Setup.

Procedures

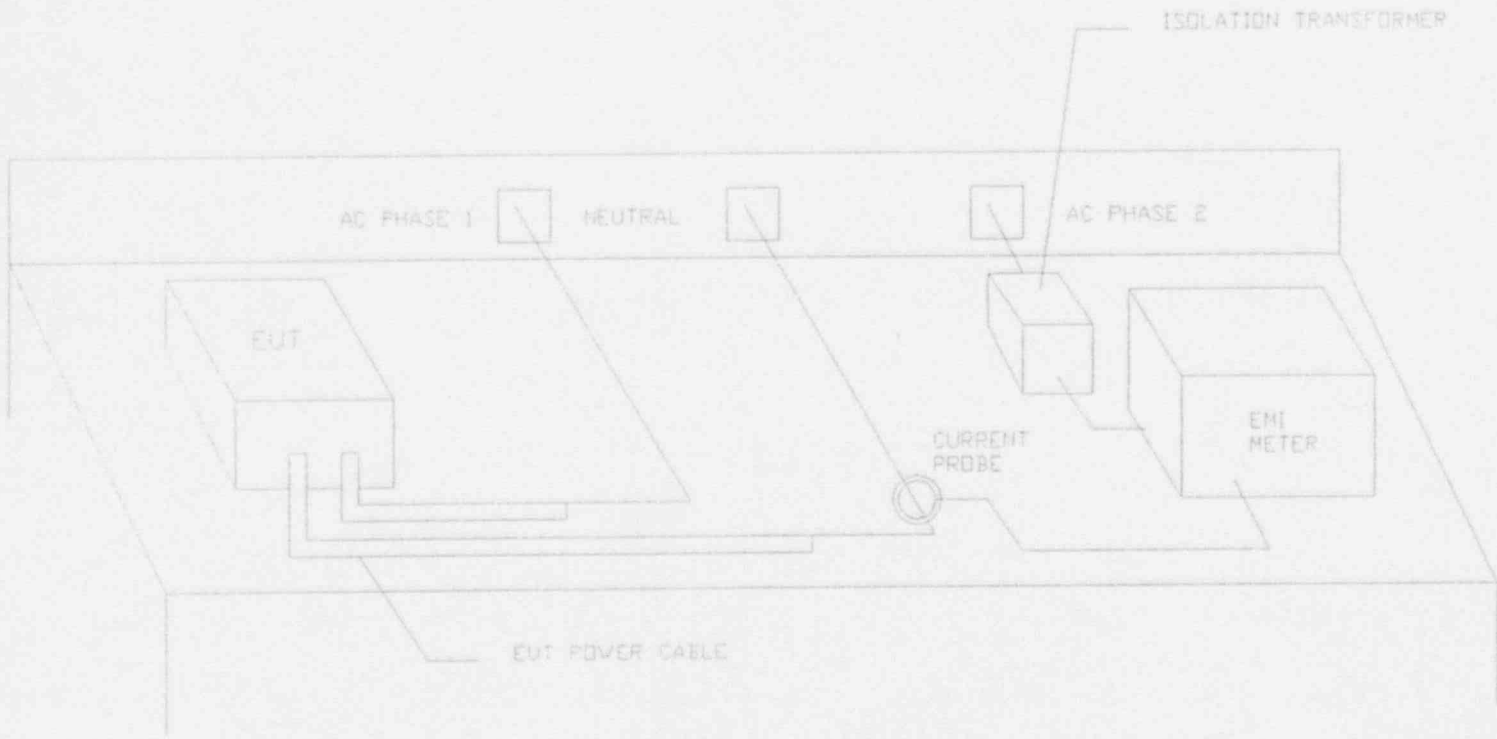
The Control Room Environment was set up and operated as specified in Section 4.0 of this report. An A.H. Systems Clamp-on Current Probe, Model BCP-200/510, was connected to a Hewlett Packard Automated Microwave Measurement System, Model 8566S through a 25-foot length of RG9B/U coaxial cable. The probe was clamped around a selected power lead, inside the control cabinet, and the frequency range was slowly swept from 30 Hz to 15 KHz, and plots were generated for narrow band measurements. Reference Section 6.1, Data Sheets.

The preceding procedure was then performed on the remaining individual power/signal leads and power/signal lead bundles.

Test Results

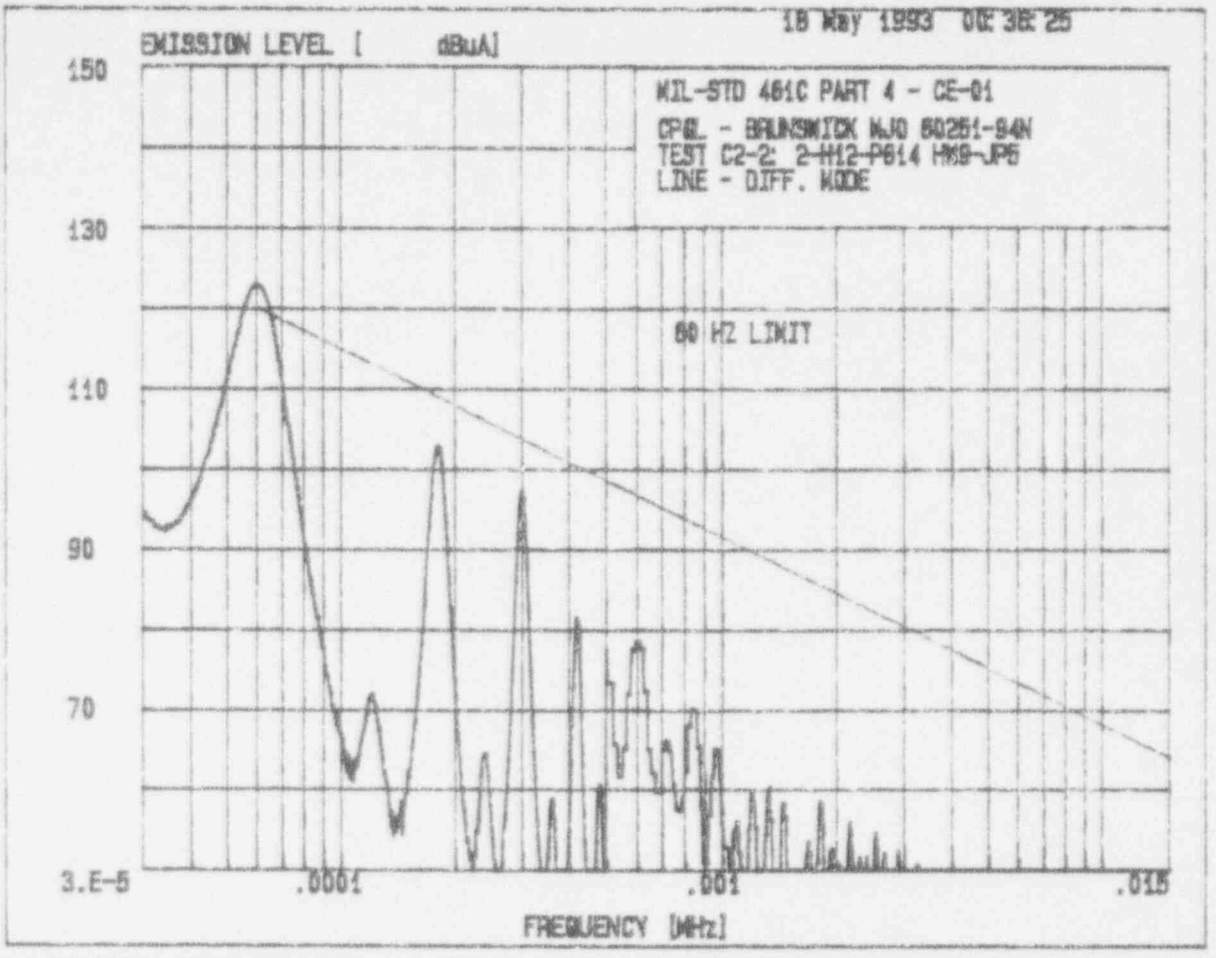
Test	Results
CE01 Conducted Emissions, 30 Hz - 15 KHz	TBD*

*See NTS Report #60251-94N-2.



CONDUCTED EMISSIONS, METHOD CE01, TYPICAL TEST SETUP

CE01 DATA SHEETS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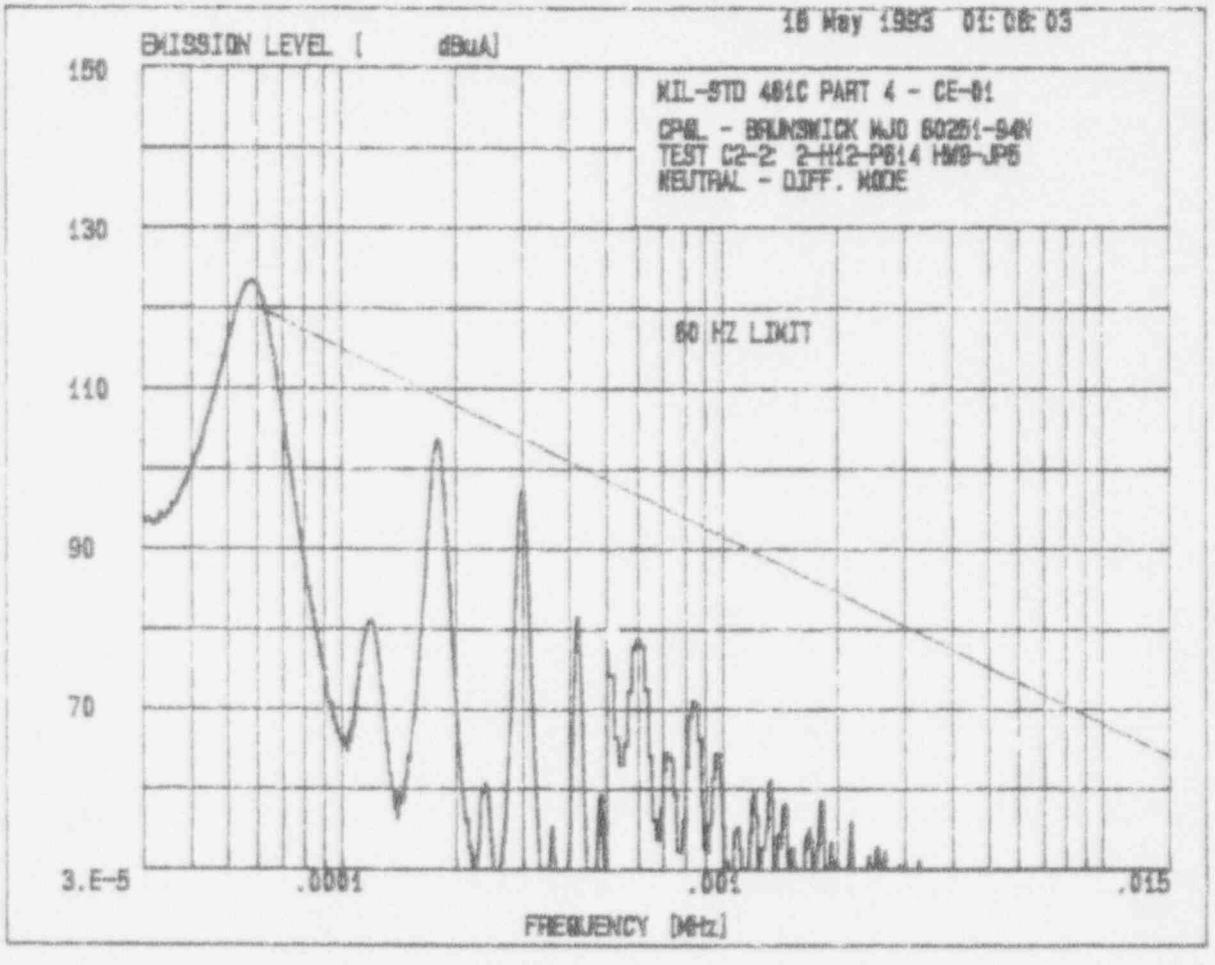
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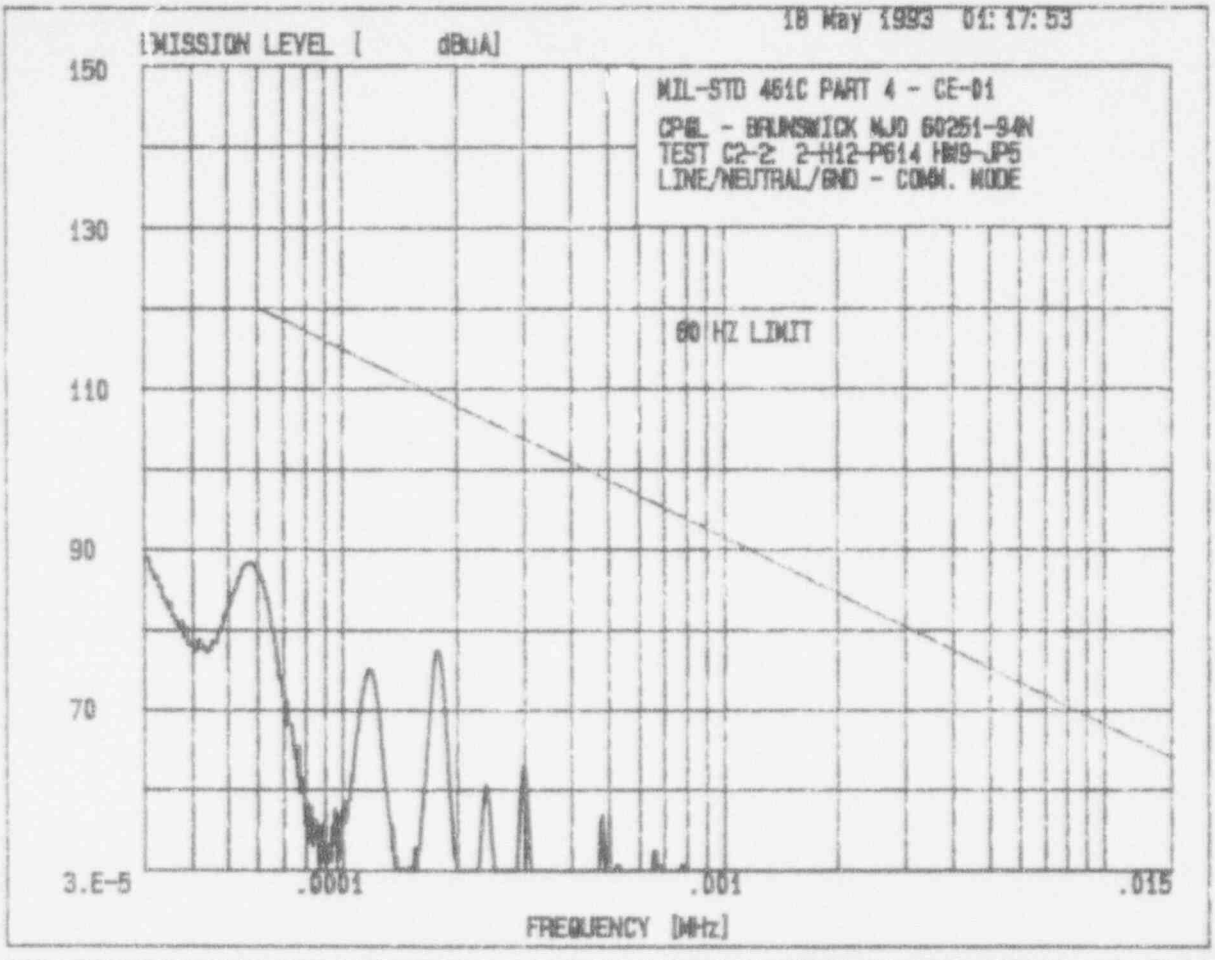
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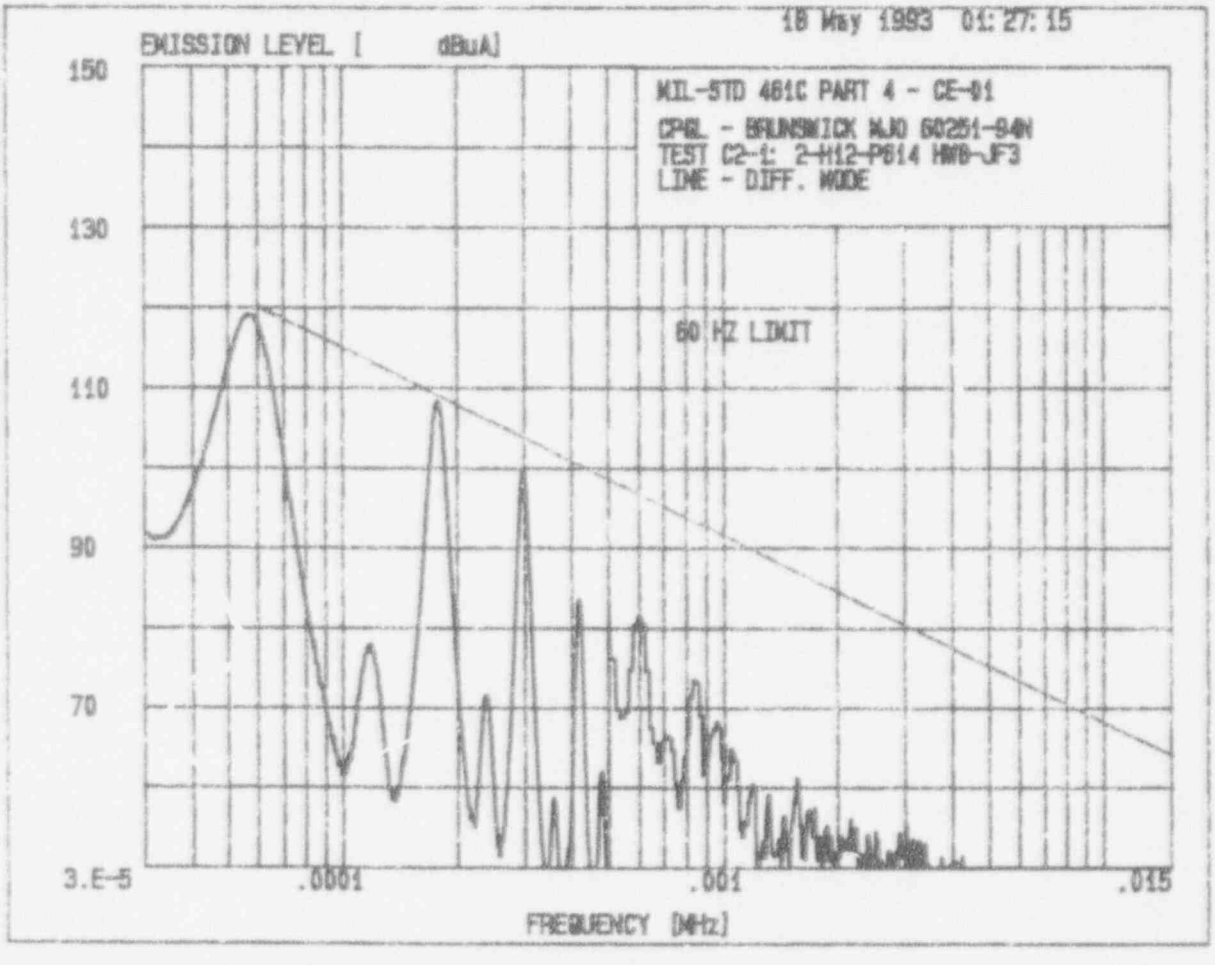
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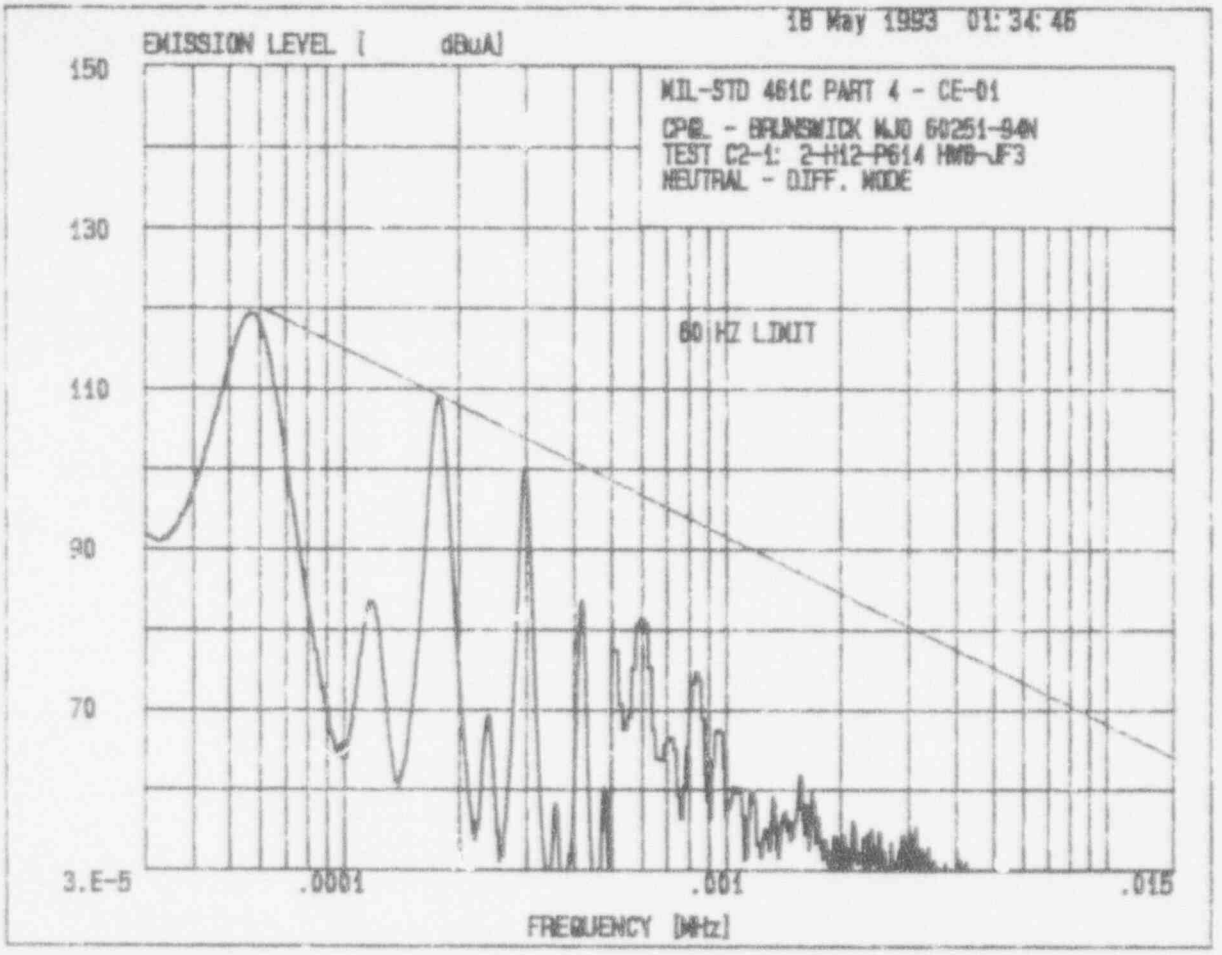
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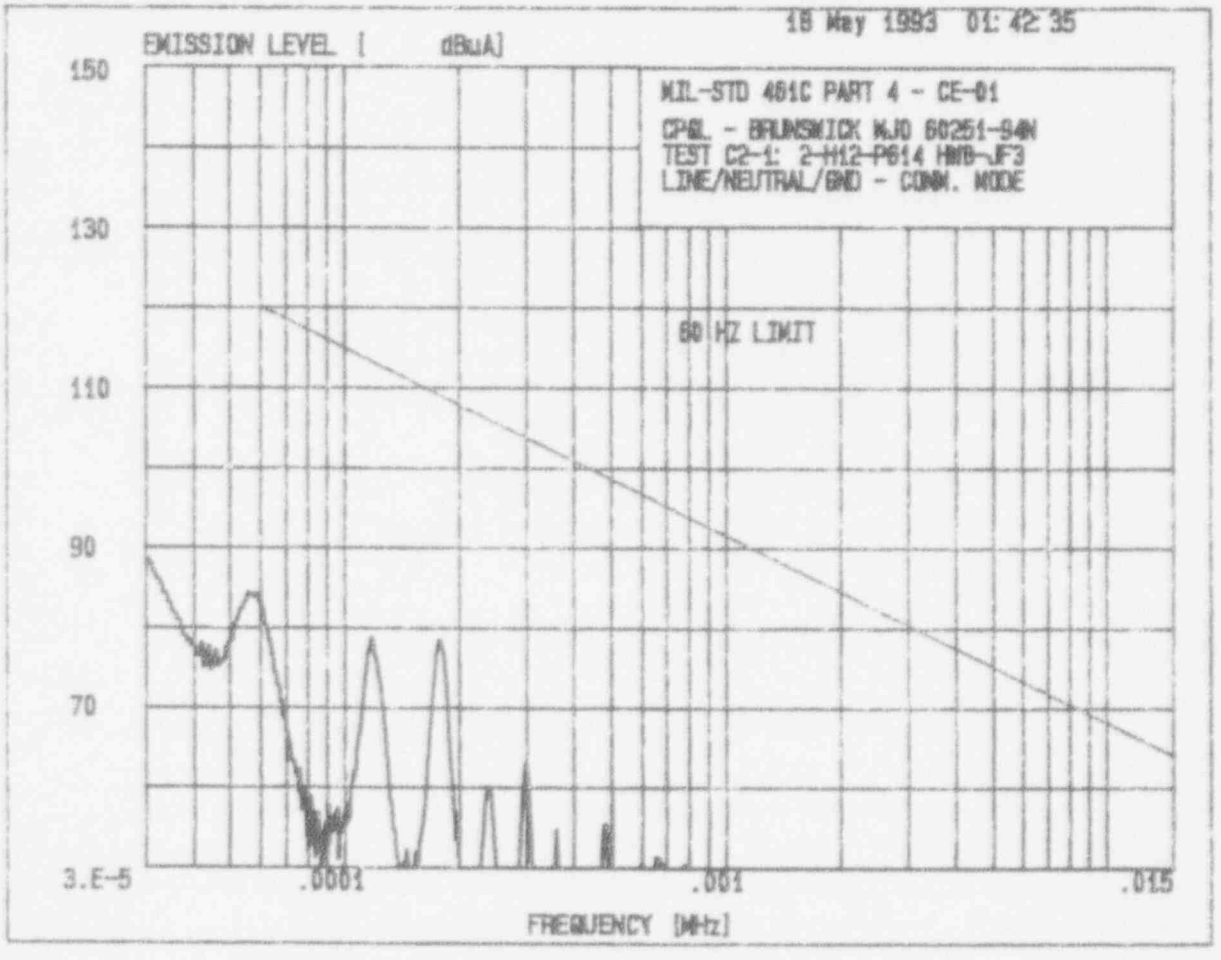
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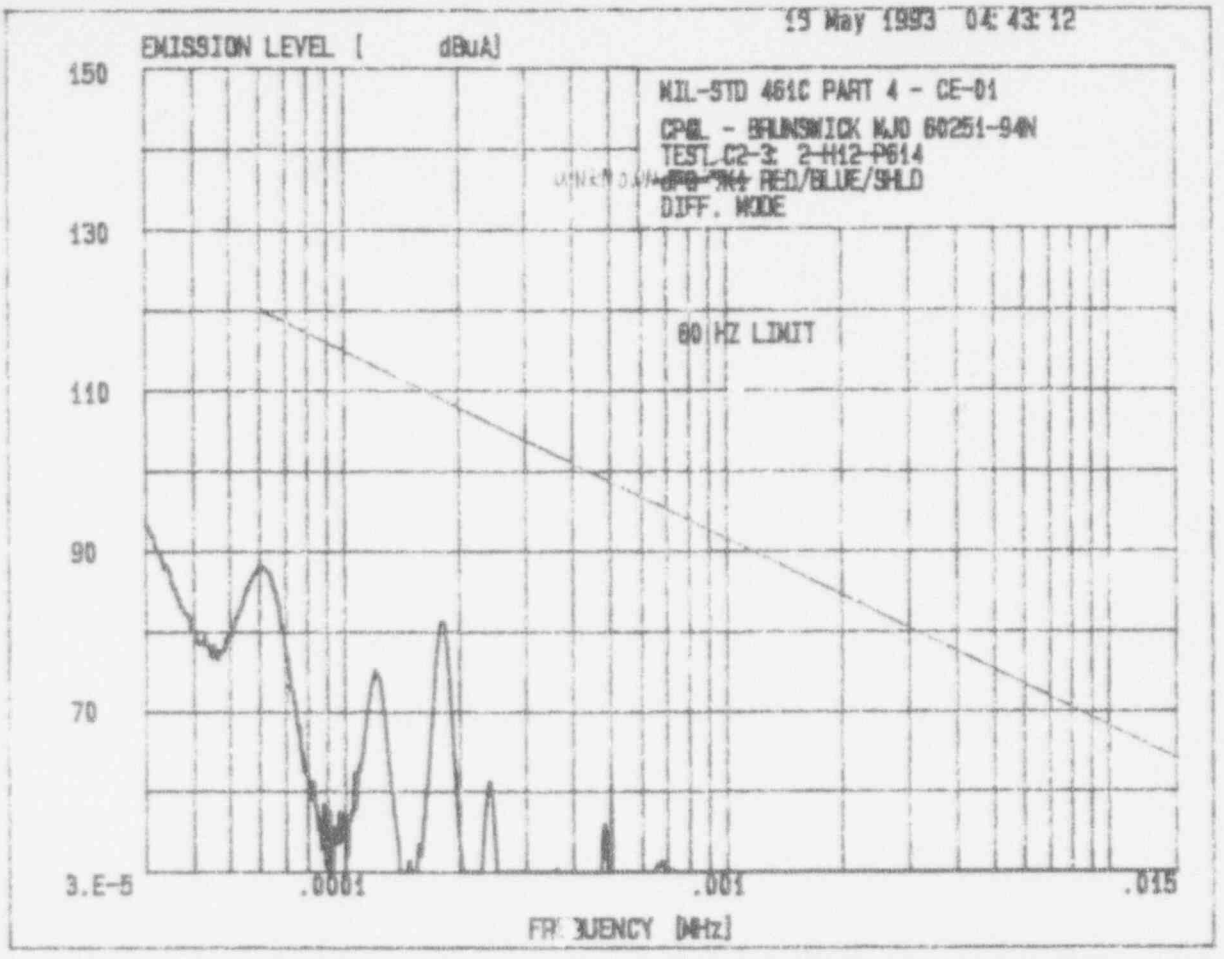
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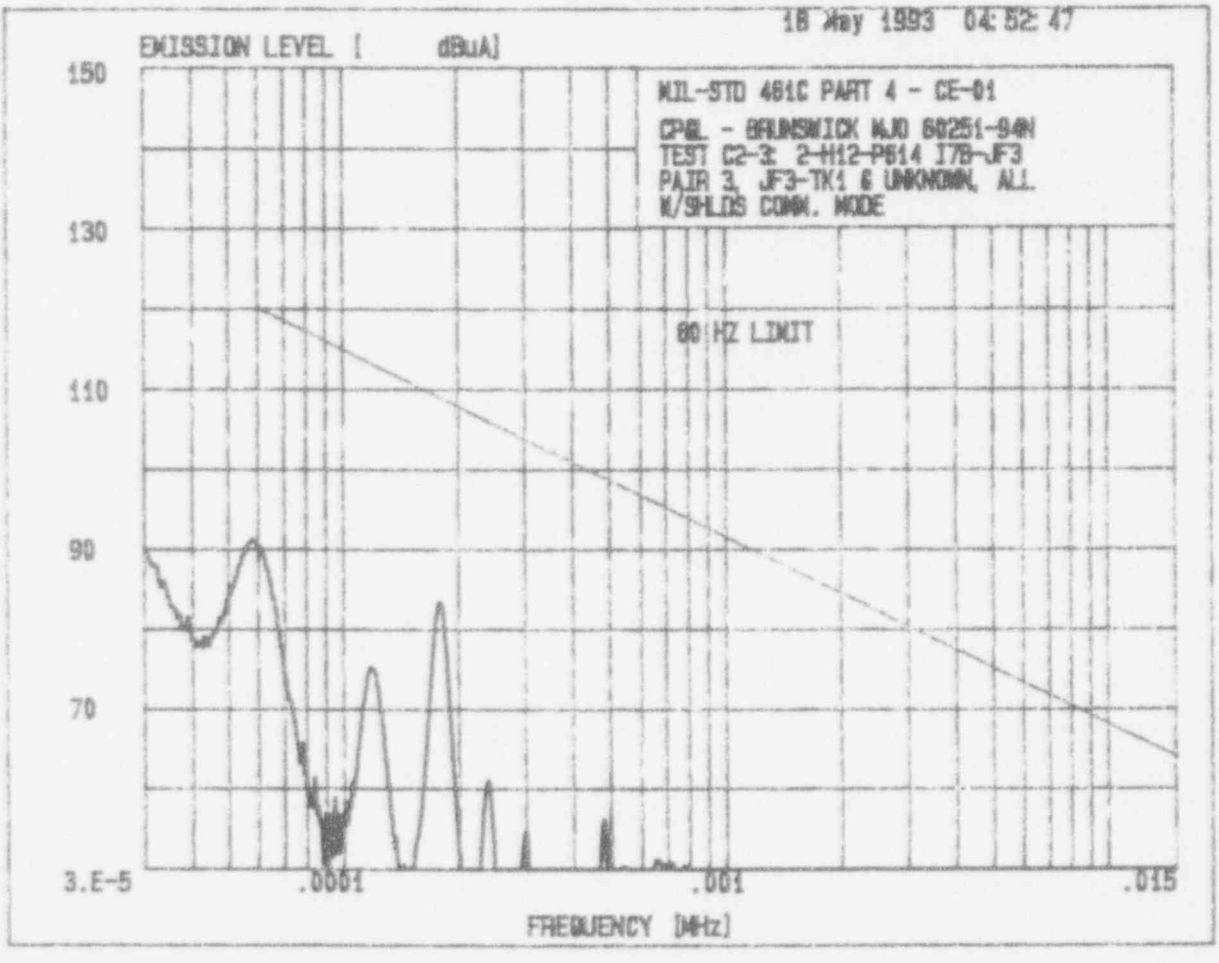
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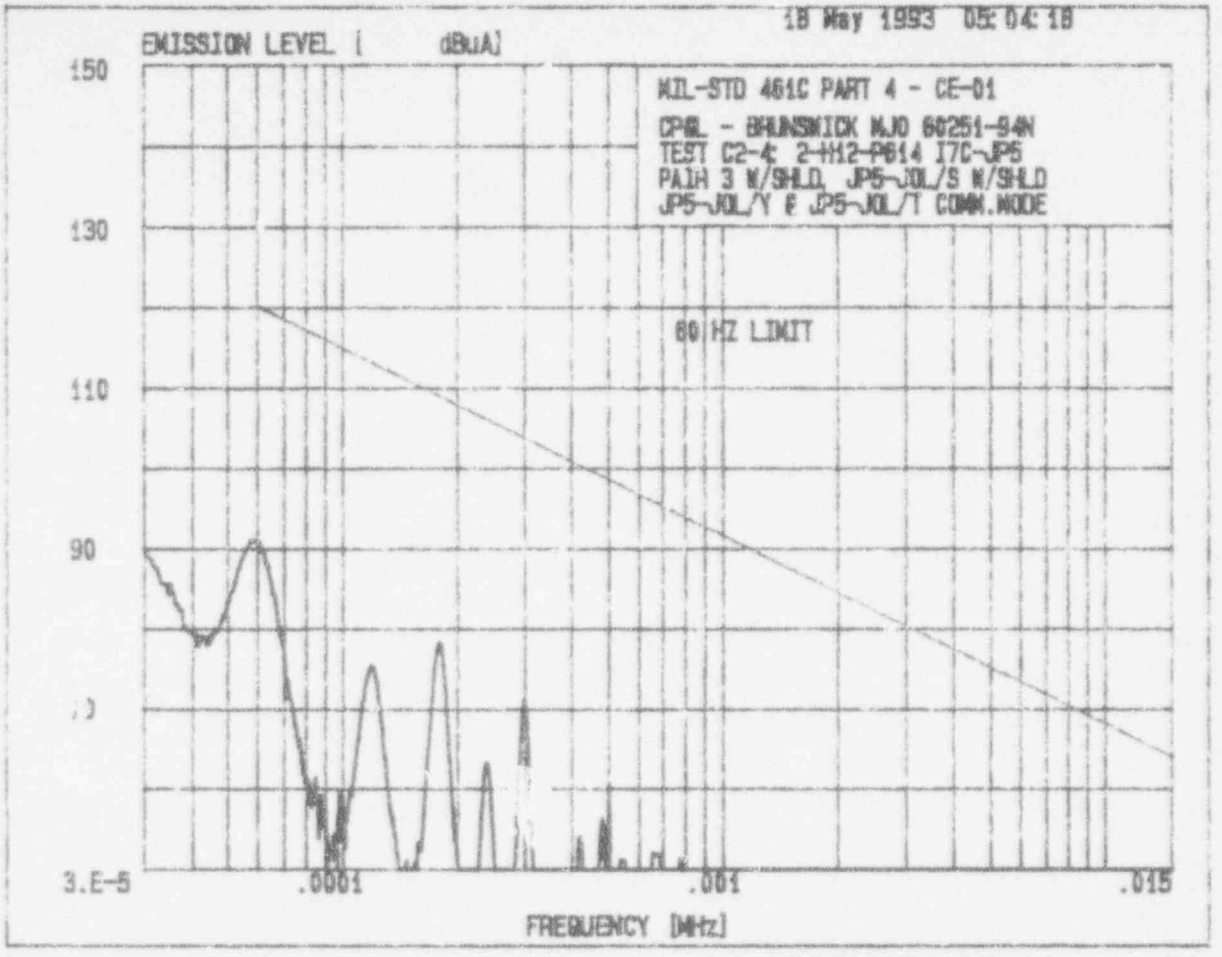
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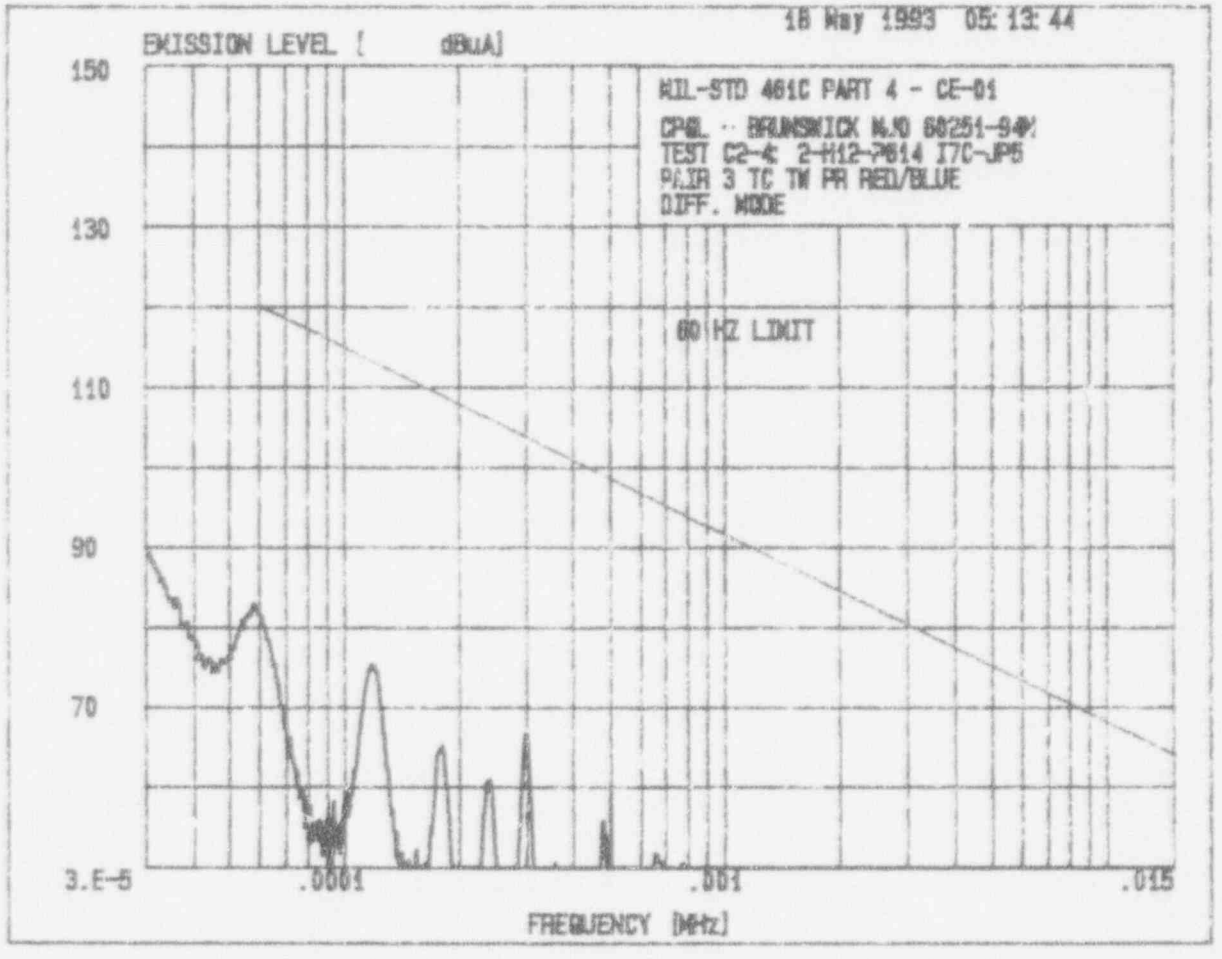
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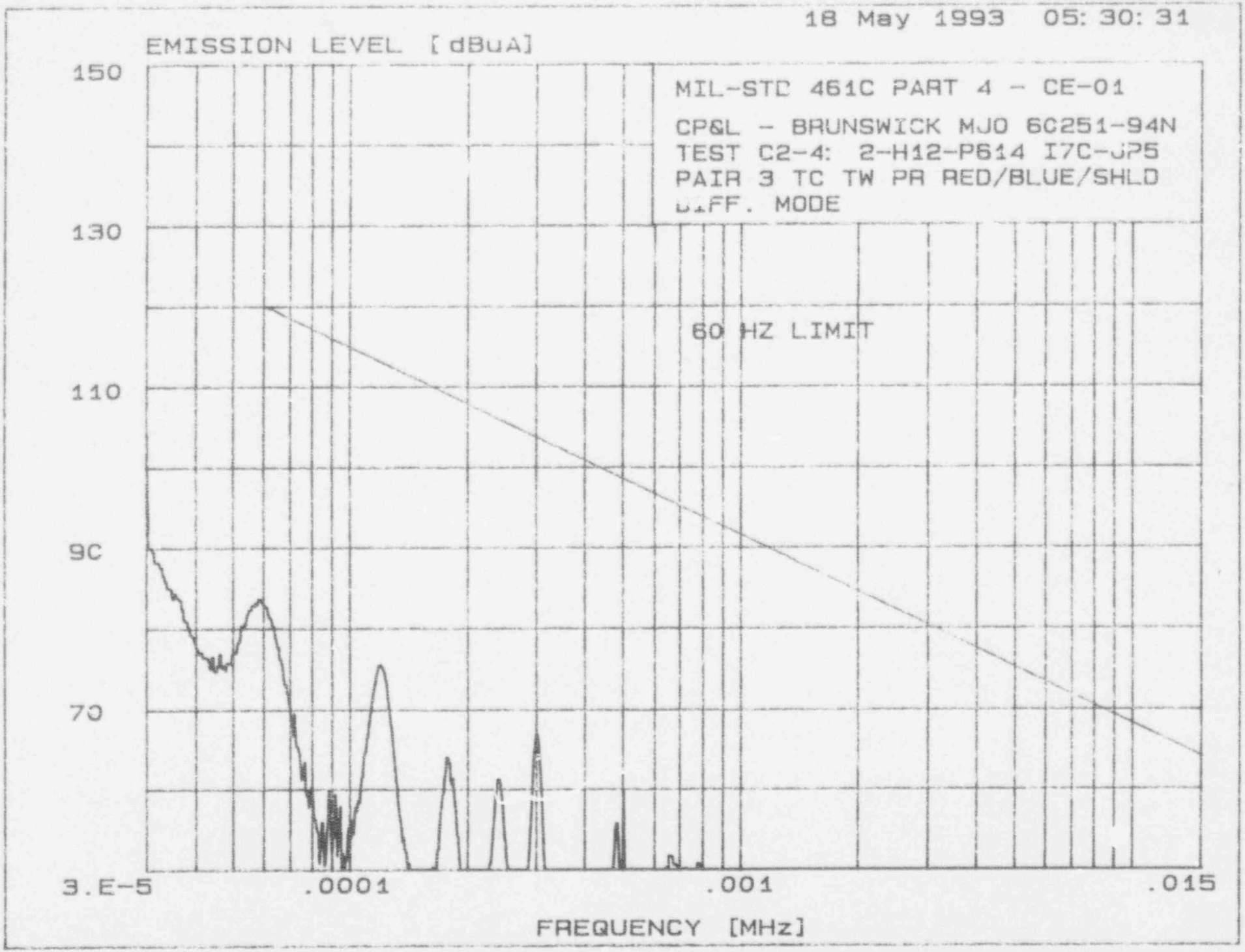
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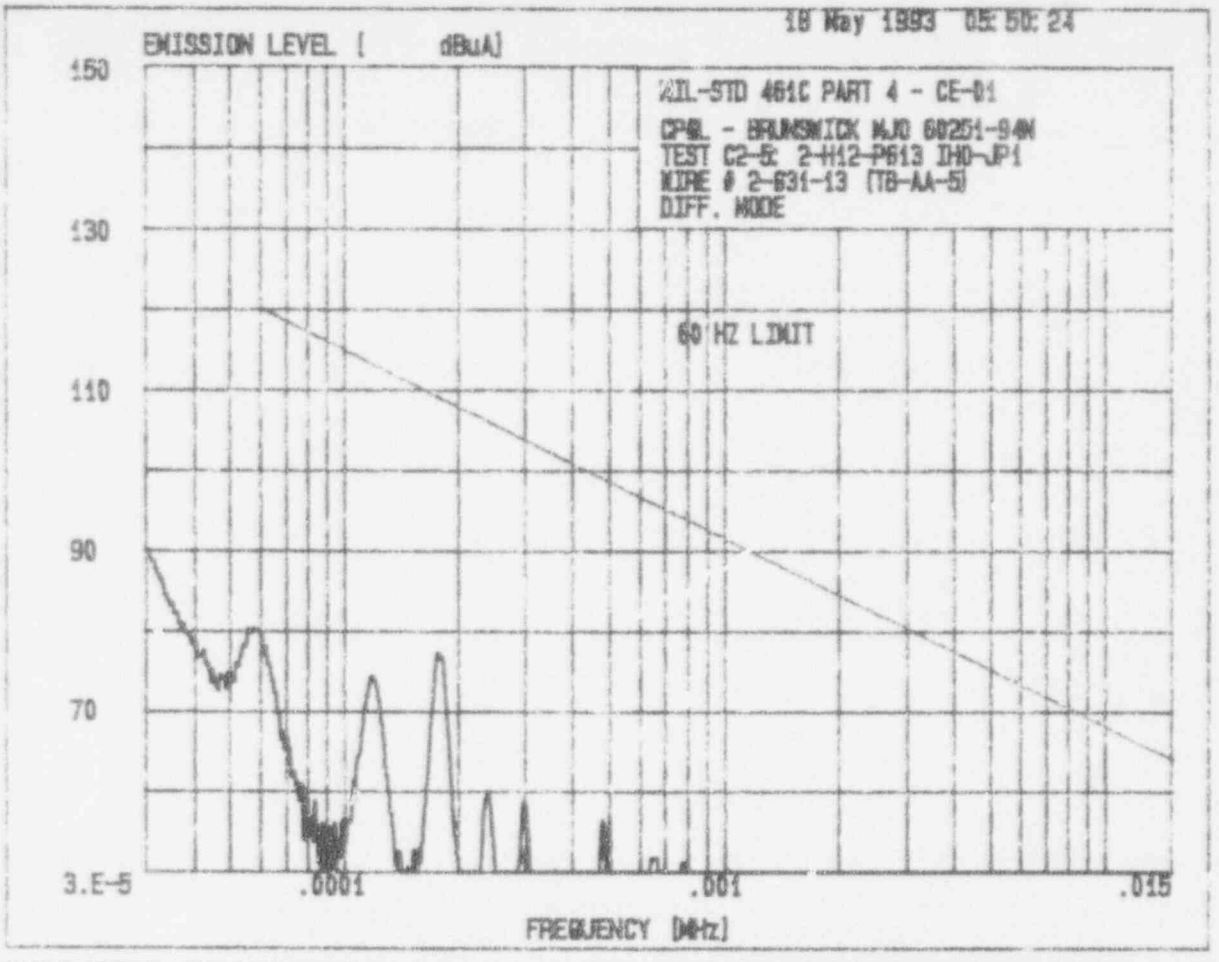
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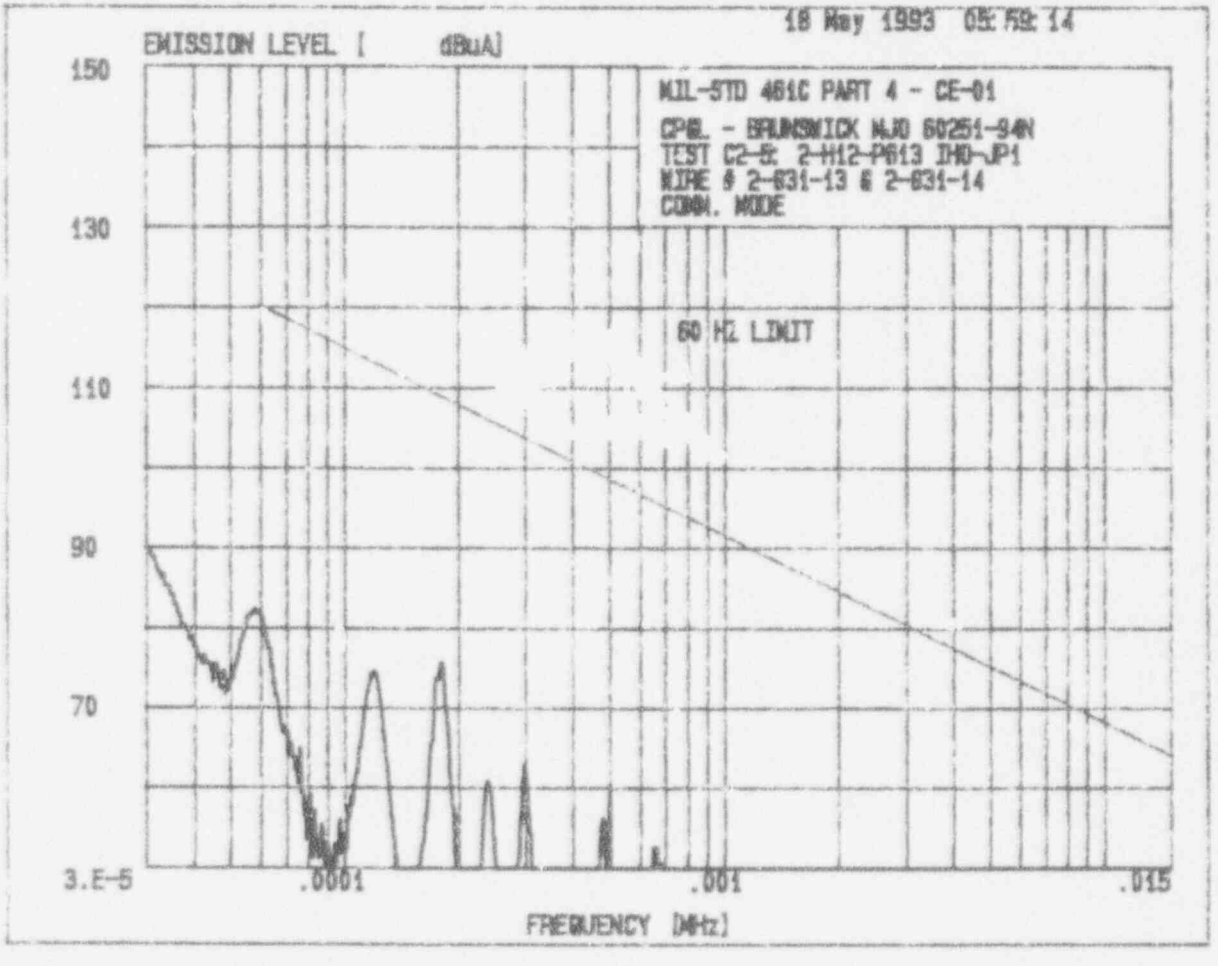
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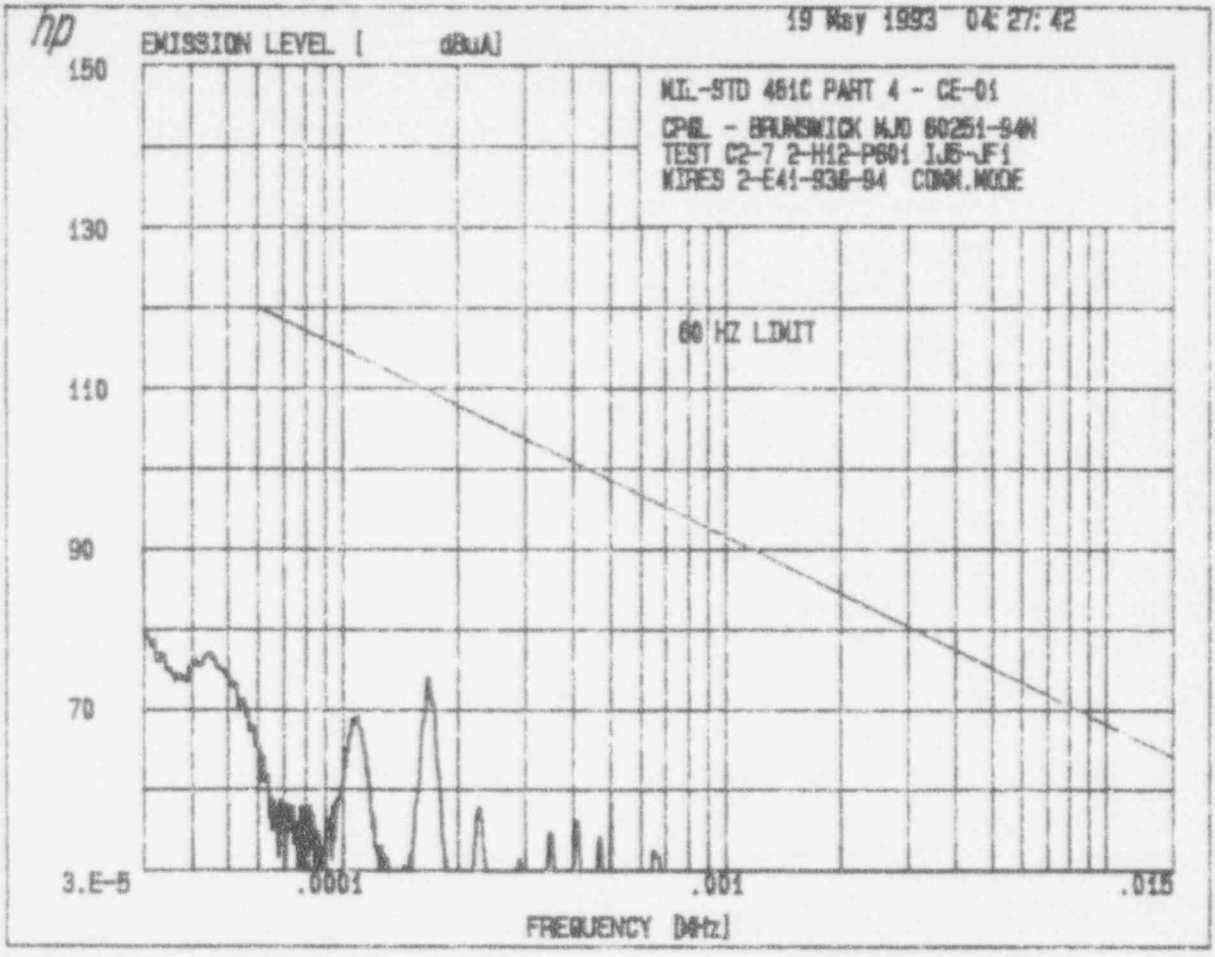
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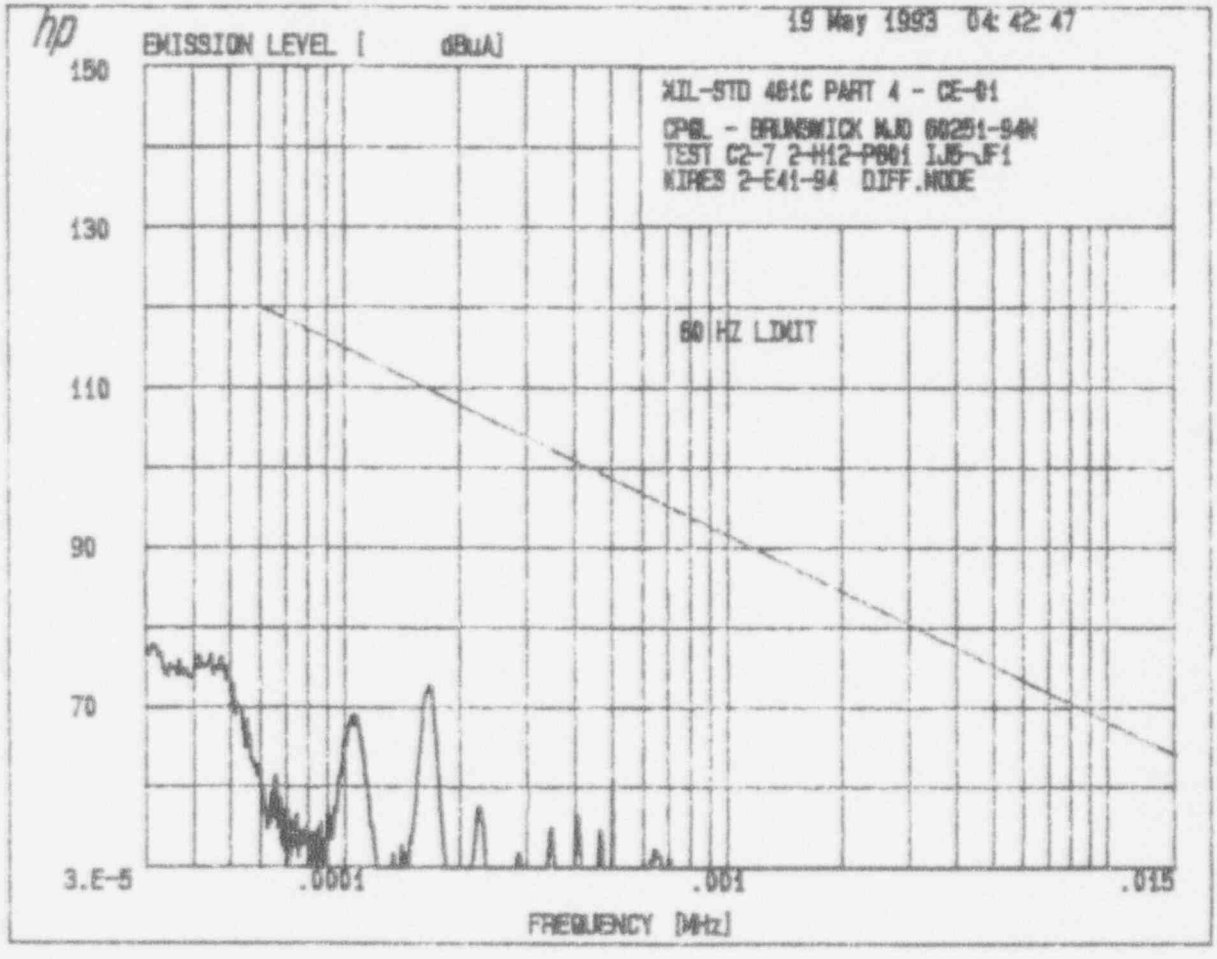
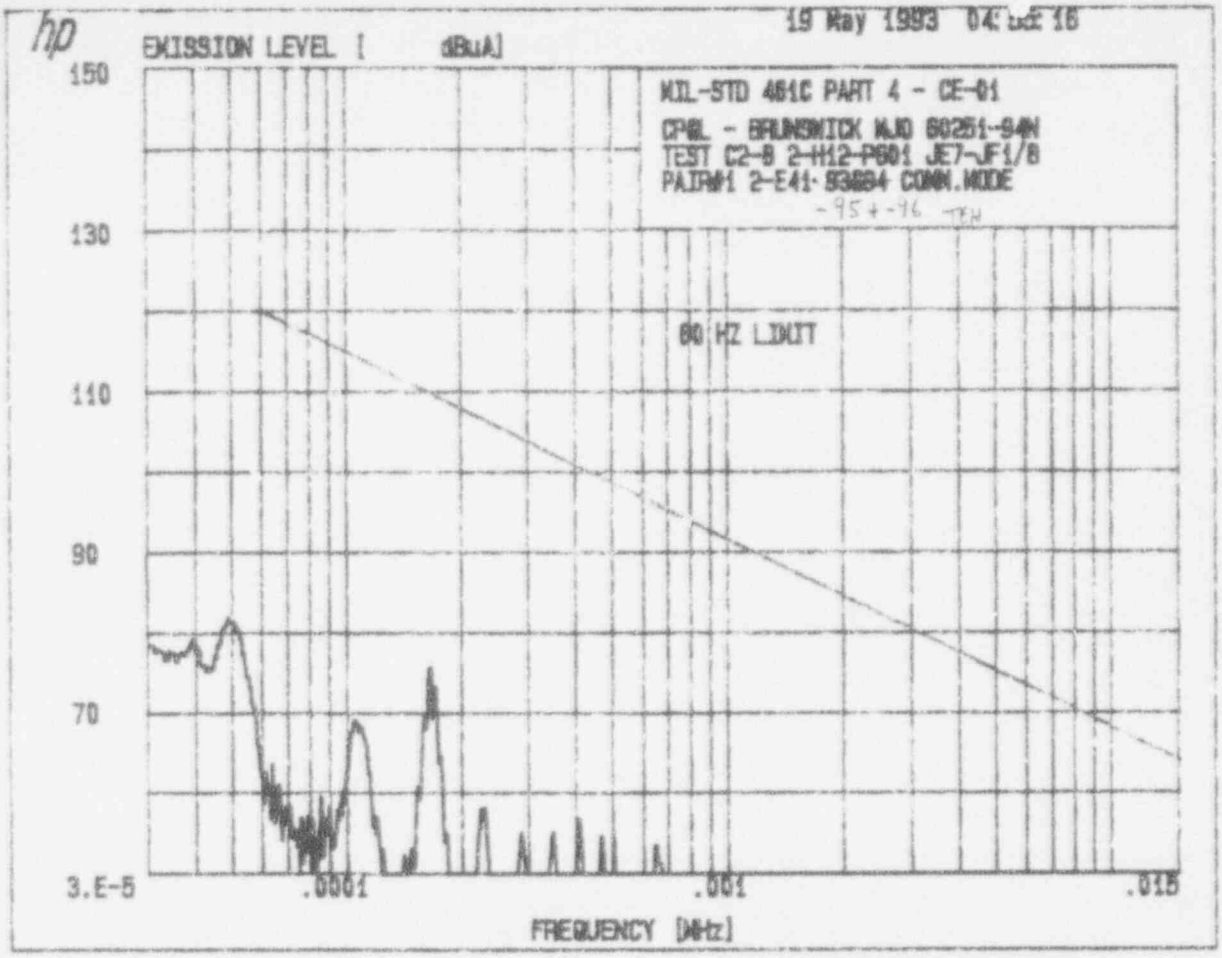
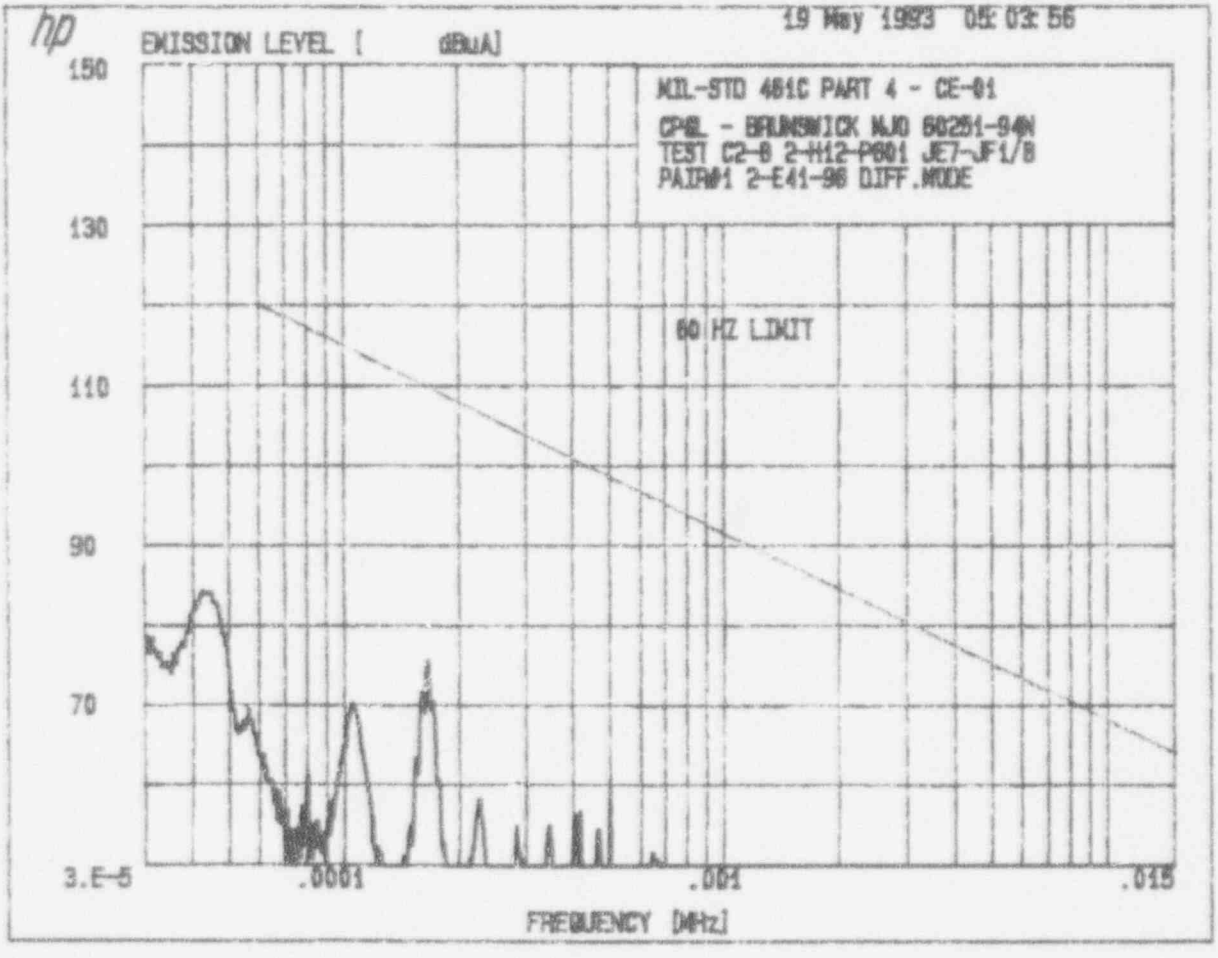
70
3.E-5
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-7 2-H12-P601 IJ5-JF1
WIRES 2-E41-936-94 COMM.MODE
60 HZ LIMIT
.0001
.001
.015
FREQUENCY [MHz]


hp
19 May 1993 04:42:47
EMISSION LEVEL [dBuA]
150
130
110
90
70
3.E-5
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-7 2-H12-P601 IJ5-JF1
WIRES 2-E41-94 DIFF.MODE
60 HZ LIMIT
.0001
.001
.015
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA]
19 May 1993 04:
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-B 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-93694 COMN.MODE
-95+-96 TH
60 HZ LIMIT
150
130
110
90
70
3.E-5
.0001
.001
.015
FREQUENCY [MHz]


hp
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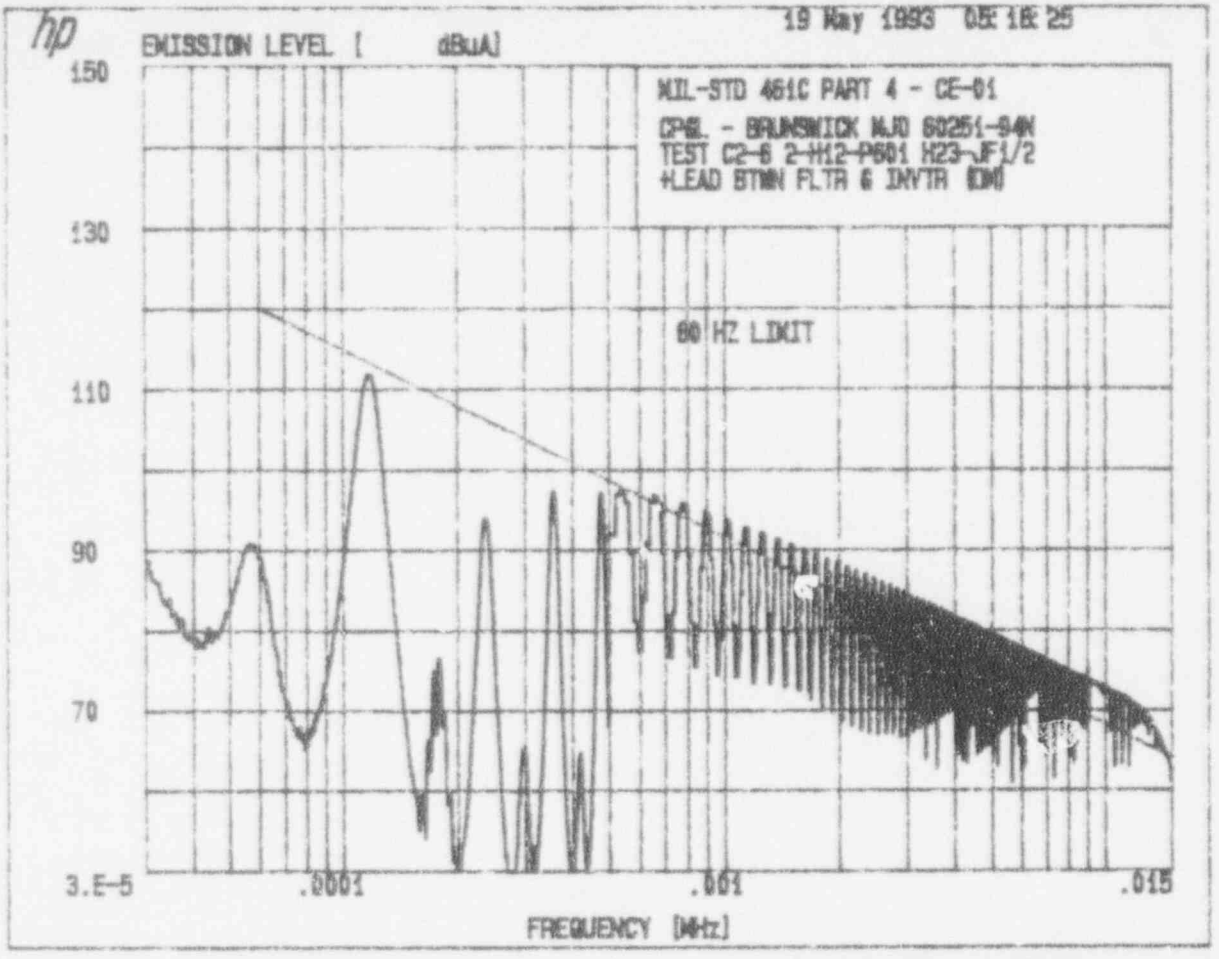
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-B 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-96 DIFF.MODE
60 HZ LIMIT
150
130
110
90
70
3.E-5
.0001
.001
.015
FREQUENCY [MHz]


hp
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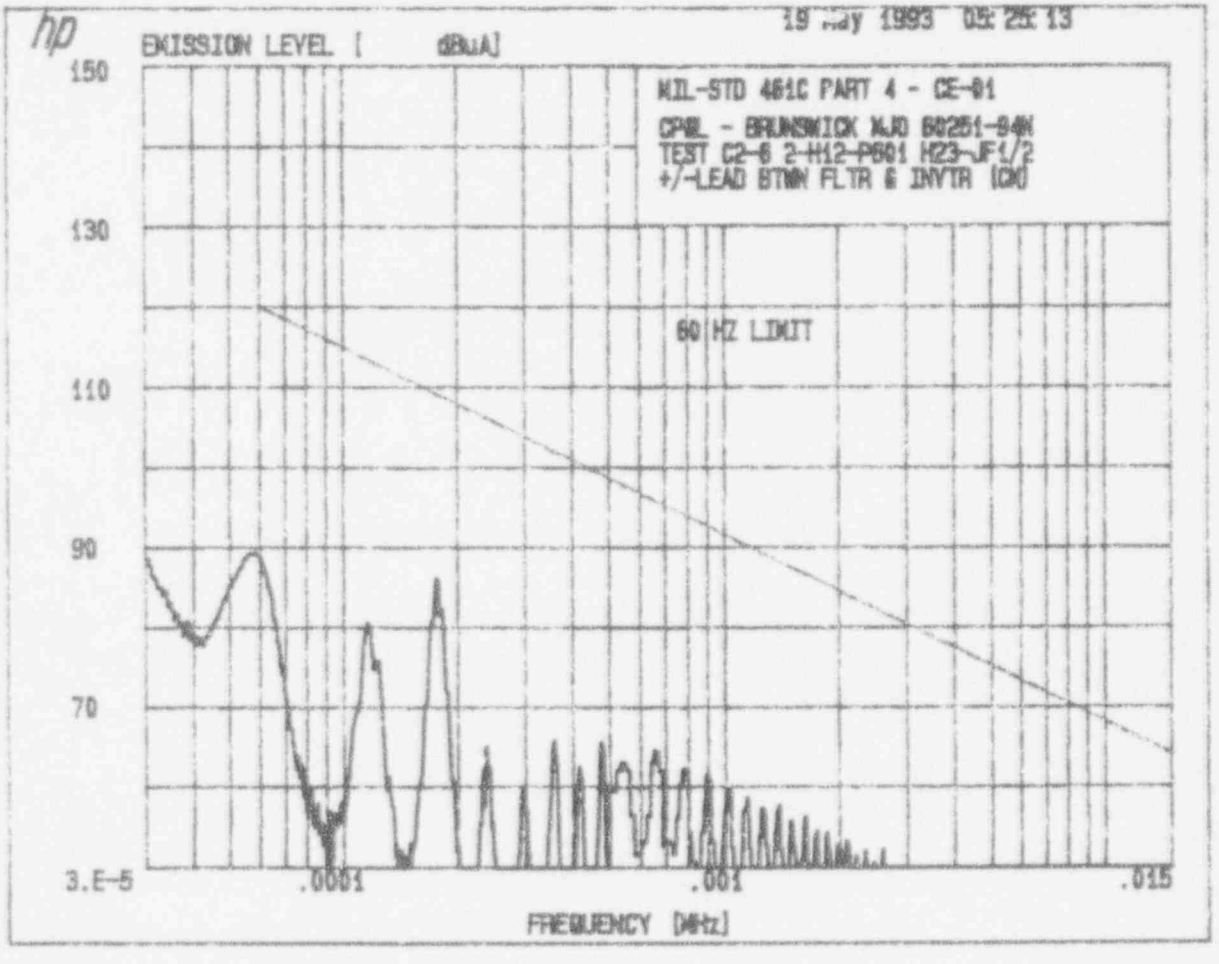
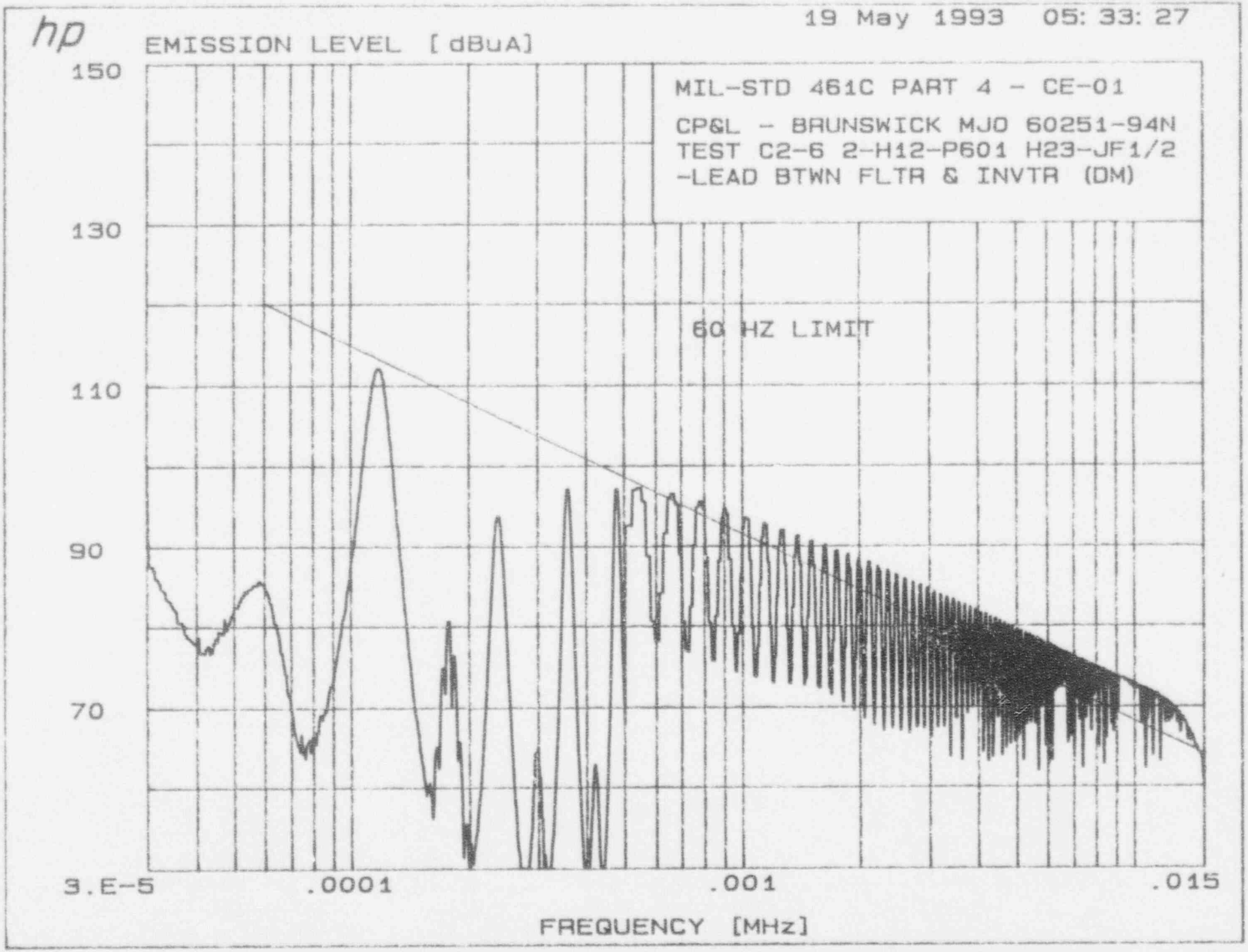
EMISSION LEVEL [dBuA]
150
130
110
90
70
3.E-5
.0001
.001
.015
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+LEAD BTWN FLTR & INVTR (CW)
60 HZ LIMIT
FREQUENCY [MHz]


hp
19 May 1993 05:25:13
EMISSION LEVEL [dBuA]
150
130
110
90
70
3.E-5
.0001
.001
.015
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+/-LEAD BTWN FLTR & INVTR (CW)
60 HZ LIMIT
FREQUENCY [MHz]


hp
19 May 1993 05: 33: 27
EMISSION LEVEL [dBuA]
150
130
110
90
70
MIL-STD 461C PART 4 - CE-01
CP&L - BRUNSWICK MJO 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
-LEAD BTWN FLTR & INVTR (DM)
60 HZ LIMIT
3.E-5
.0001
.001
.015
FREQUENCY [MHz]

6.2 Conducted Emissions, Method CE03, Power and Signal Leads, 15 KHz to 50 MHz

Requirements

Conducted emission measurements, from 15 KHz to 50 MHz, were made in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method CE03 of MIL-STD-462. Reference Section 6.2, Test Setup.

Procedures

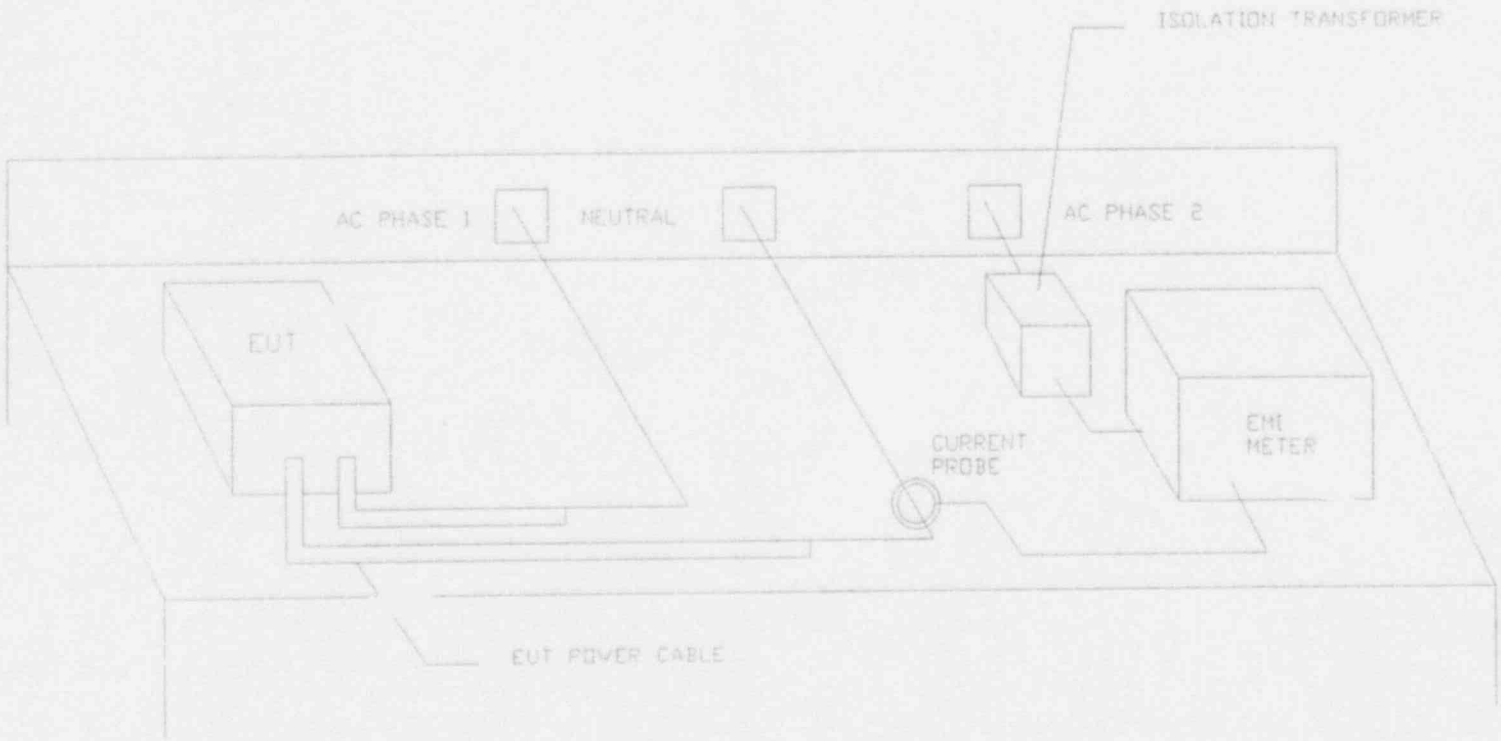
The Control Room Environment was set up and operated as specified in Section 4.0 of this report. An A. H. Systems Clamp-on Current Probe, Model BCP-200/511, was connected to a Hewlett-Packard Automated Microwave Measurement System, Model 8566S, through a 10' length of RG9B/U coaxial cable. The current probe was clamped around a selected power lead, inside the control cabinet, and the analyzer was swept over the frequency range from 15 KHz to 50 MHz, and plots were generated for both Narrow and Broad Band measurements. Reference Section 6.2, Data Sheets.

The preceding procedure was repeated with the current probe clamped around the appropriate individual power/signal leads and power/signal lead bundles.

Test Results

Test	Results
CEO3 Conducted Emissions, 15KHz - 50 MHz	TBD*

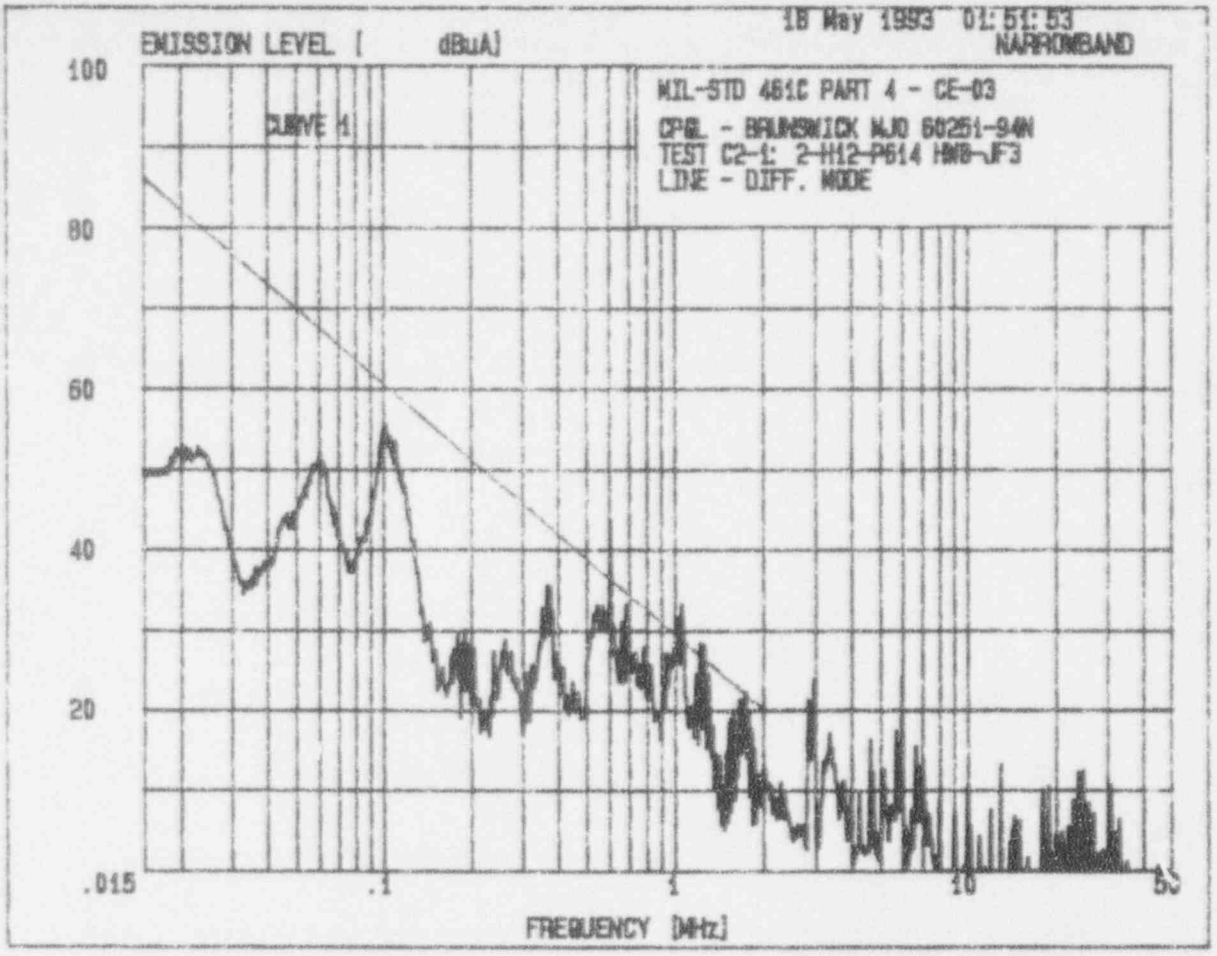
*See NTS Report #60251-94N-2.

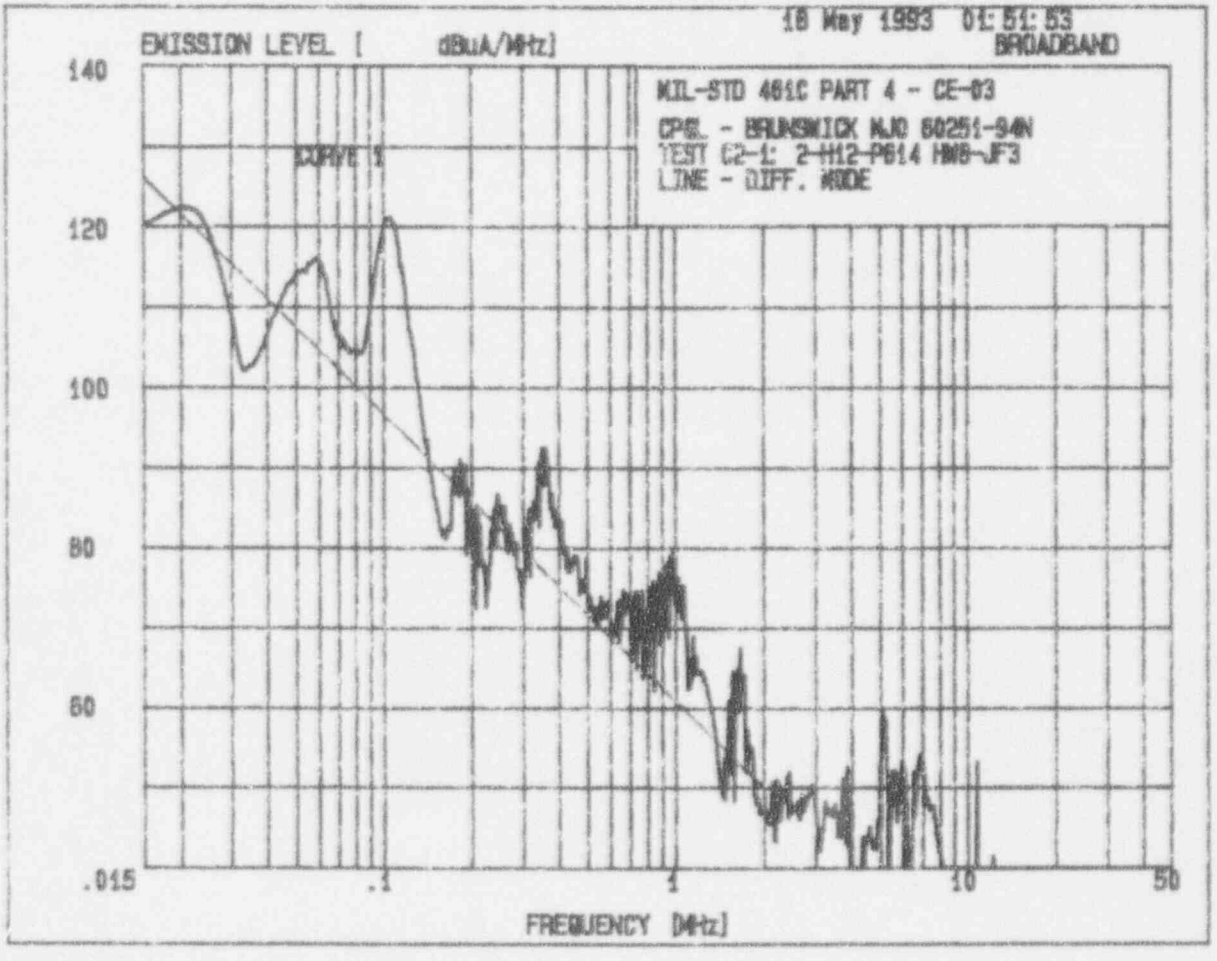


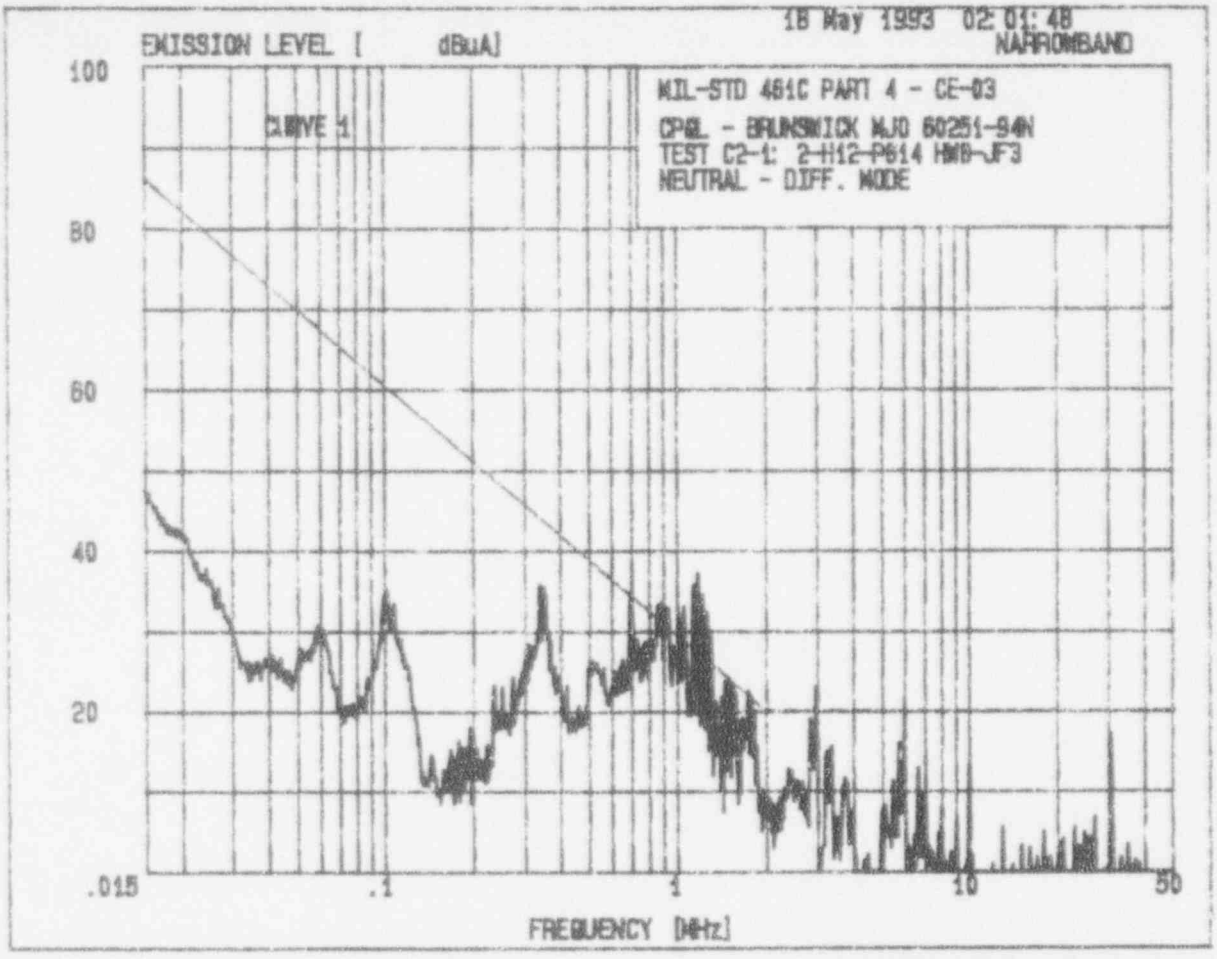
CONDUCTED EMISSIONS, METHOD CE03, TYPICAL TEST SETUP

NTS

CE03 DATA SHEETS


18 May 1993 01:51:53
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
LINE - DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 01:51:53
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
LINE - DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]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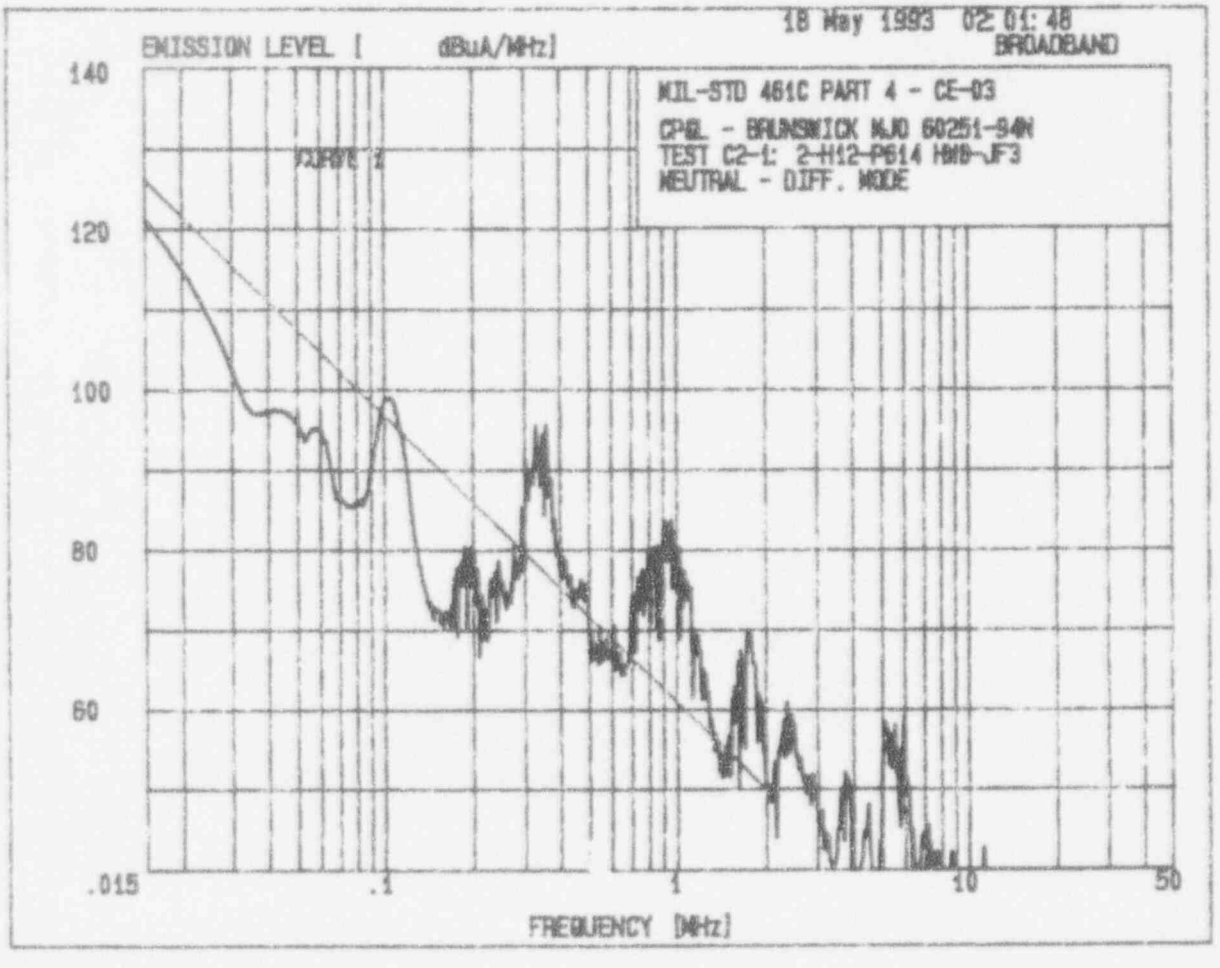
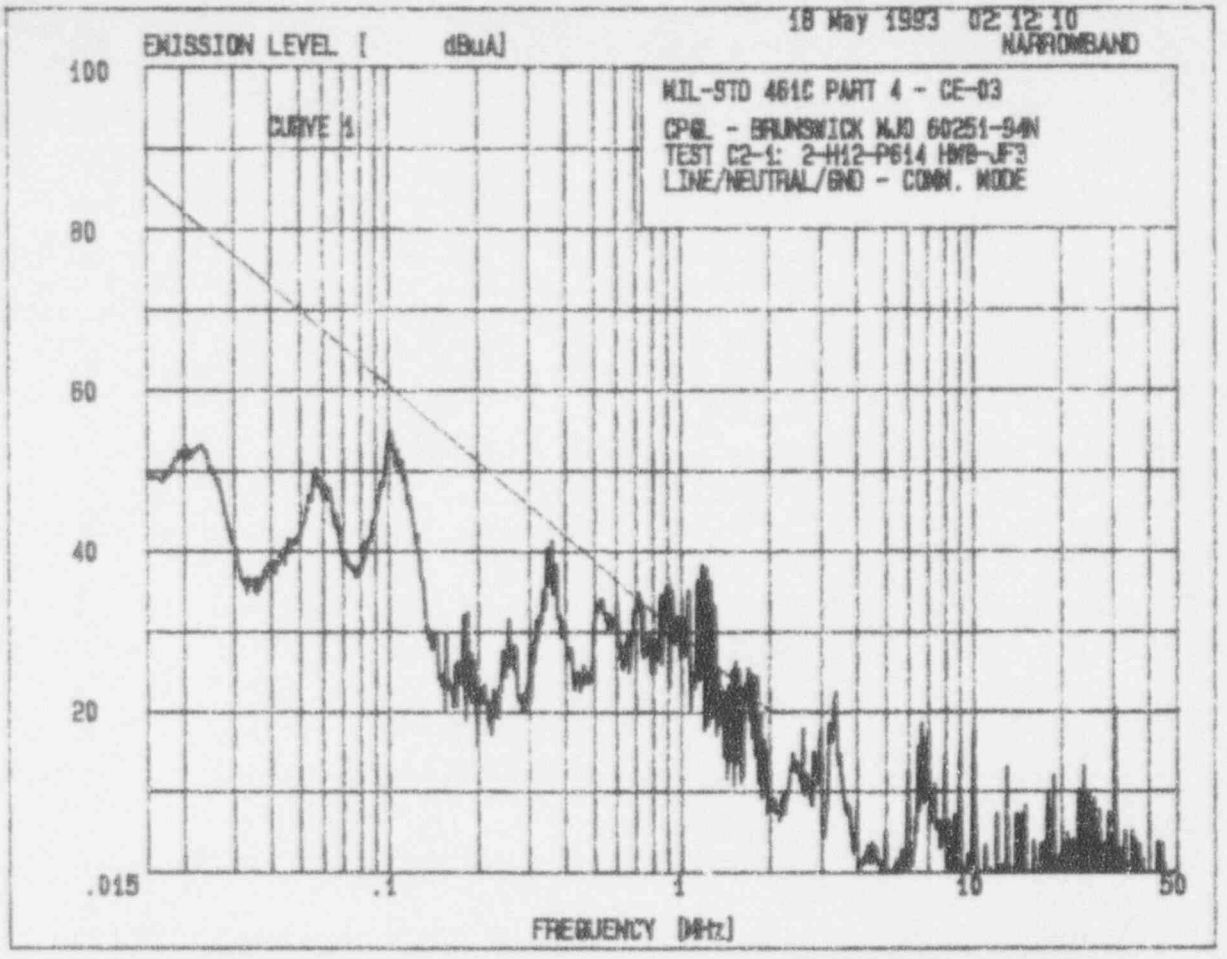
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
NEUTRAL - DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 02:01:48
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
NEUTRAL - DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]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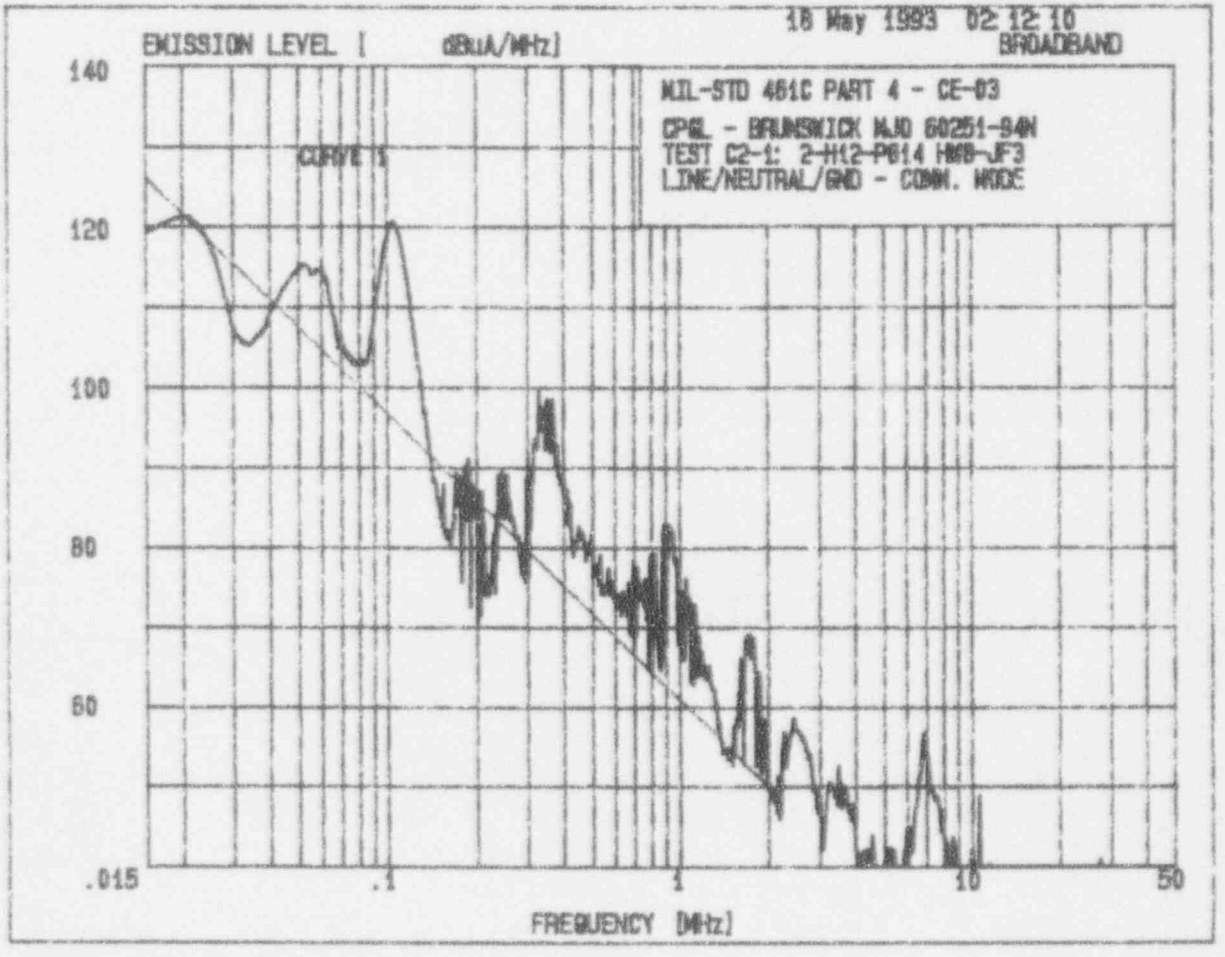
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
LINE/NEUTRAL/GND - COMM. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]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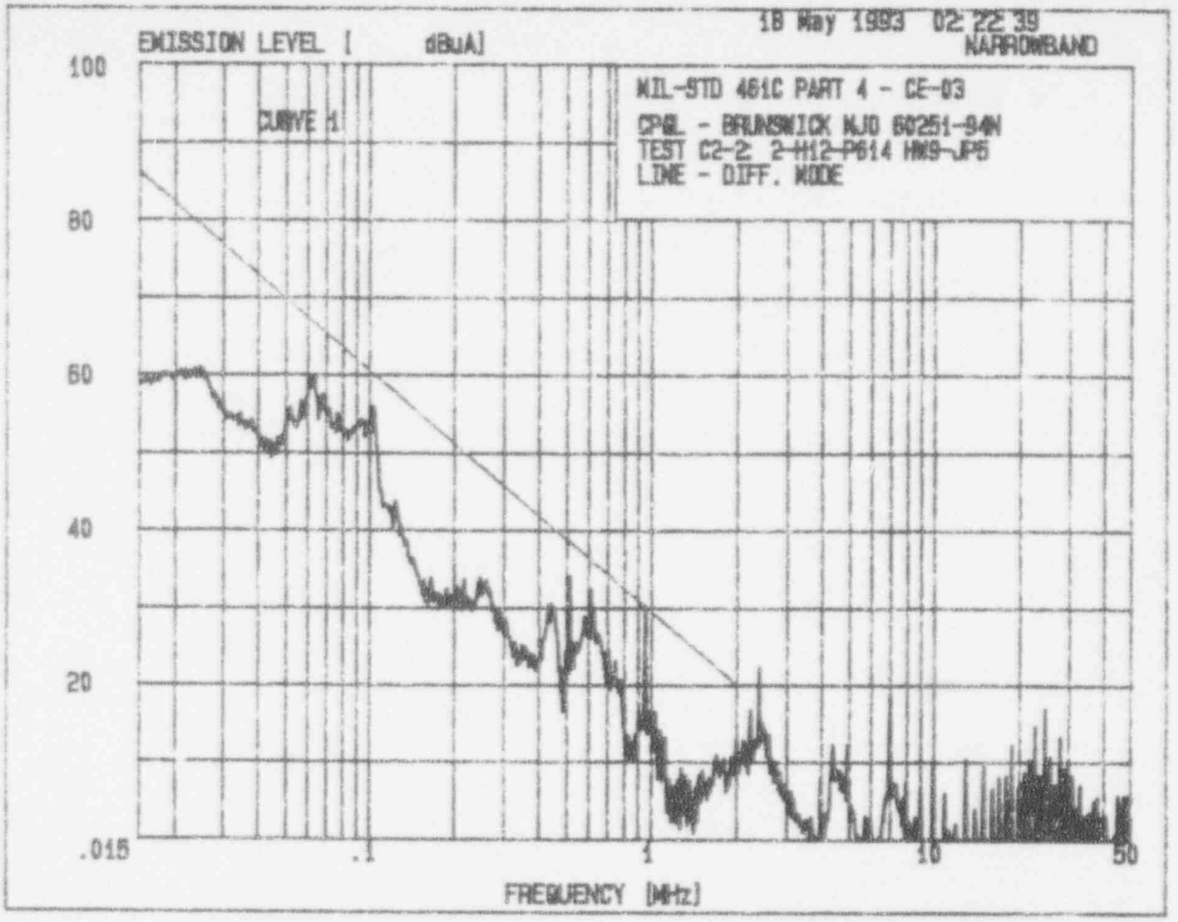
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-1: 2-H12-P614 HWB-JF3
LINE/NEUTRAL/GND - COMM. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]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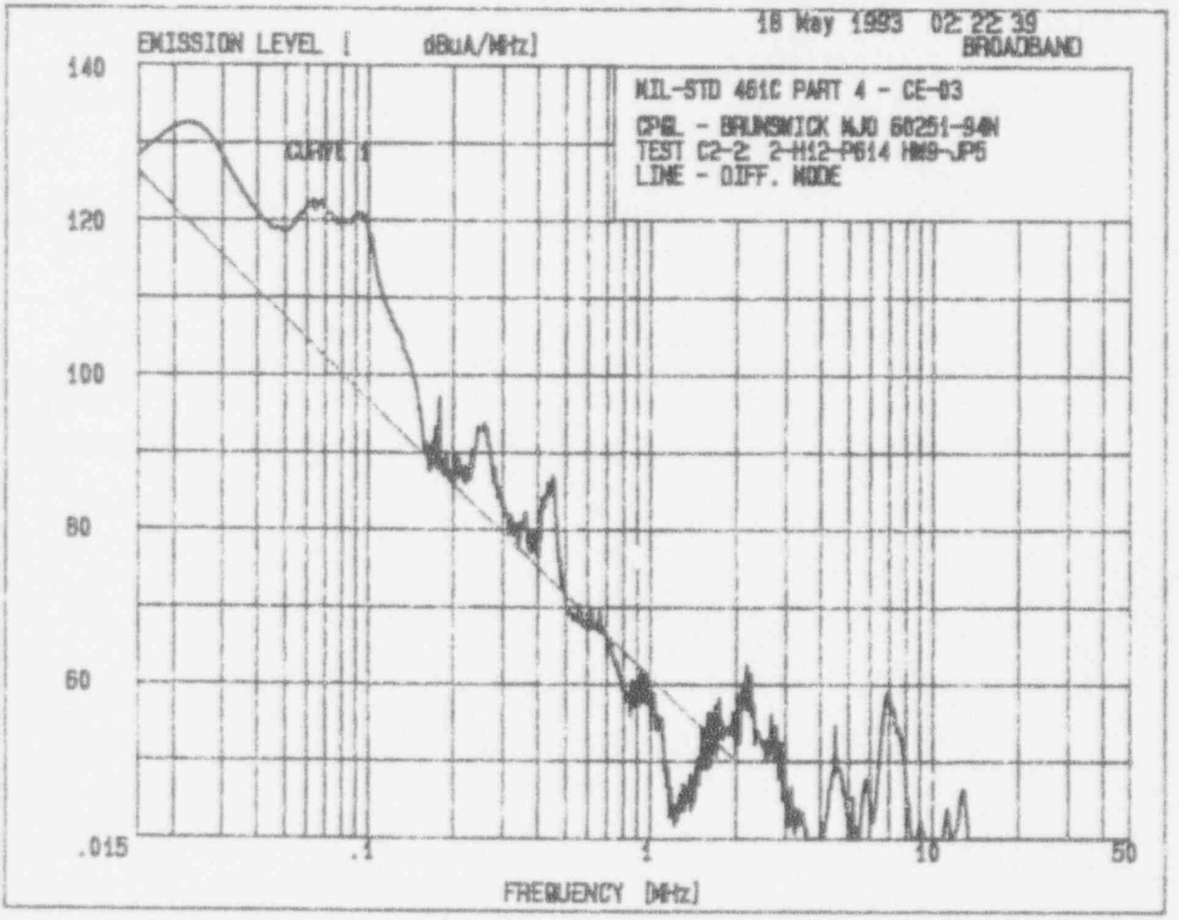
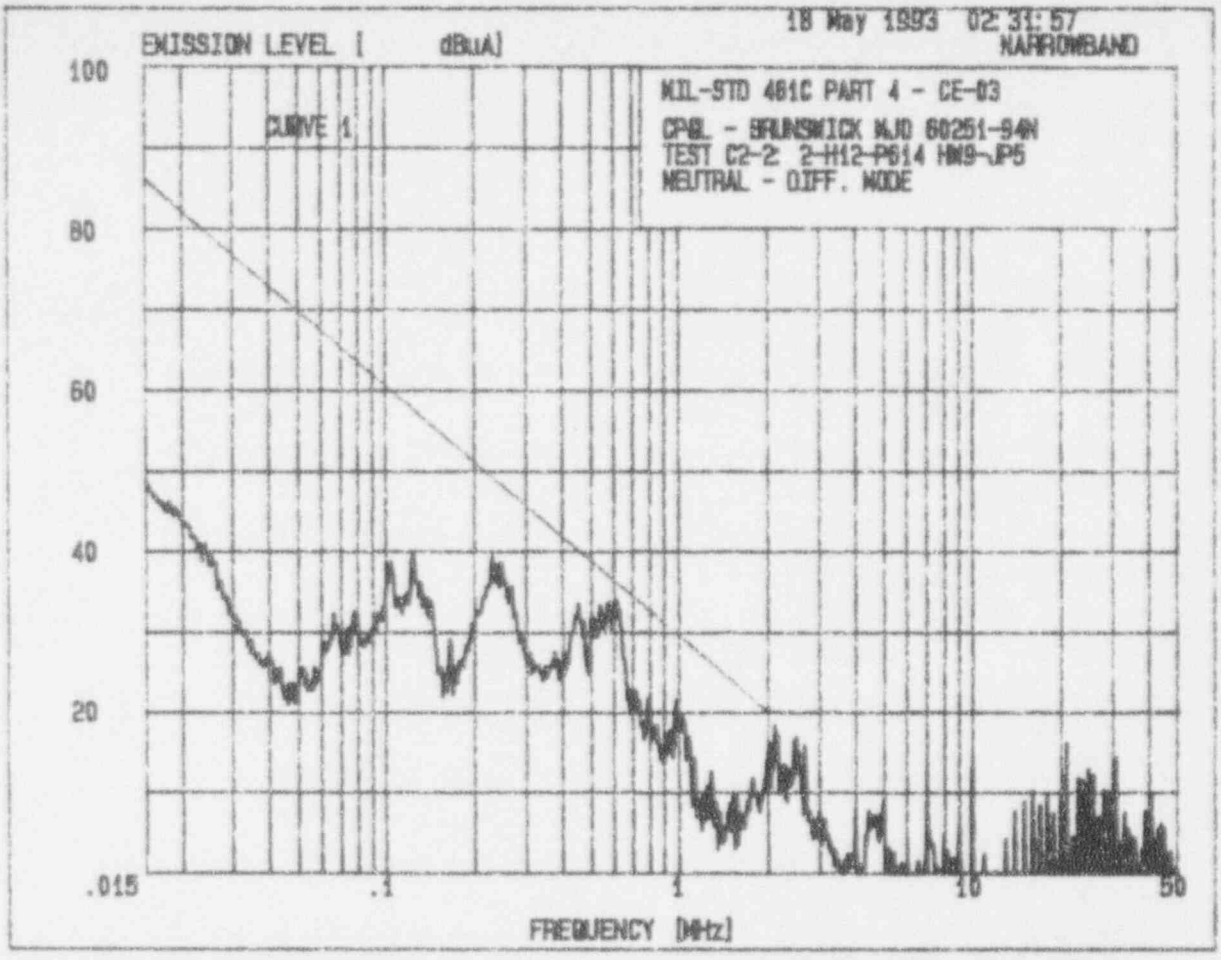
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HW9-JP5
LINE - DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 02:22:39
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HW9-JP5
LINE - DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]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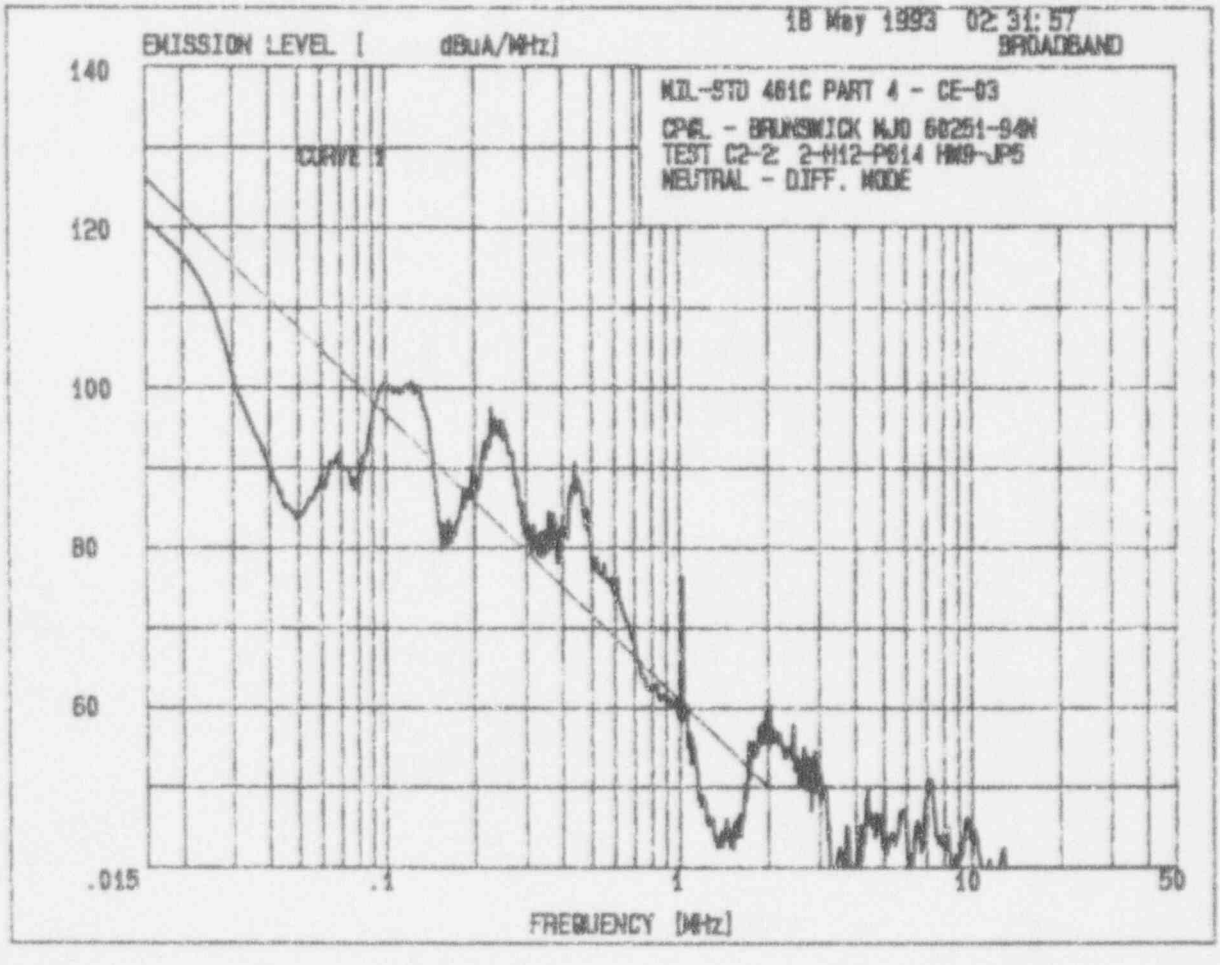
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HM9-JP5
NEUTRAL - DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]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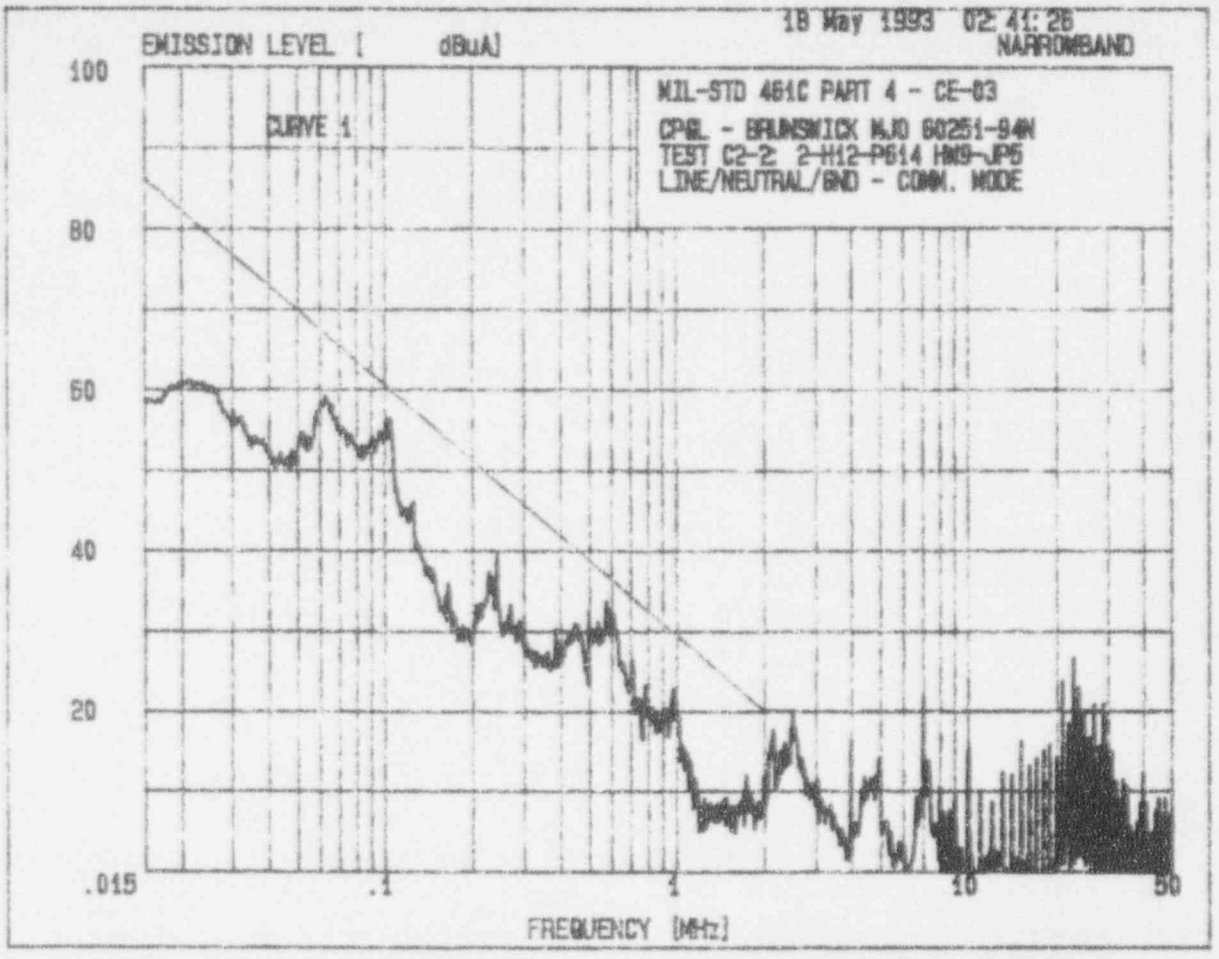
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HM9-JP5
NEUTRAL - DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]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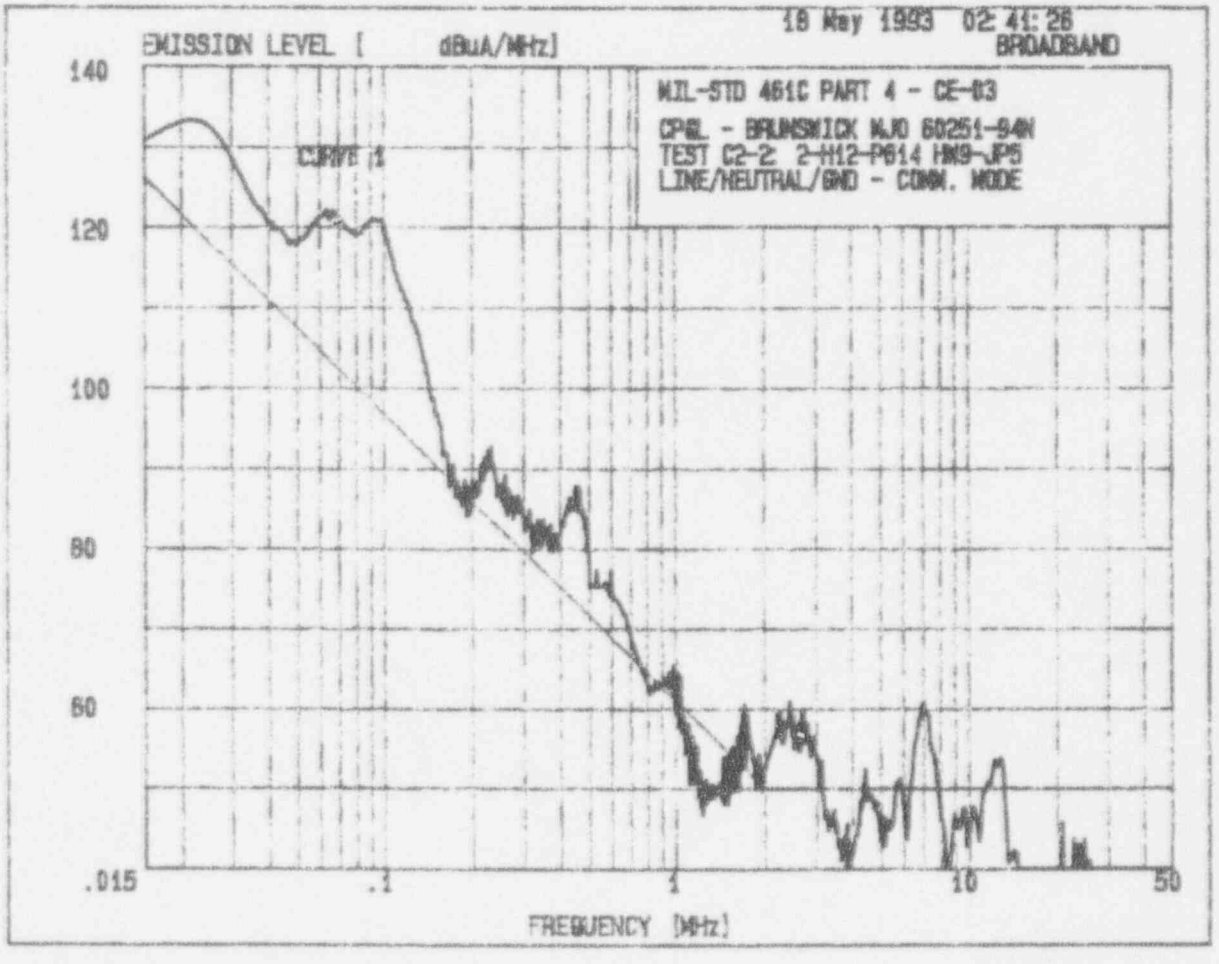
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HN9-JP5
LINE/NEUTRAL/GND - COMM. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]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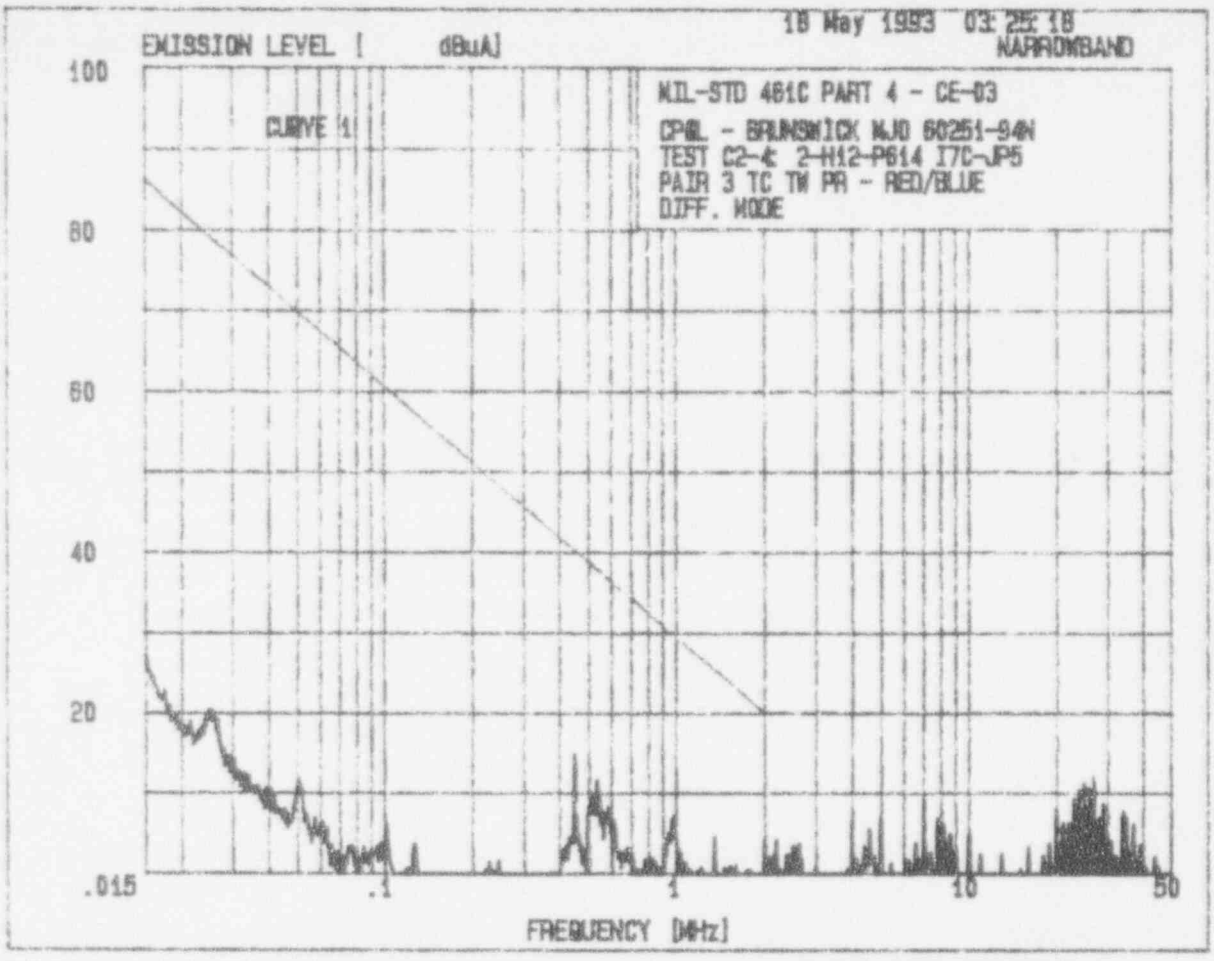
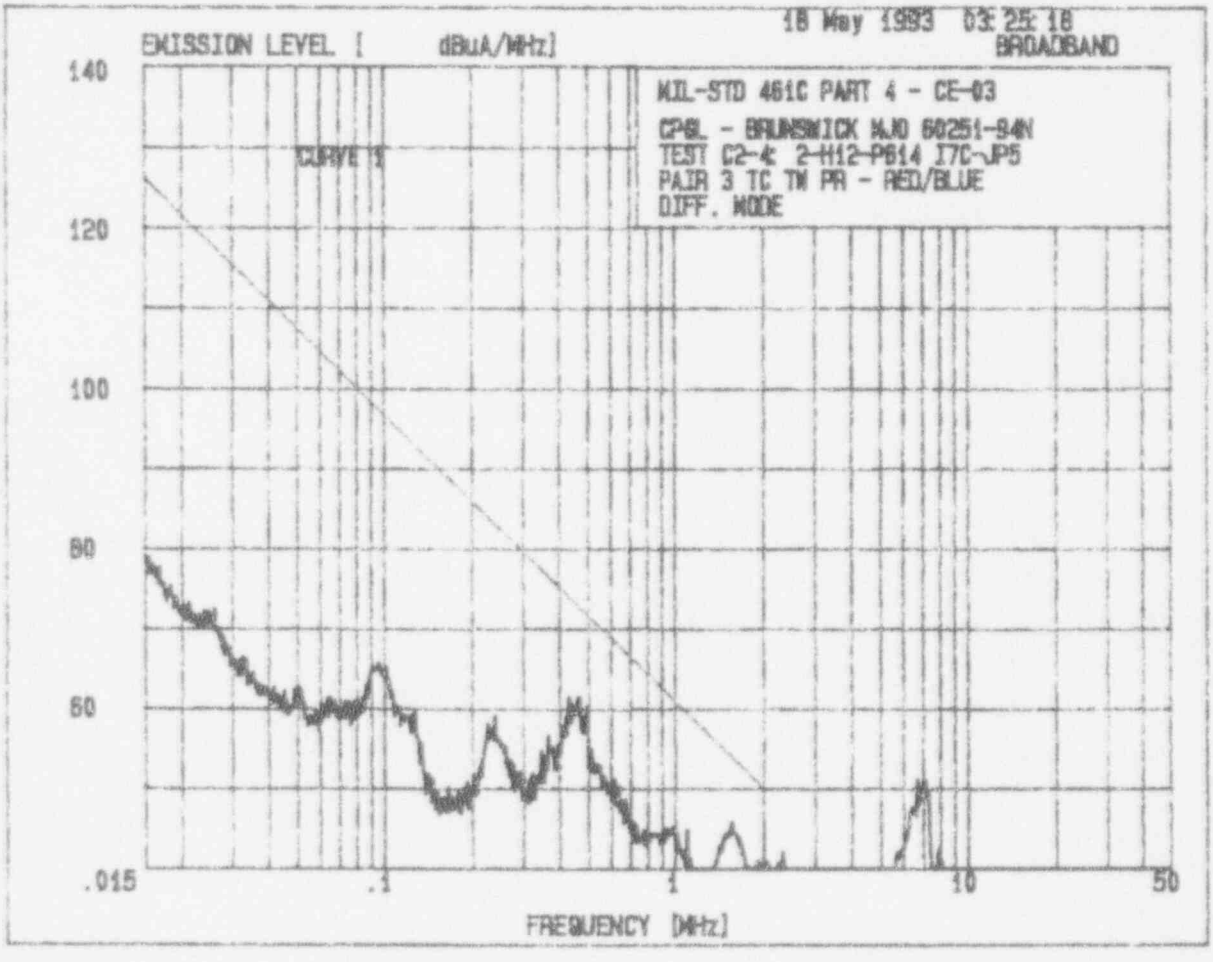
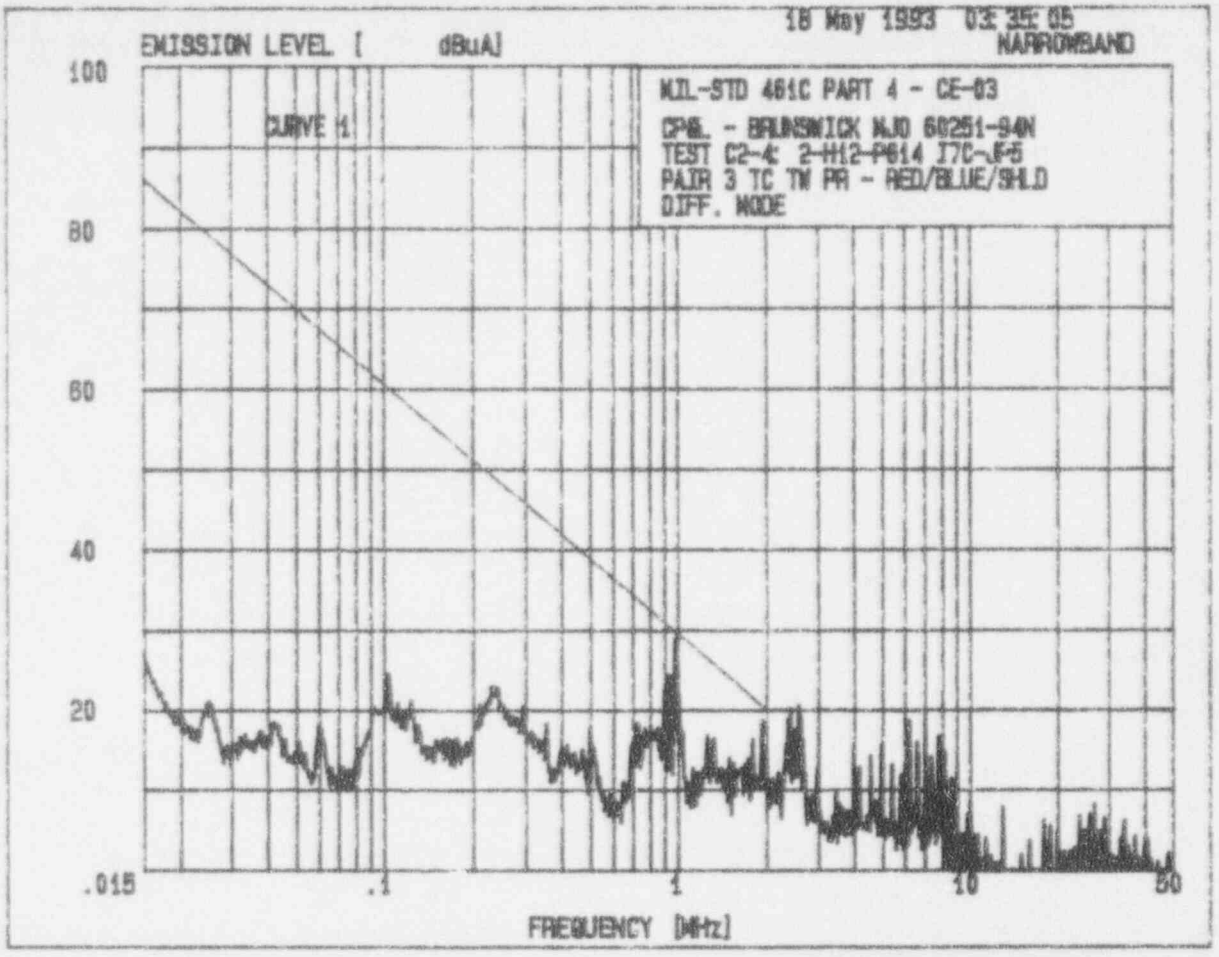
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-2 2-H12-P614 HN9-JP5
LINE/NEUTRAL/GND - COMM. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 03:25:18
NARROWBAND
EMISSION LEVEL [dBuA]
100
80
60
40
20
.015
.1
1
10
50
CURVE 1
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 TC TW PR - RED/BLUE
DIFF. MODE
FREQUENCY [MHz]


18 May 1993 03:25:18
BROADBAND
EMISSION LEVEL [dBuA/MHz]
140
120
100
80
60
.015
.1
1
10
50
CURVE 1
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 TC TW PR - RED/BLUE
DIFF. MODE
FREQUENCY [MHz]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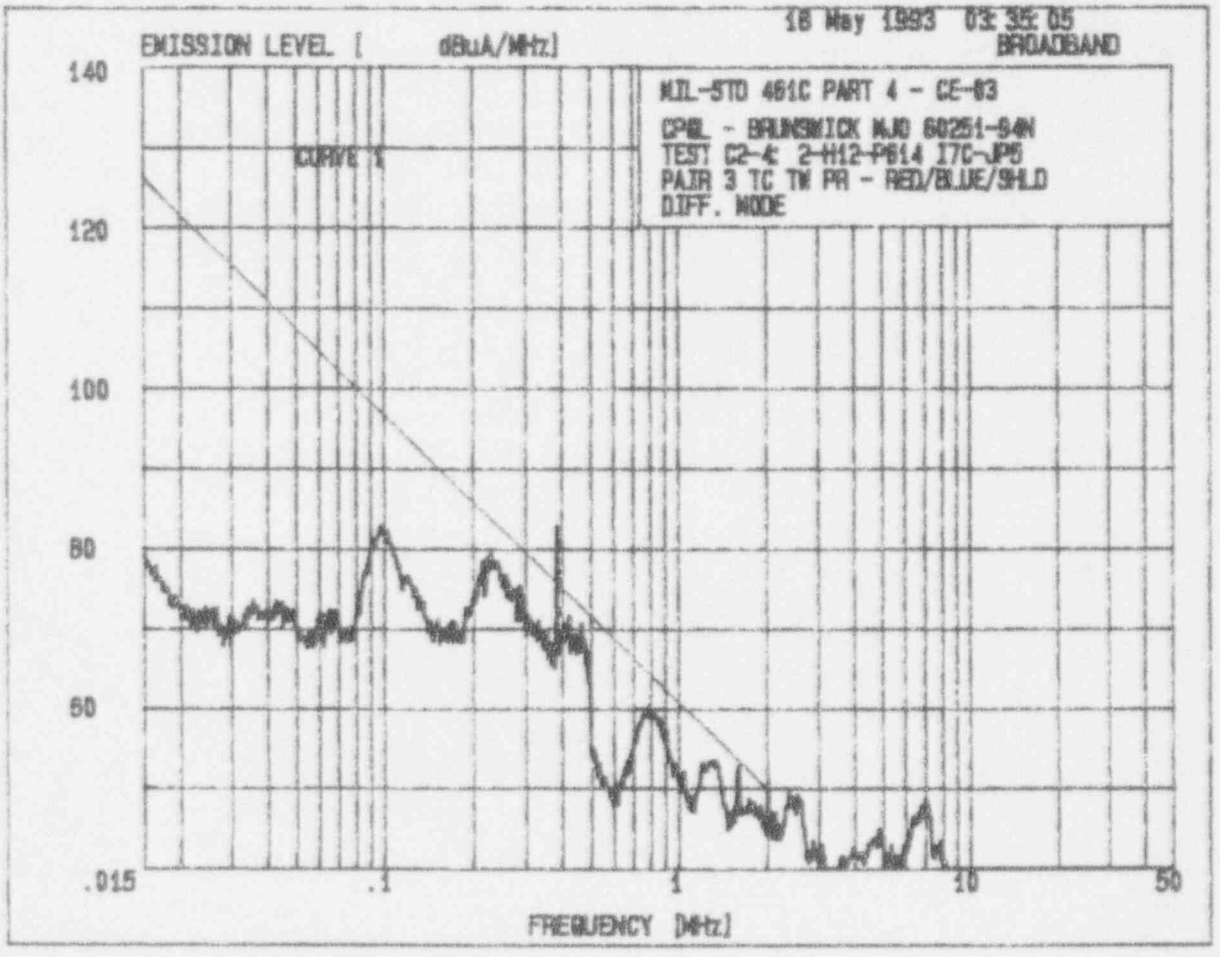
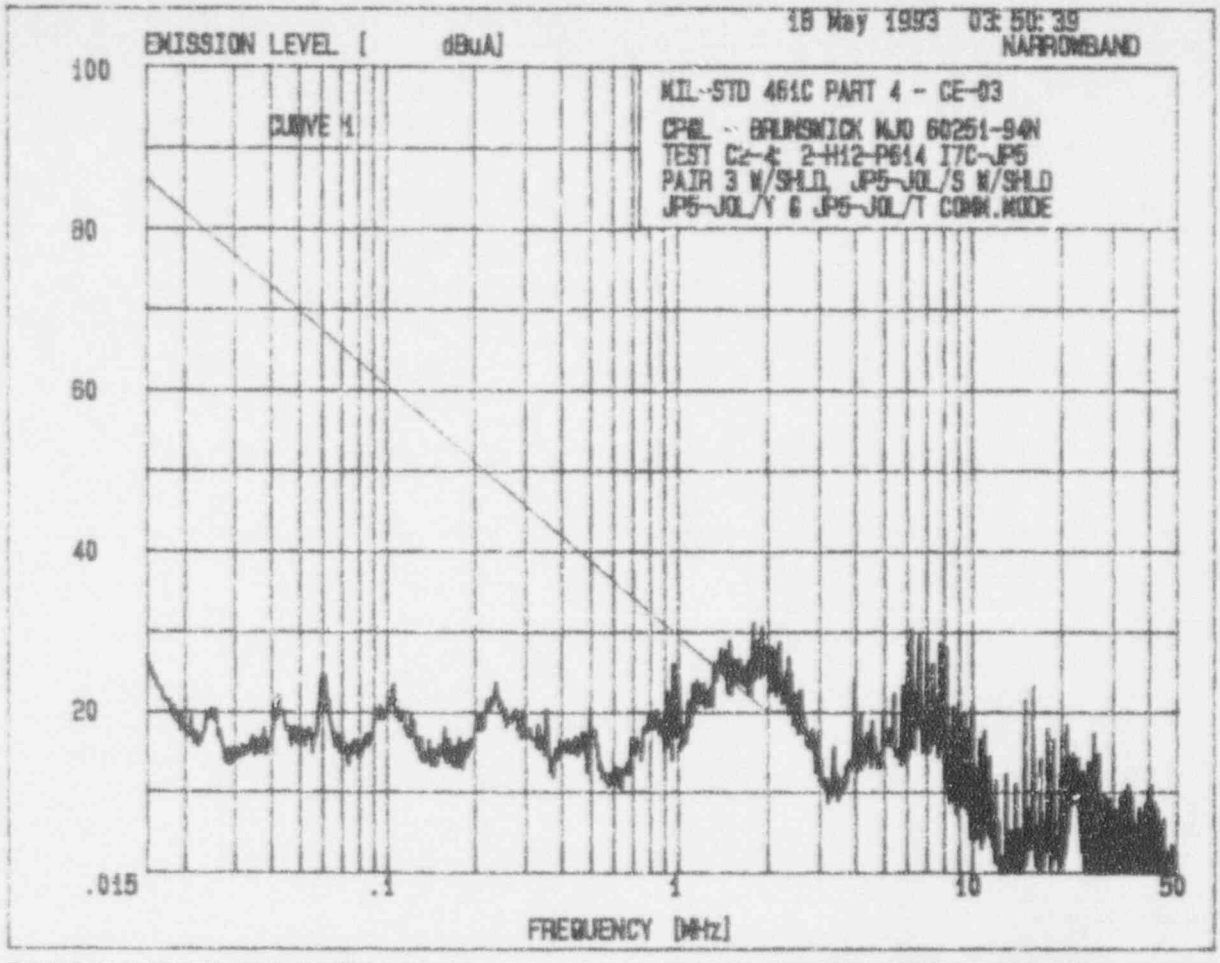
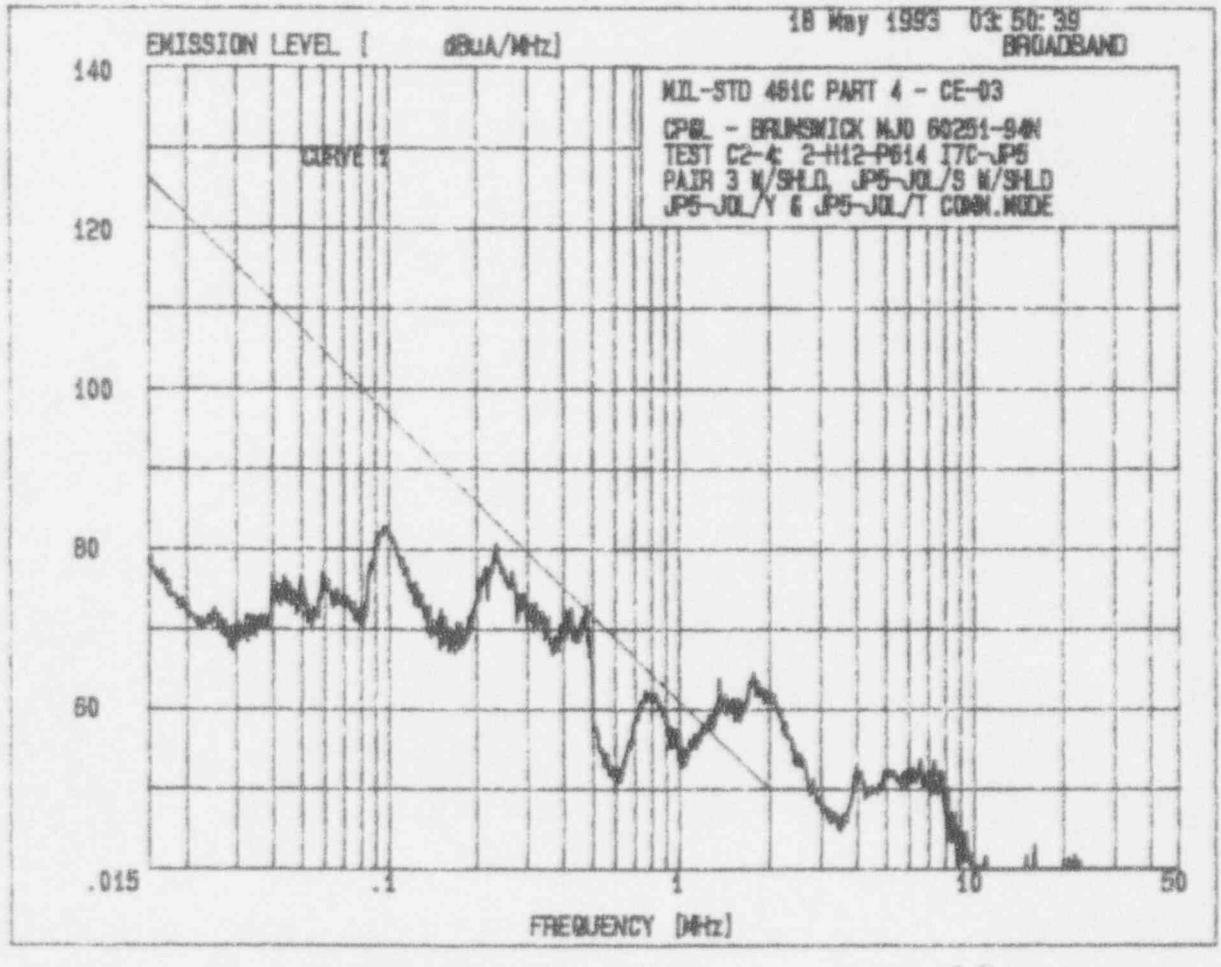
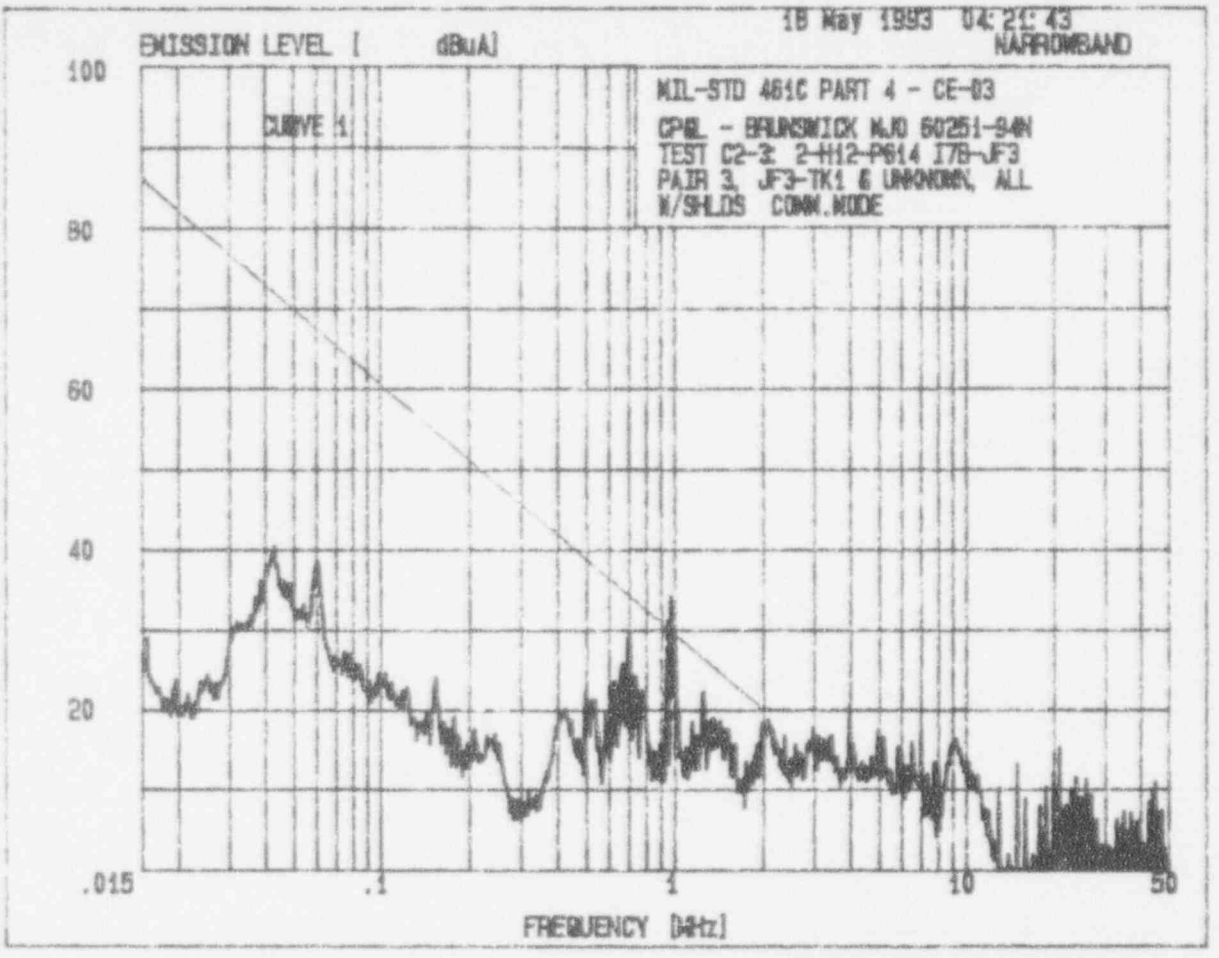
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 TC TW PR - RED/BLUE/SHLD
DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 03:35:05
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 TC TW PR - RED/BLUE/SHLD
DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]


18 May 1993 03:50:39
EMISSION LEVEL [dBuA]
NARROWBAND
100
80
60
40
20
.015
.1
1
10
50
CURVE H
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 W/SHLD, JP5-JOL/S W/SHLD
JP5-JOL/Y & JP5-JOL/T COMM.MODE
FREQUENCY [MHz]


18 May 1993 03:50:39
EMISSION LEVEL [dBuA/MHz]
BROADBAND
140
120
100
80
60
.015
.1
1
10
50
CURVE I2
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 60251-94N
TEST C2-4: 2-H12-P614 I7C-JP5
PAIR 3 W/SHLD, JP5-JOL/S W/SHLD
JP5-JOL/Y & JP5-JOL/T COMM.MODE
FREQUENCY [MHz]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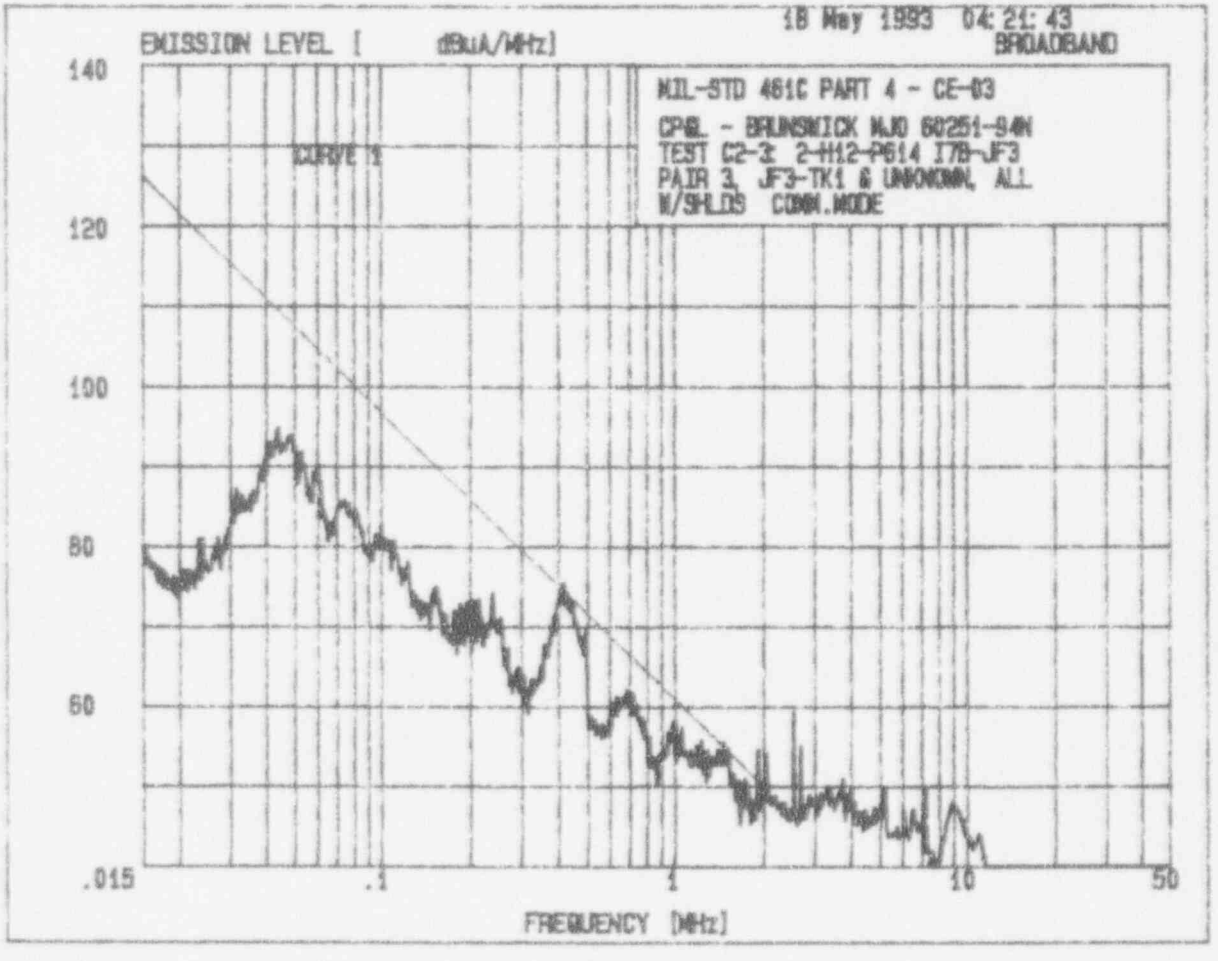
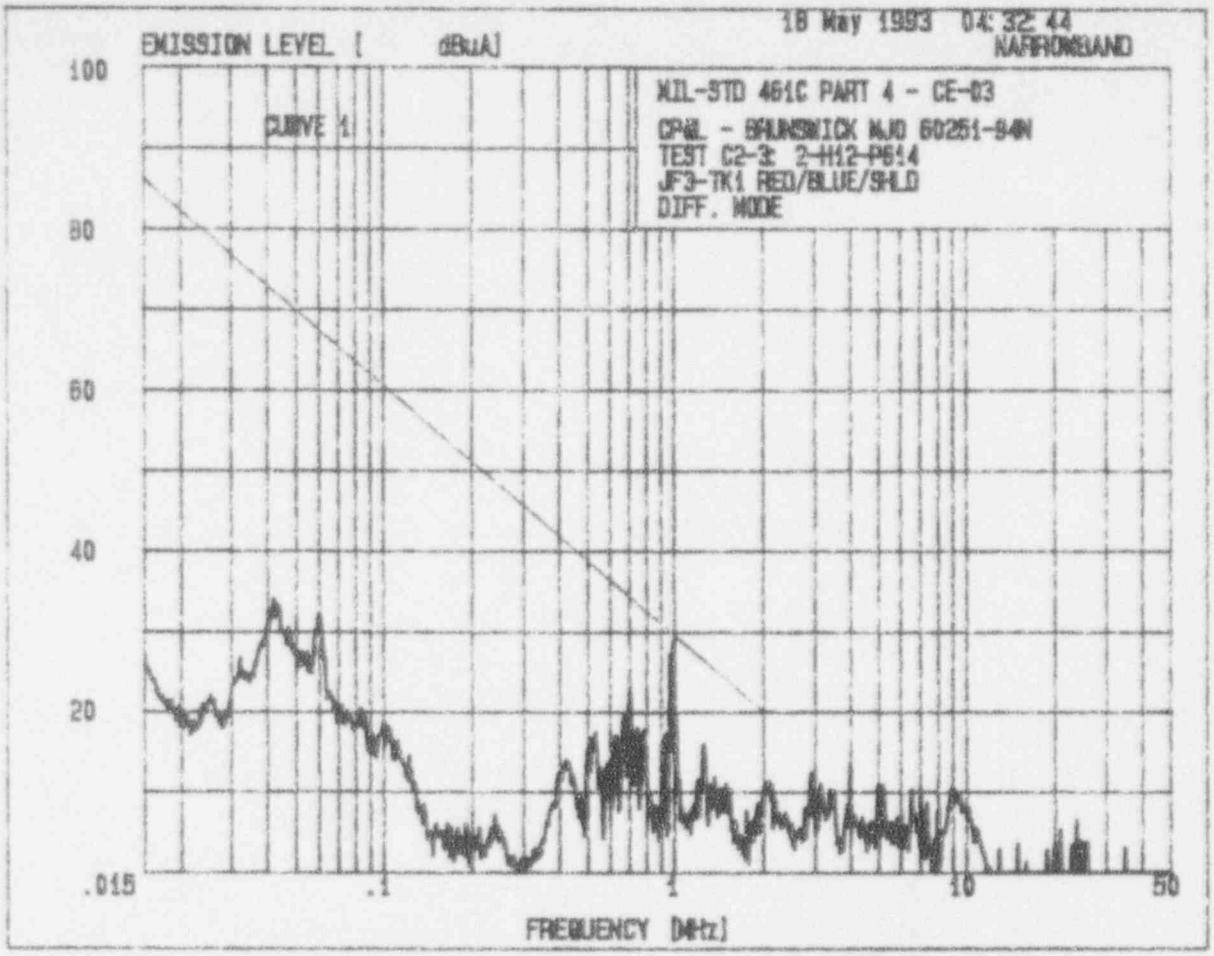
NARROWBAND
EMISSION LEVEL [dBuA]
100
80
60
40
20
.015
.1
1
10
50
CURVE 1
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 50251-94N
TEST C2-3: 2-H12-P614 I7B-JF3
PAIR 3, JF3-TK1 & UNKNOWN, ALL
W/SHLDS COMM.MODE
FREQUENCY [MHz]


18 May 1993 04:21:43
BROADBAND
EMISSION LEVEL [dBuA/MHz]
140
120
100
80
60
.015
.1
1
10
50
CURVE 1
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUC 50251-94N
TEST C2-3: 2-H12-P614 I7B-JF3
PAIR 3, JF3-TK1 & UNKNOWN, ALL
W/SHLDS COMM.MODE
FREQUENCY [MHz]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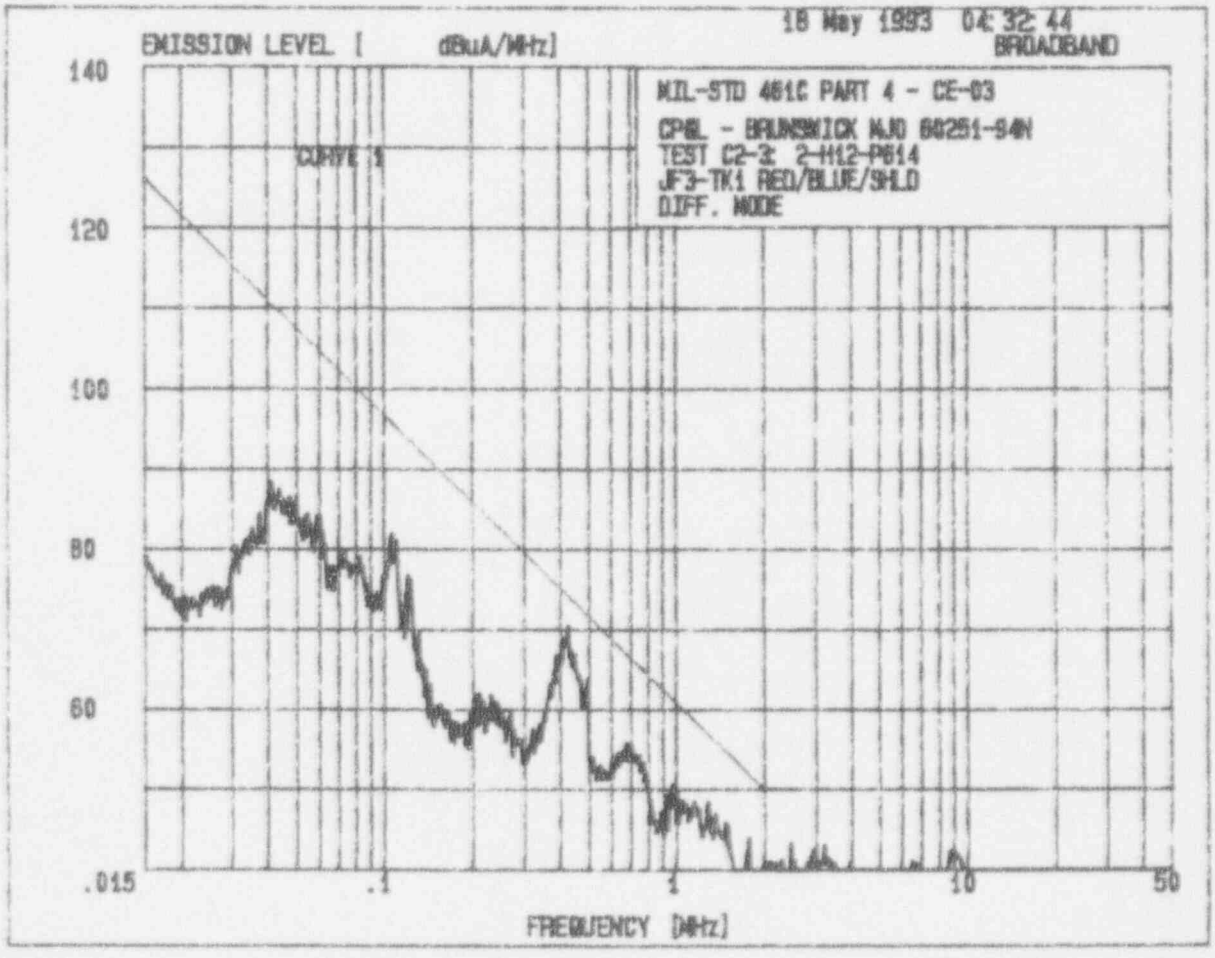
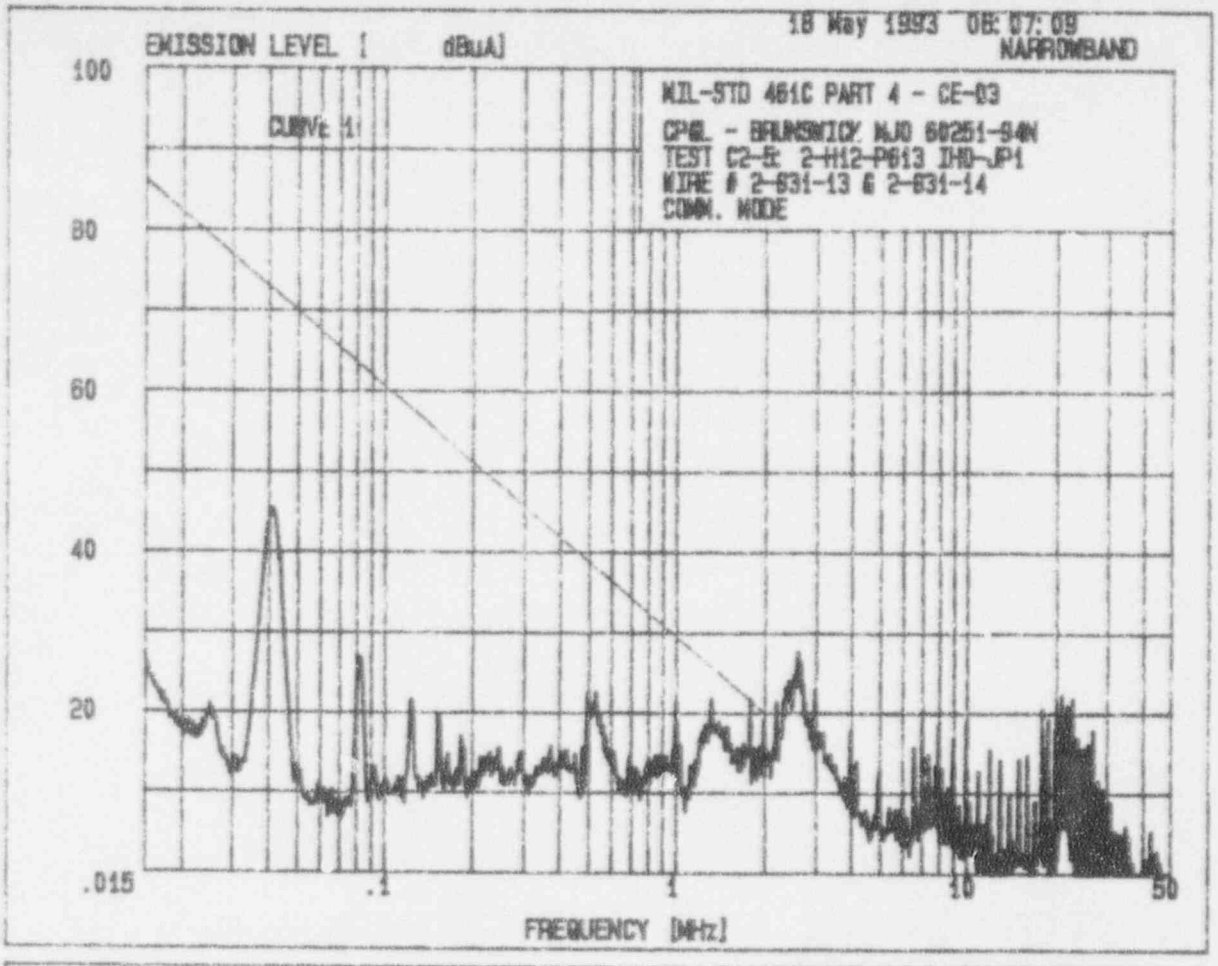
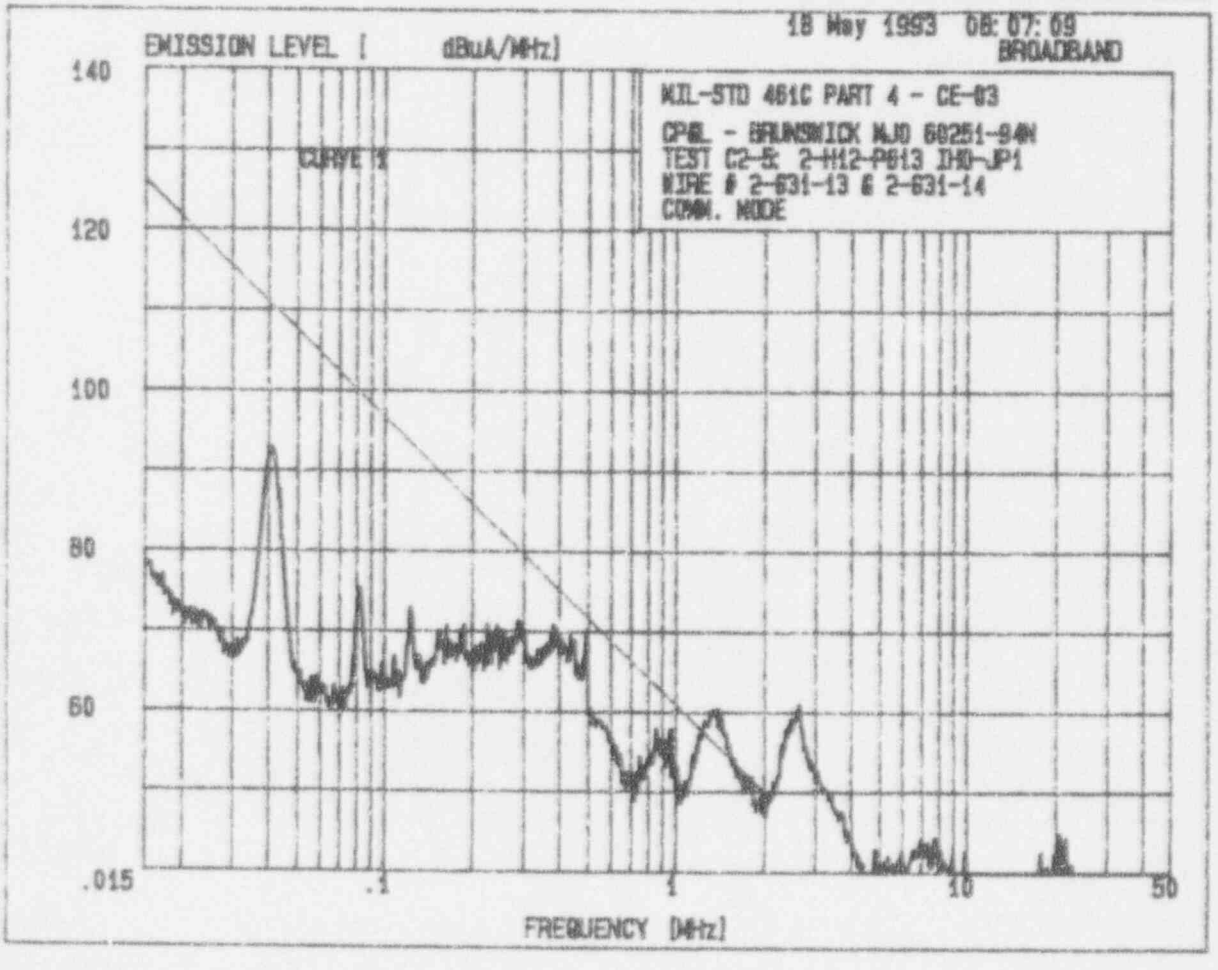
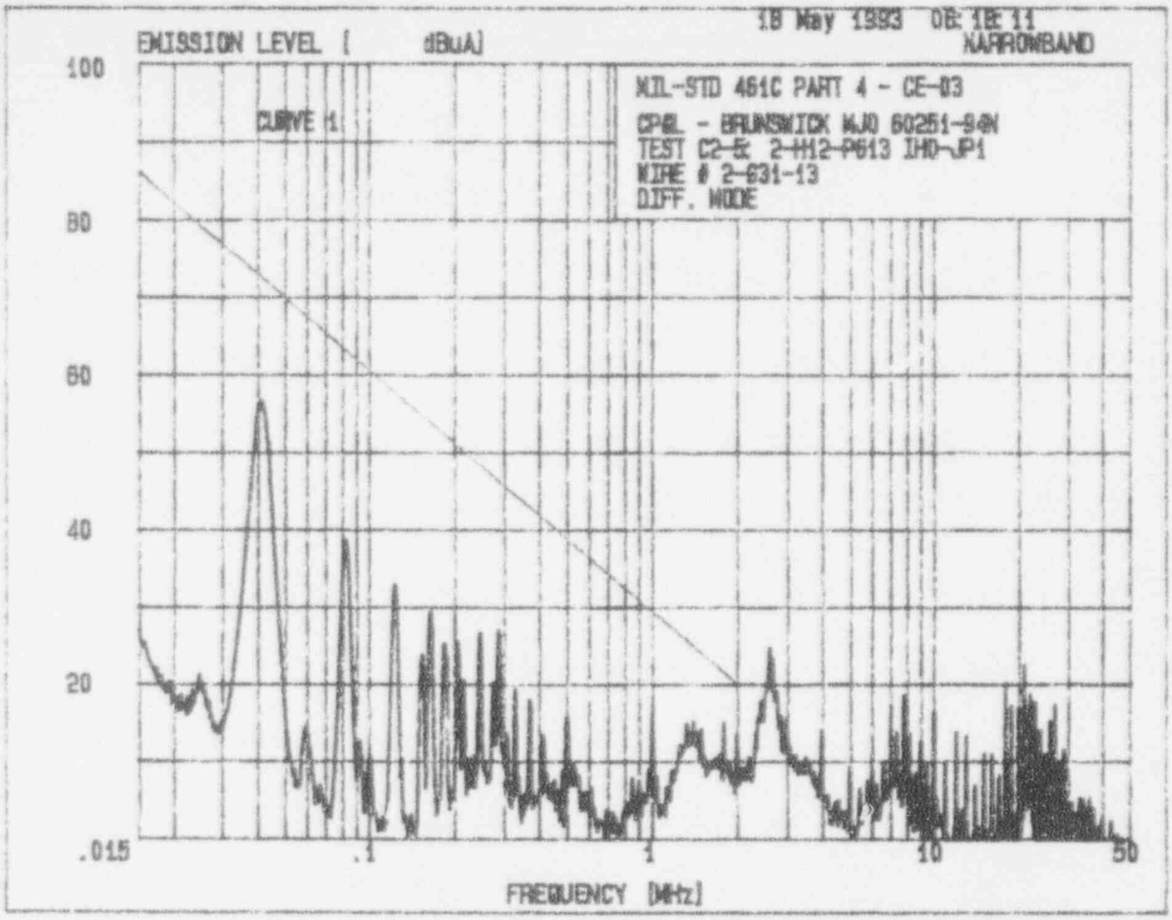
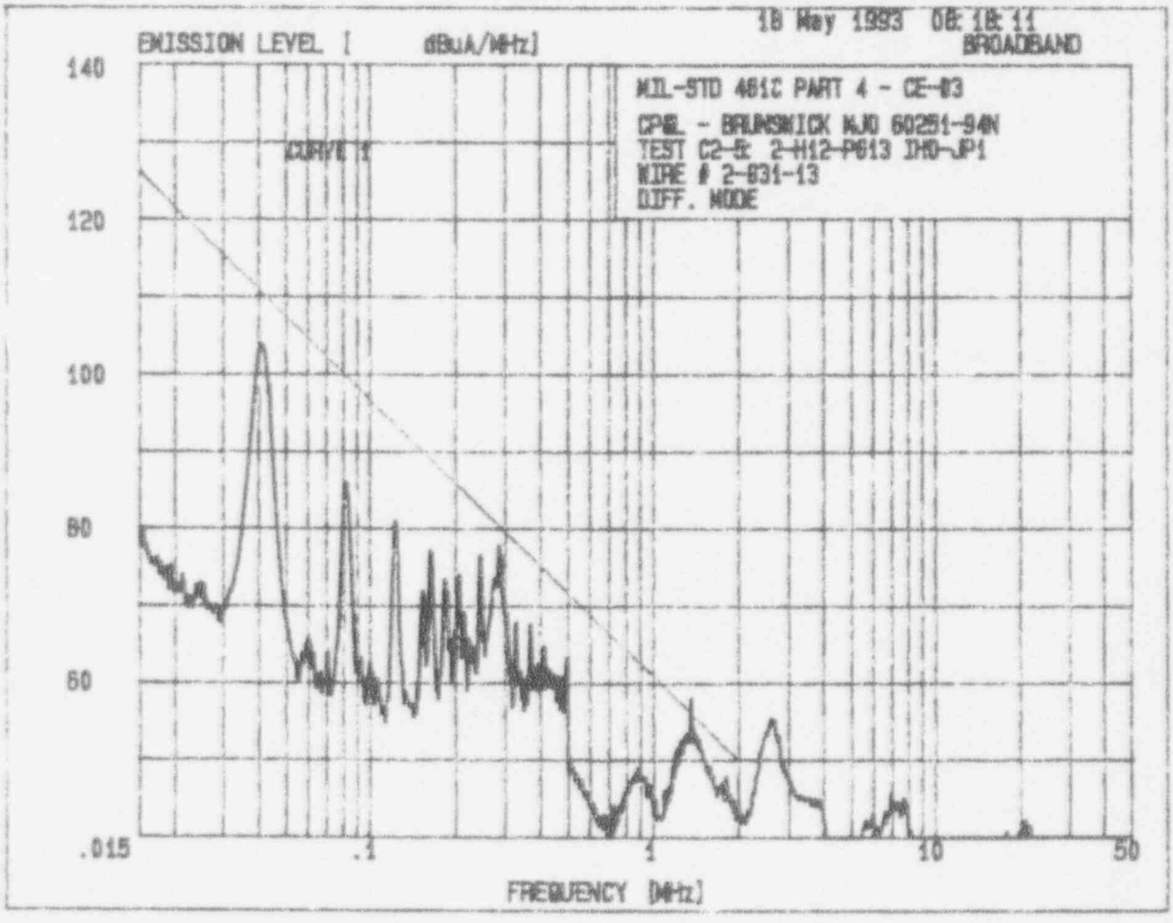
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-3: 2-H12-P614
JF3-TK1 RED/BLUE/SHLD
DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

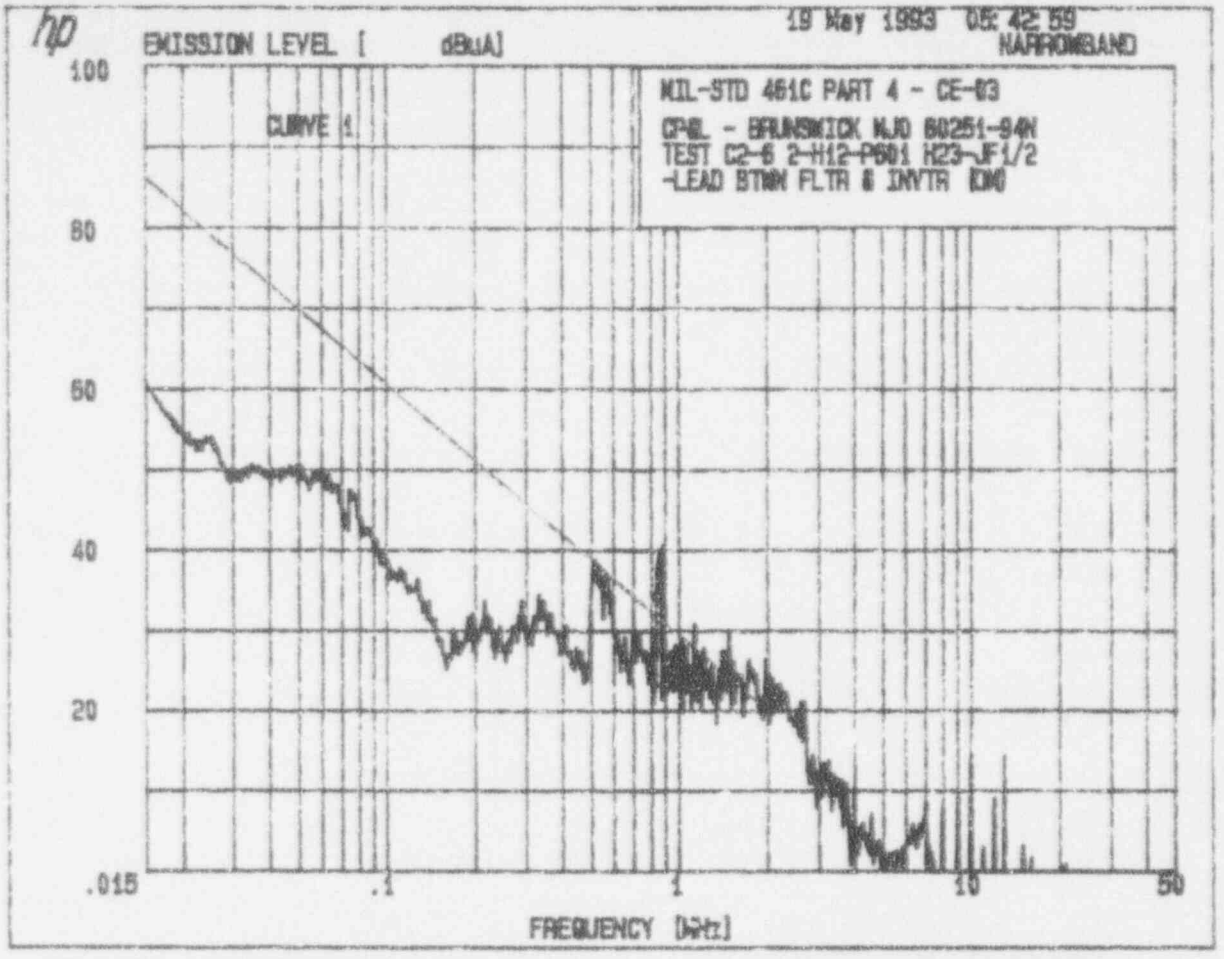

18 May 1993 04:32:44
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-3: 2-H12-P614
JF3-TK1 RED/BLUE/SHLD
DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

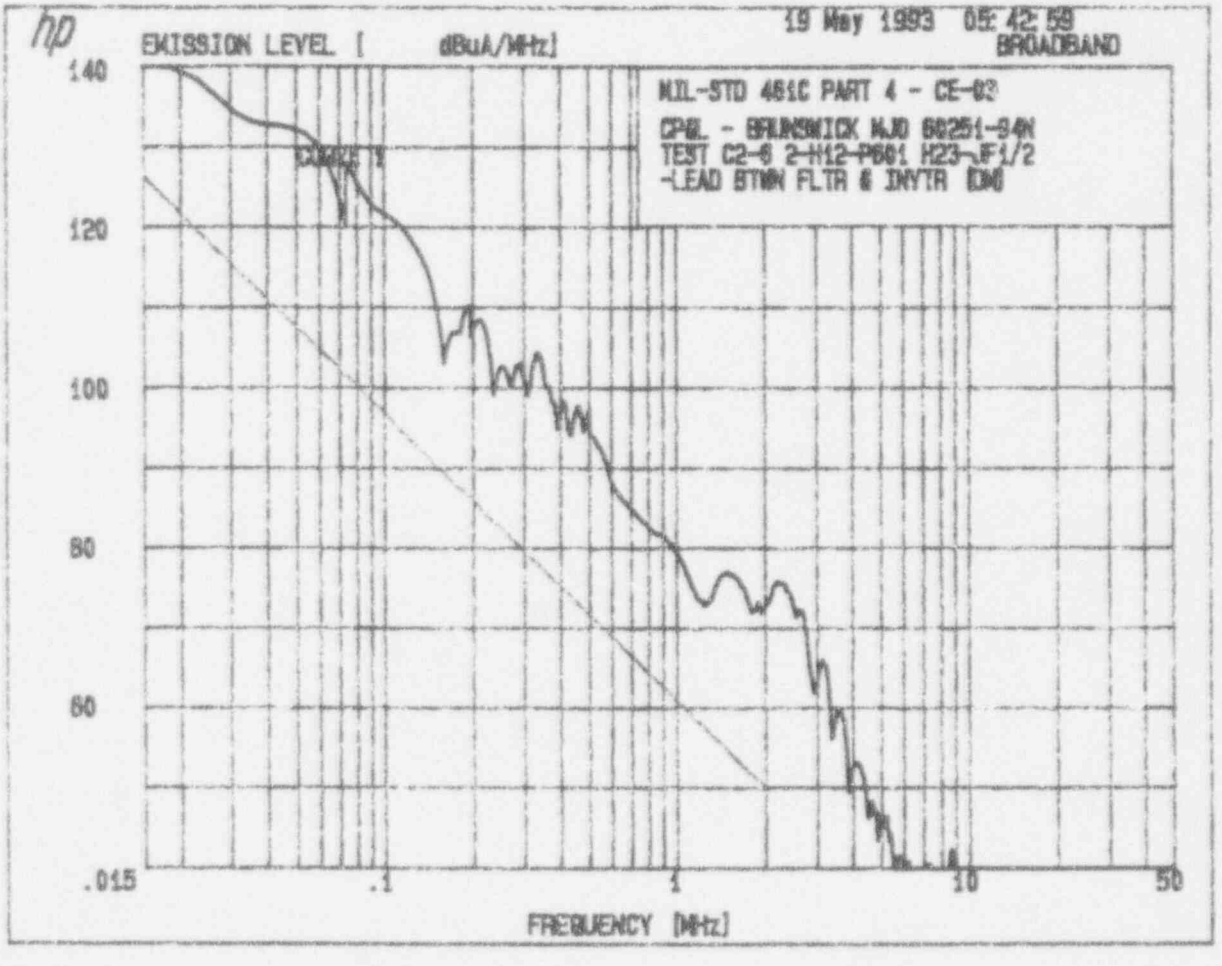

18 May 1993 08:07:09
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-5: 2-H12-P613 IHD-JP1
WIRE # 2-631-13 & 2-631-14
COMM. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

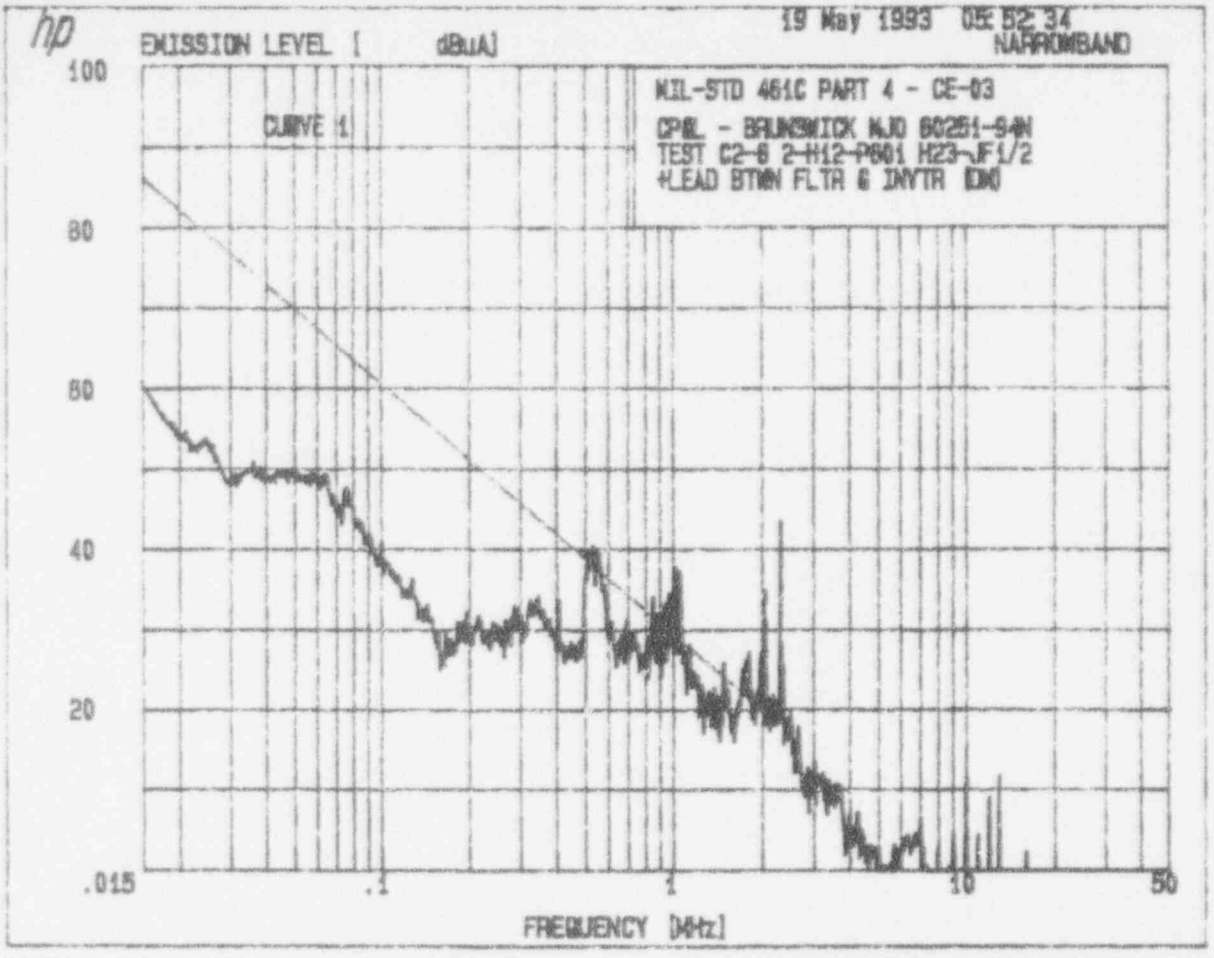

18 May 1993 08:07:09
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-5: 2-H12-P613 IHD-JP1
WIRE # 2-631-13 & 2-631-14
COMM. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

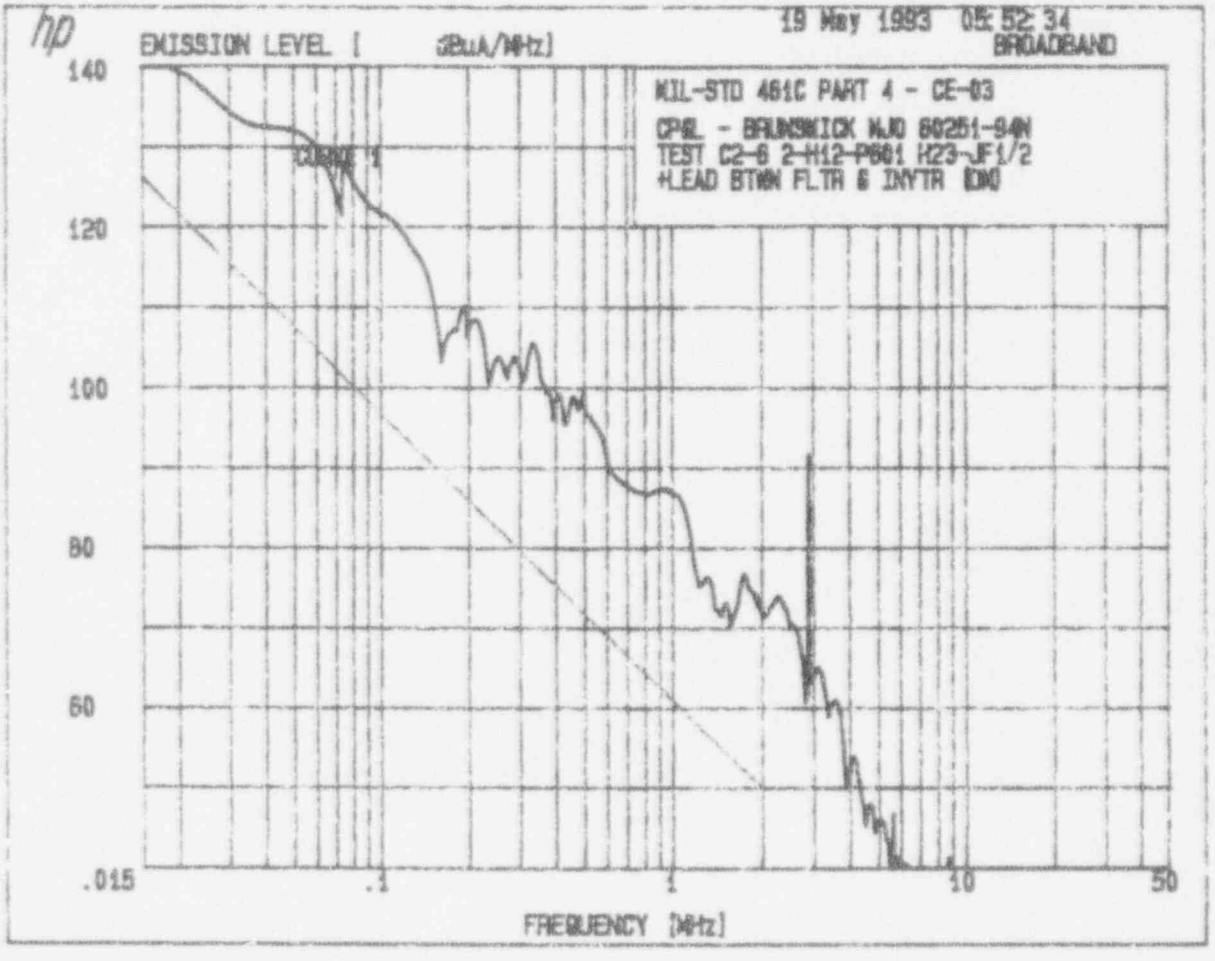

18 May 1993 08:18:11
NARROWBAND
EMISSION LEVEL [dBuA]
MIL-STD 461C PART 4 - CE-03
CPSL - BRUNSWICK MJO 60251-94N
TEST C2-& 2-H12-P613 IHD-JP1
WIRE # 2-631-13
DIFF. MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

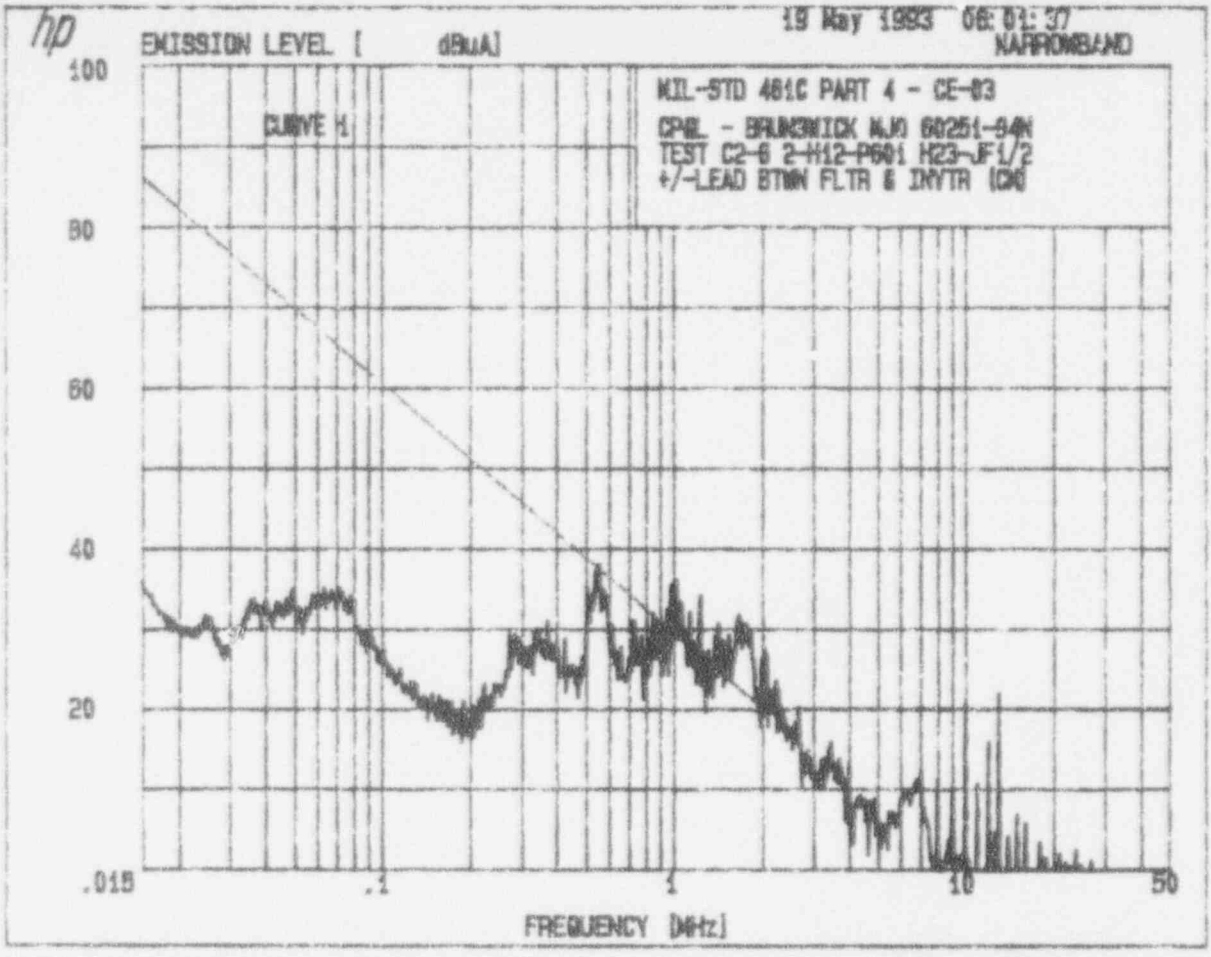

18 May 1993 08:18:11
BROADBAND
EMISSION LEVEL [dBuA/MHz]
MIL-STD 461C PART 4 - CE-03
CPSL - BRUNSWICK MJO 60251-94N
TEST C2-& 2-H12-P613 IHD-JP1
WIRE # 2-631-13
DIFF. MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

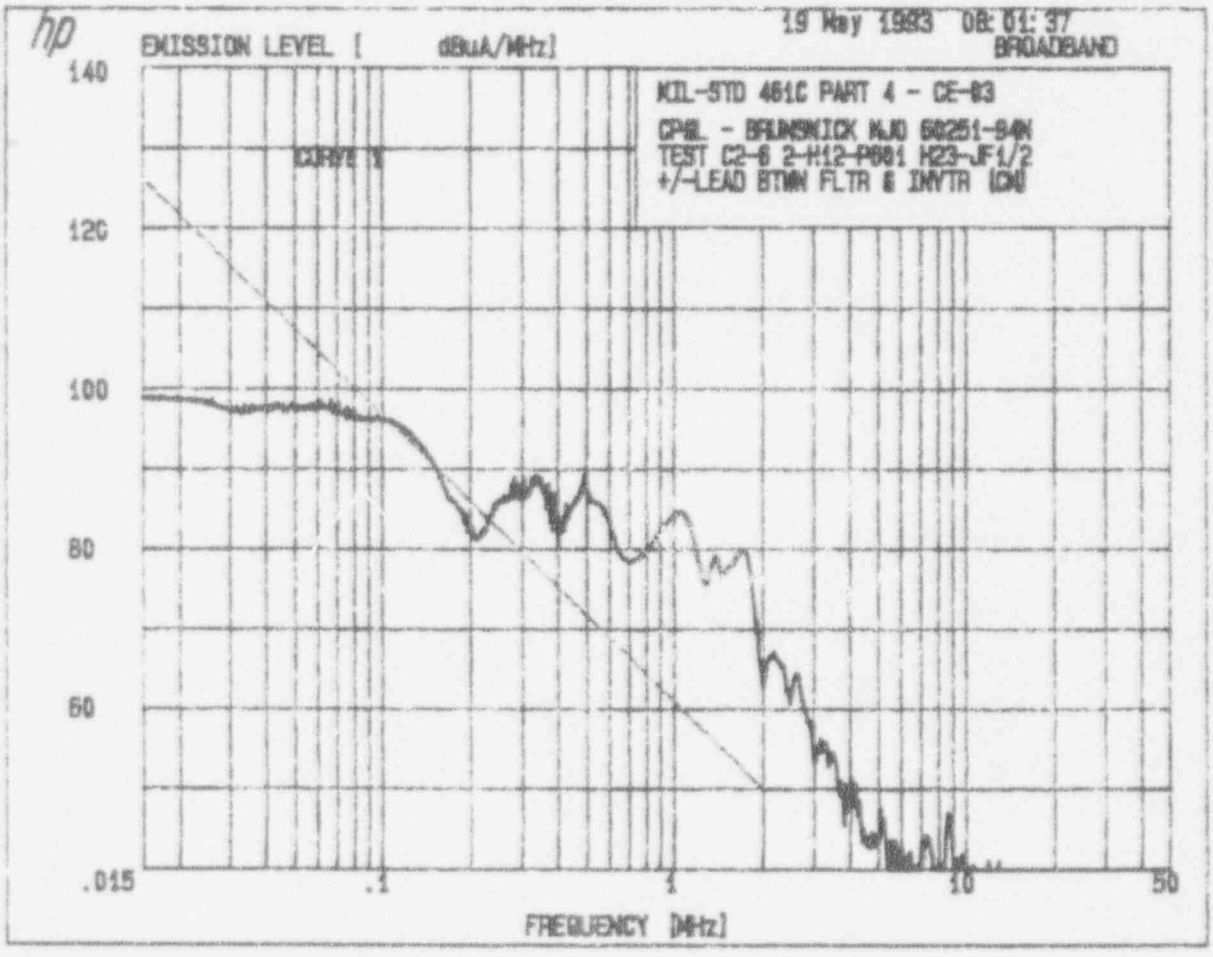

hp
EMISSION LEVEL [dBuA]
19 May 1993 05:42:59
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP-6L - BRUNSWICK MJO 80251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
-LEAD BTWN FLTR & INVTR (DM)
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

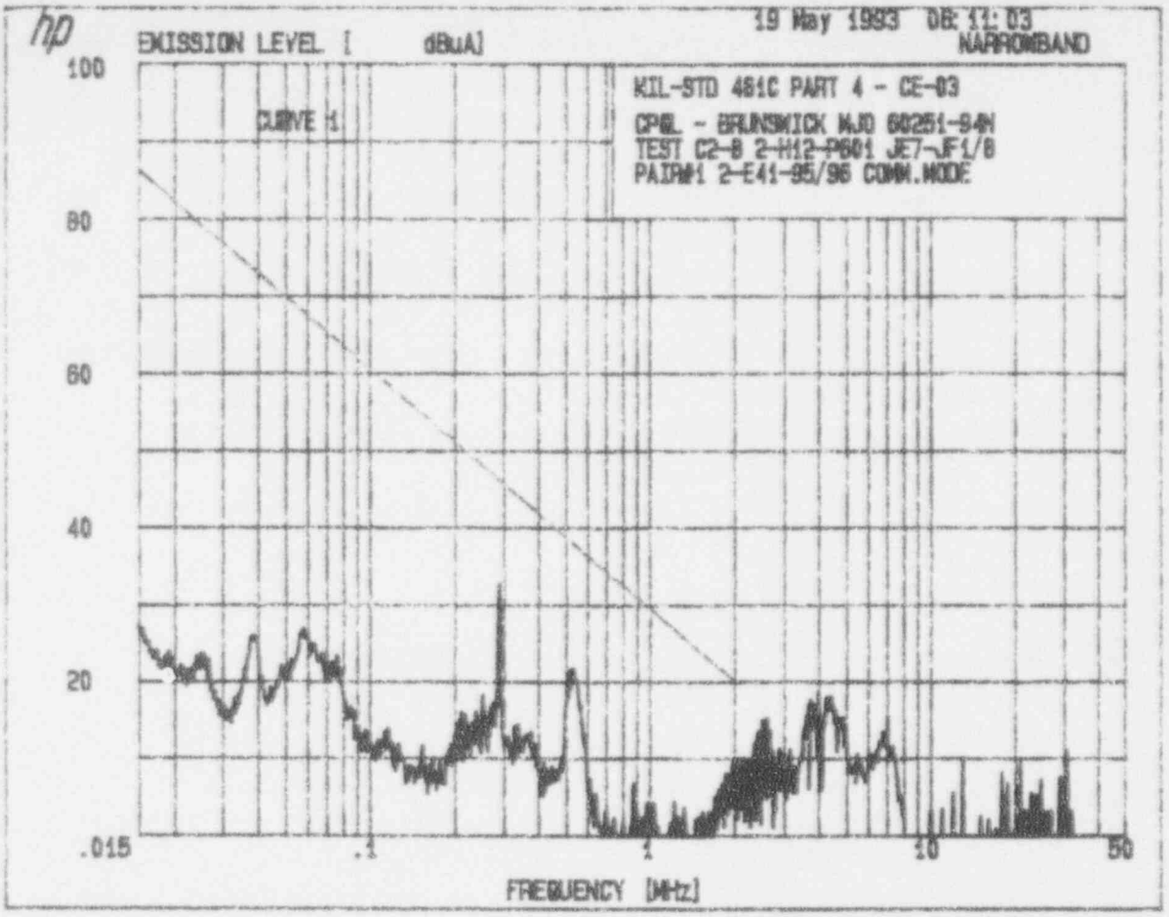

hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 05:42:59
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP-6L - BRUNSWICK MJO 80251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
-LEAD BTWN FLTR & INVTR (DM)
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

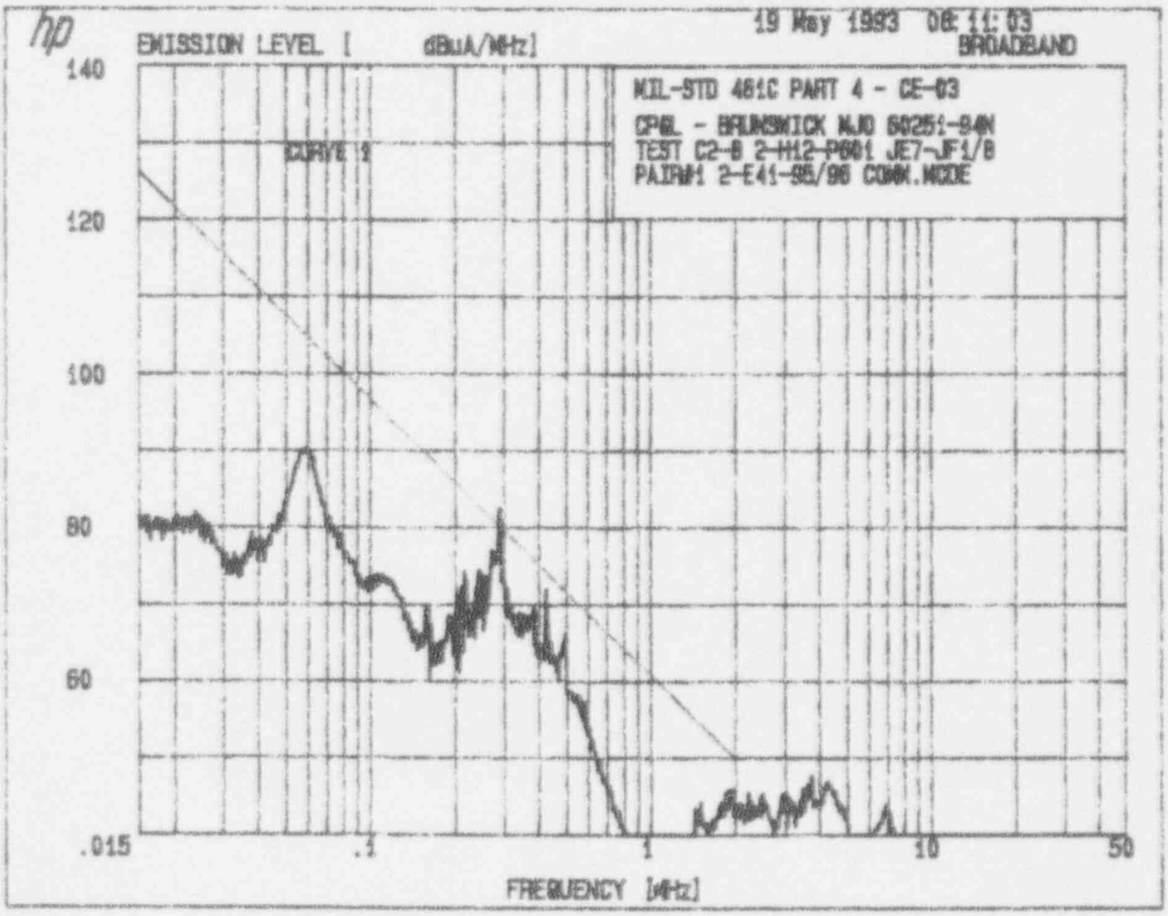

hp
EMISSION LEVEL [dBuA]
19 May 1993 05:52:34
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+LEAD BTWN FLTR & INVTR (DM)
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

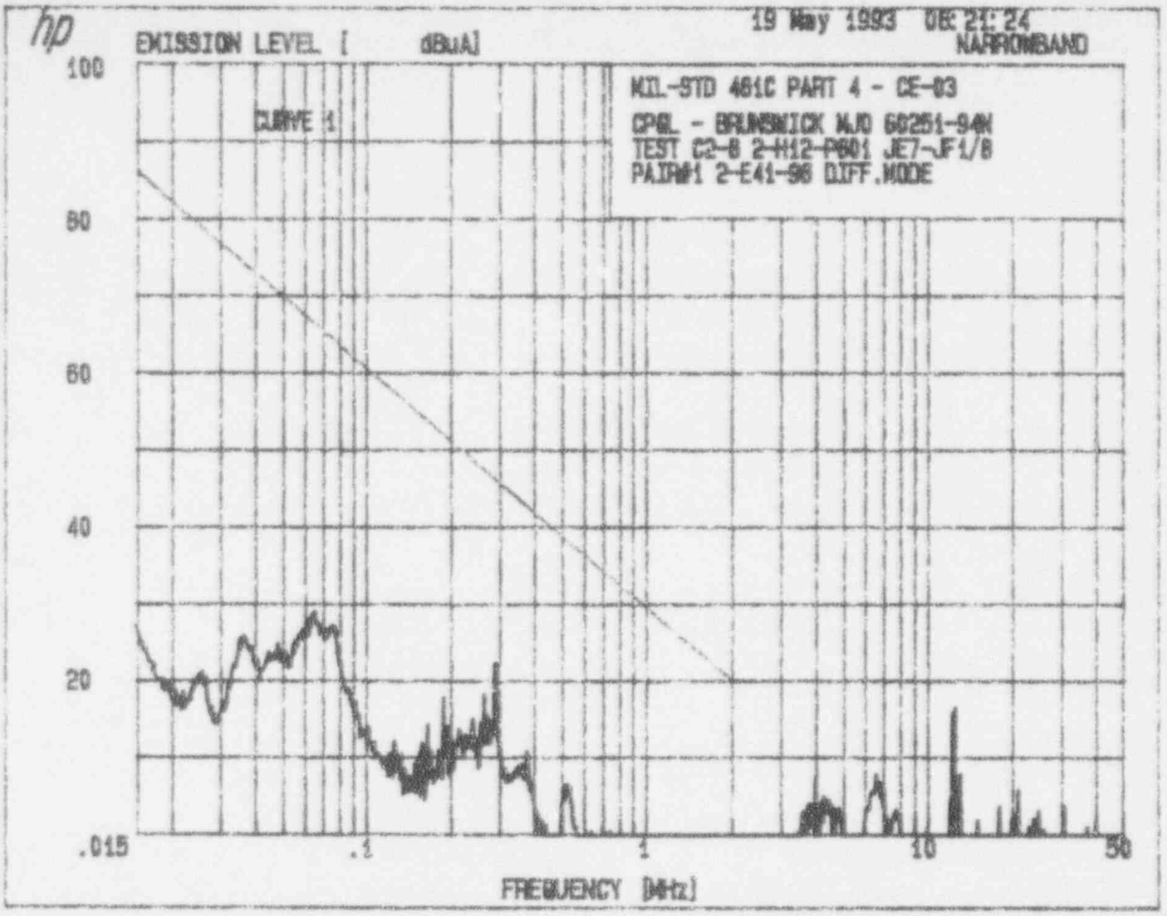

hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 05:52:34
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+LEAD BTWN FLTR & INVTR (DM)
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

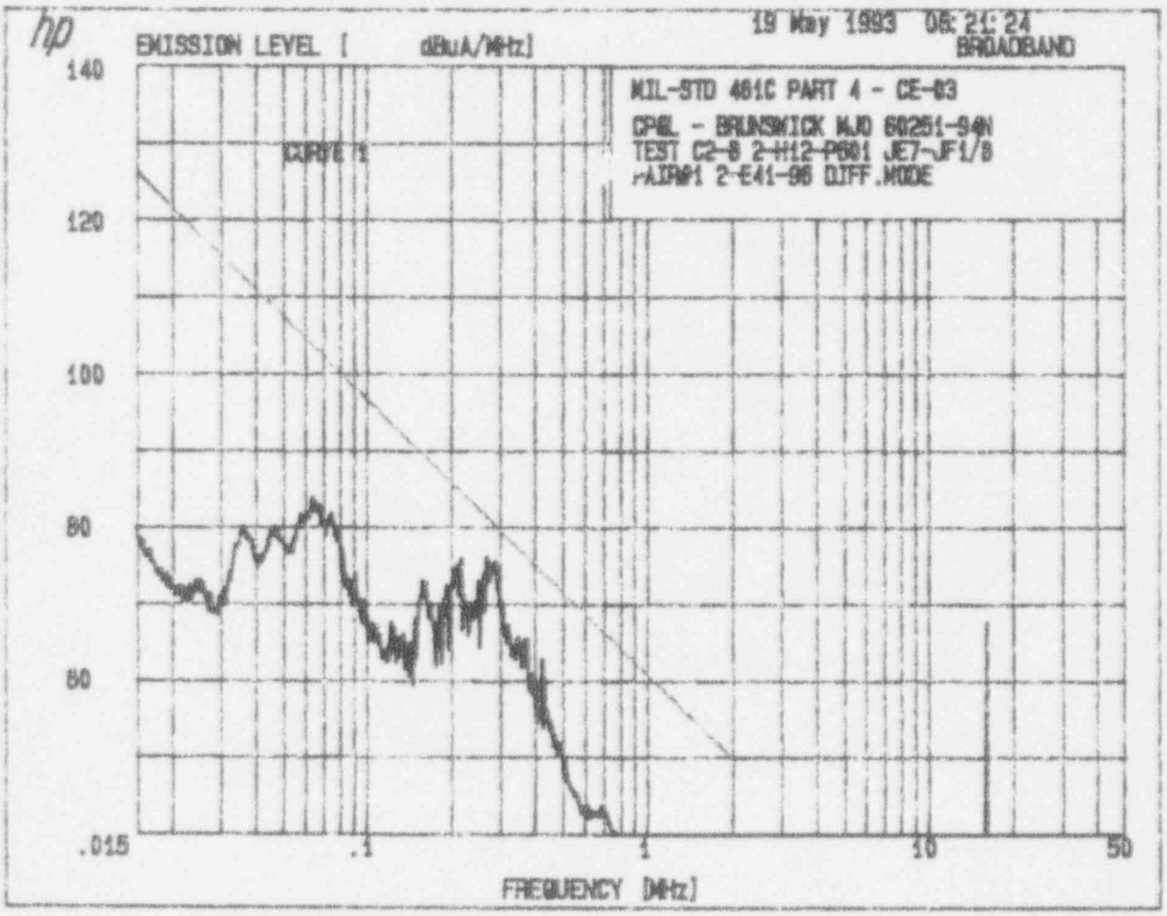

hp
EMISSION LEVEL [dBuA]
19 May 1993 08:01:37
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+/-LEAD BTWN FLTR & INVTR (CN)
CURVE H
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

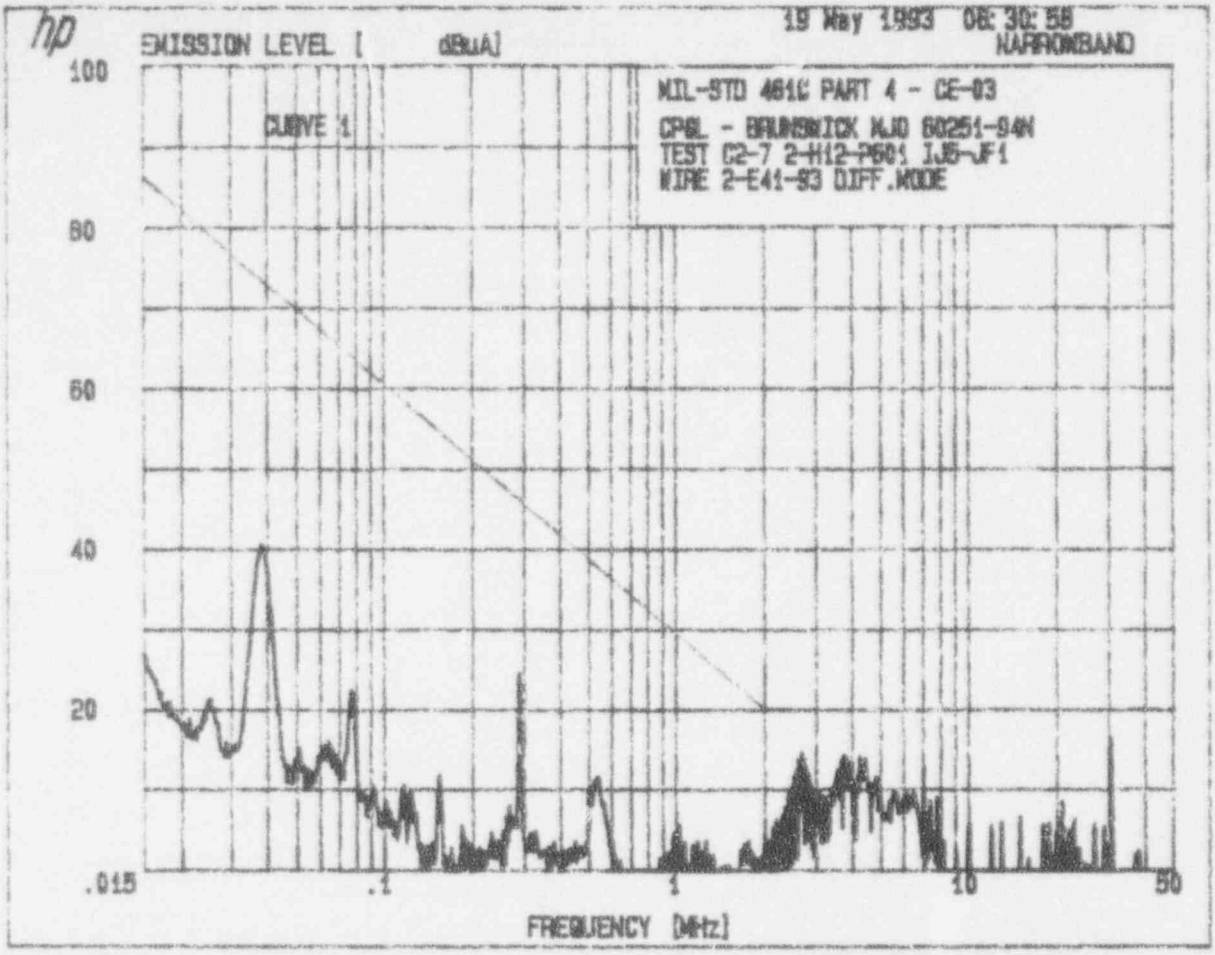

hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 08:01:37
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-6 2-H12-P601 H23-JF1/2
+/-LEAD BTWN FLTR & INVTR (CN)
CURVE H
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

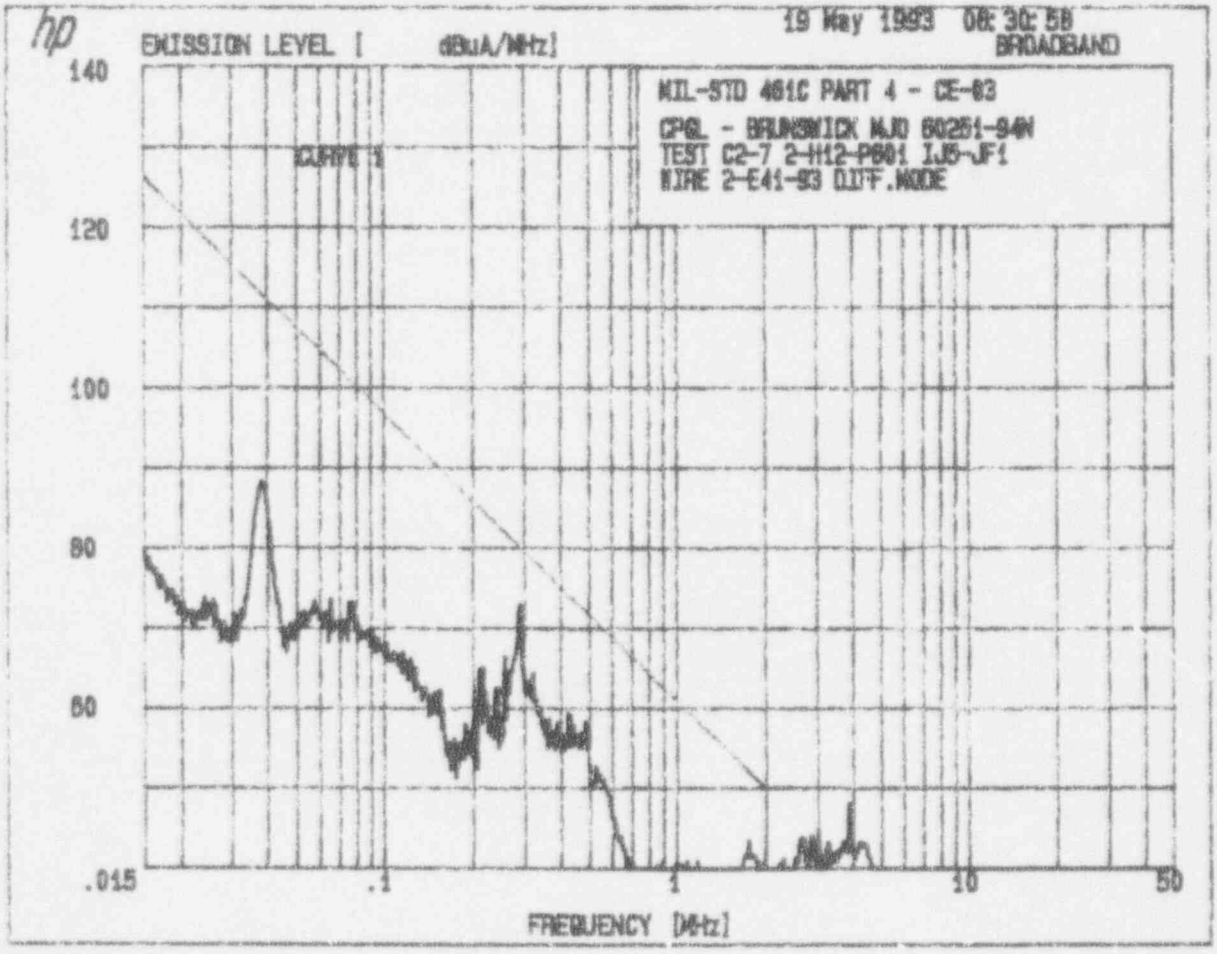

hp
EMISSION LEVEL [dBuA]
19 May 1993 08:11:03
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-B 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-95/96 COMM.MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]

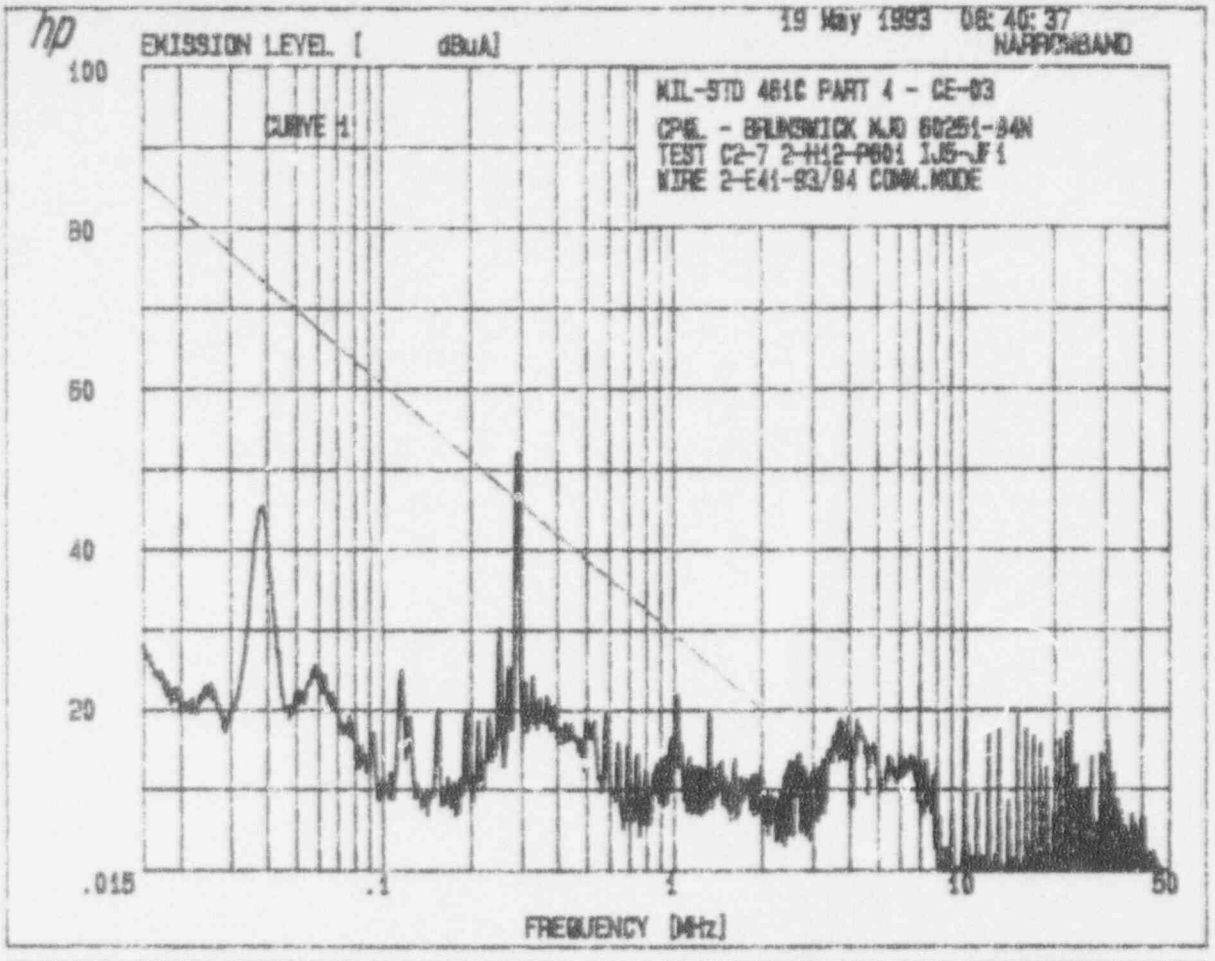

hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 08:11:03
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUD 60251-94N
TEST C2-B 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-95/96 COMM.MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

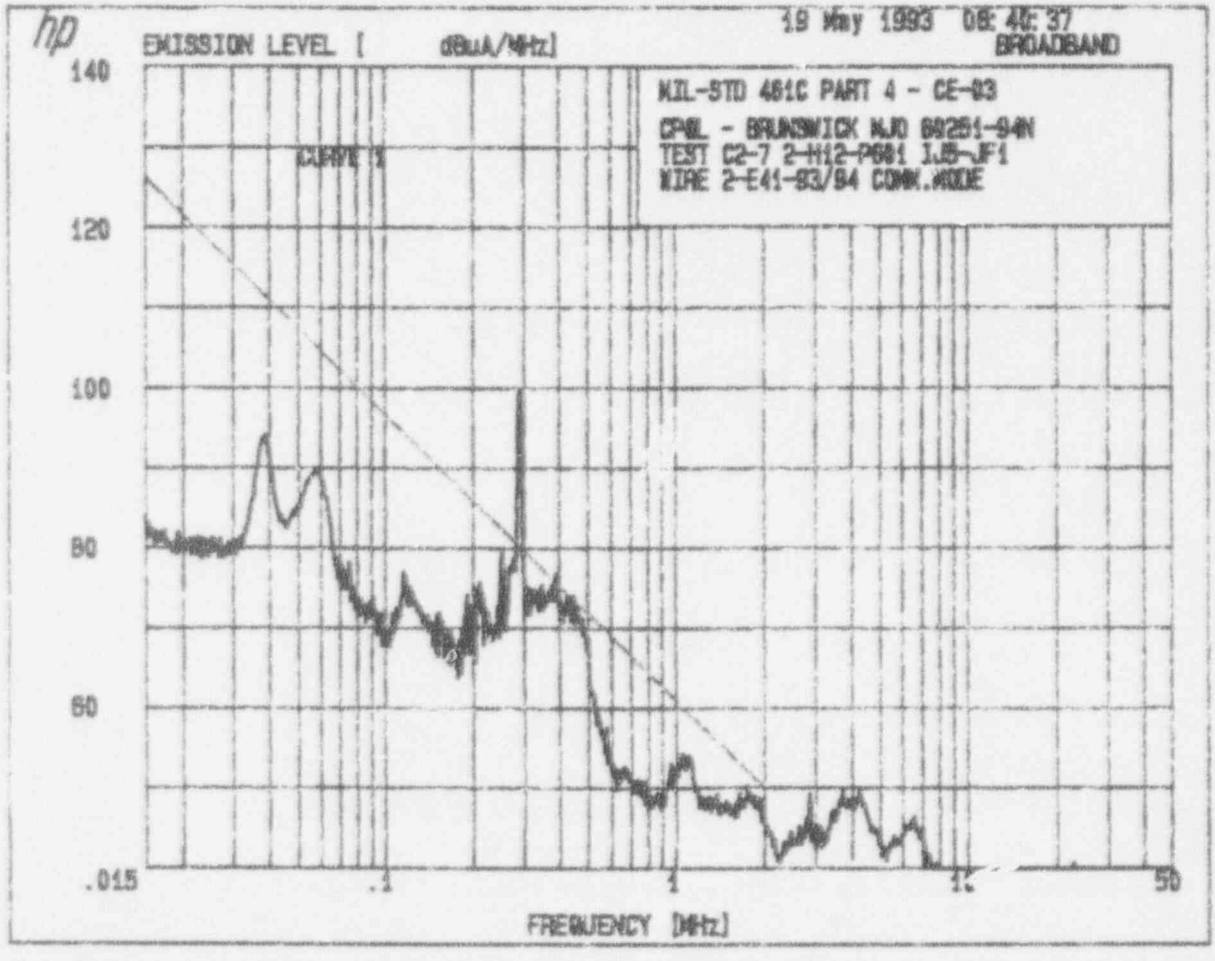

hp
EMISSION LEVEL [dBuA]
19 May 1993 06:21:24
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-8 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-96 DIFF.MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 06:21:24
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NUO 60251-94N
TEST C2-8 2-H12-P601 JE7-JF1/8
PAIR#1 2-E41-96 DIFF.MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA]
19 May 1993 08:30:58
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CPGL - BRUNSWICK MJO 60251-94N
TEST C2-7 2-H12-P601 IJ5-JF1
WIRE 2-E41-93 DIFF.MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 08:30:58
BROADBAND
MIL-STD 461C PART 4 - CE-03
CPGL - BRUNSWICK MJO 60251-94N
TEST C2-7 2-H12-P601 IJ5-JF1
WIRE 2-E41-93 DIFF.MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA]
19 May 1993 08:46:37
NARROWBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NJO 69251-94N
TEST C2-7 2-H12-P601 1J5-JF1
WIRE 2-E41-93/94 COMM.MODE
CURVE 1
100
80
60
40
20
.015
.1
1
10
50
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuA/MHz]
19 May 1993 08:46:37
BROADBAND
MIL-STD 461C PART 4 - CE-03
CP&L - BRUNSWICK NJO 69251-94N
TEST C2-7 2-H12-P601 1J5-JF1
WIRE 2-E41-93/94 COMM.MODE
CURVE 1
140
120
100
80
60
.015
.1
1
10
50
FREQUENCY [MHz]

6.3 Conducted Emissions, Method CE07, Switching Transients, Time Domain

Requirements

Conducted emissions switching transients, time domain, were measured in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method CE07 of MIL-STD-462, Reference Section 6.3, Test Setup.

Procedures

The Control Room Environment was set up and operated as specified in Section 4.0 of this report. A Tektronix oscilloscope, Model 520, and current probe was connected to a selected power lead. The transients caused by normal plant operations and cycling of specific loads, relays and sensors were trapped and stored by the oscilloscope as they occurred. The results were printed and/or stored on electronic media. Reference Section 6.3, Data Sheets.

The preceding procedure was repeated with the current probe connected to the appropriate power/signal lead pair (terminated in close proximity to the signal lead bundle), and the appropriate power/signal lead pair (with the longest individual run to the point of termination).

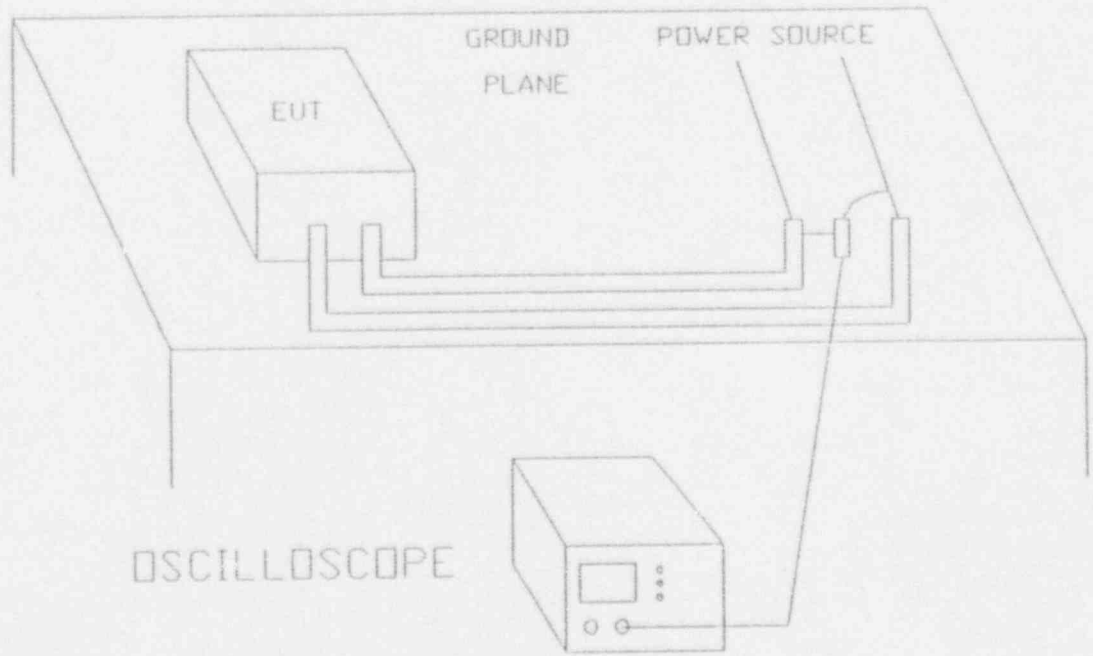
The trigger level of the oscilloscope was set to trap any transients greater than the steady-state time domain noise. In approximately 50% of the intentionally generated cycling of relays and loads, no transients were generated/trapped above the steady-state noise levels.

6.3 Conducted Emissions, Method CE07, Switching Transients, Time Domain (continued)

Test Results

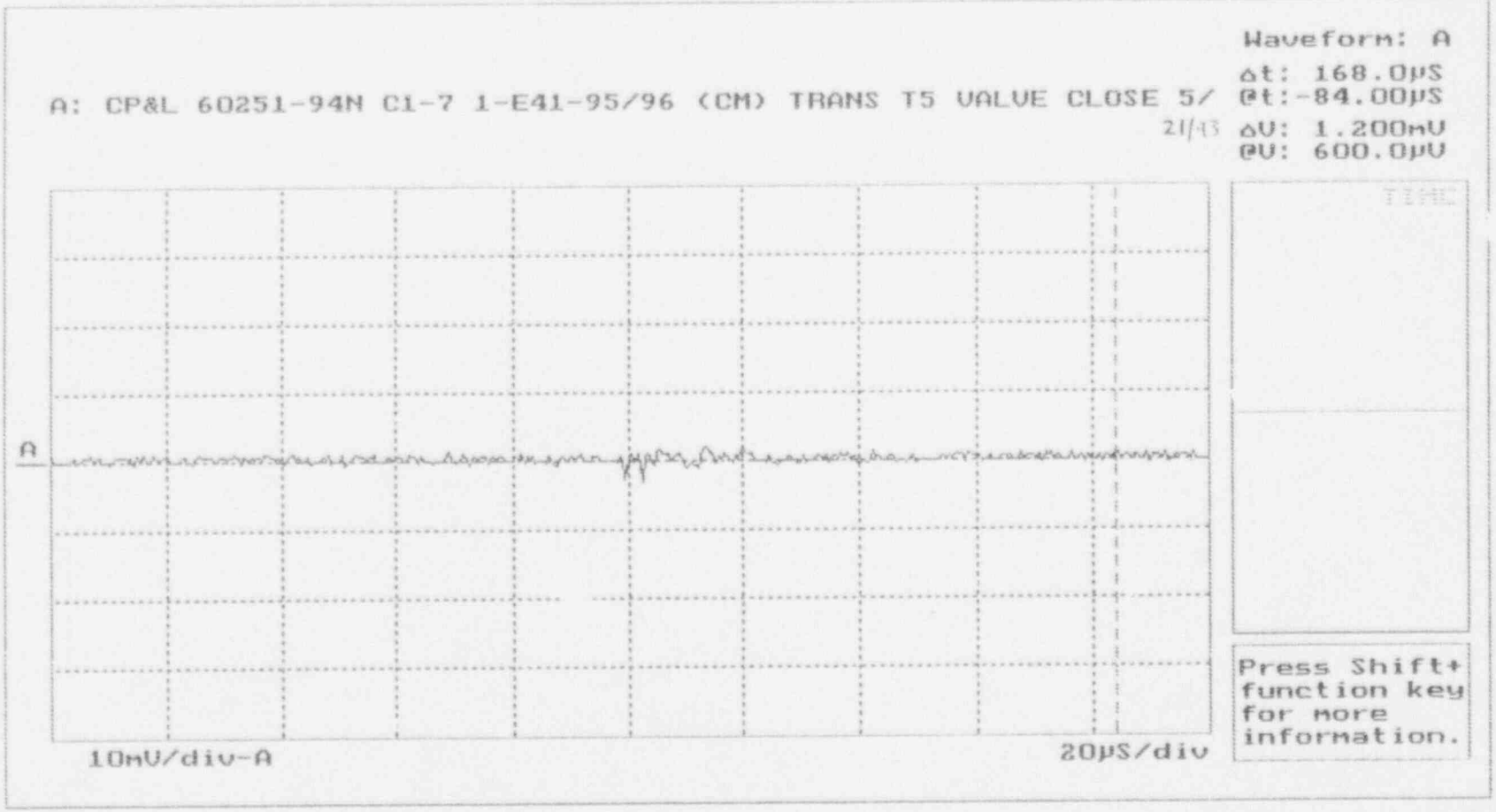
Test	Results
CEO7 Conducted Emissions, Switching Transients, Time Domain	TBD*

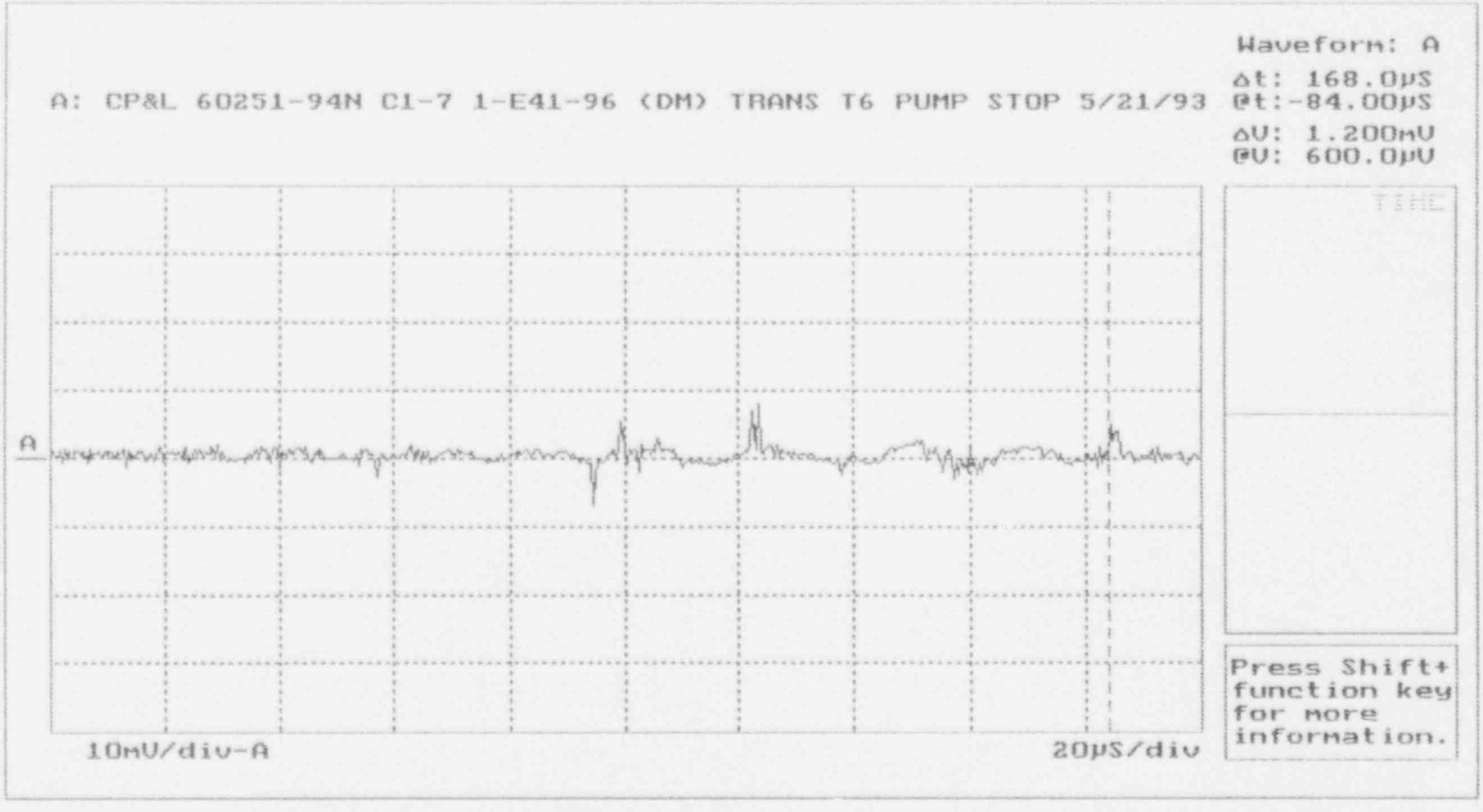
*See NTS Report #60251-94N-2.

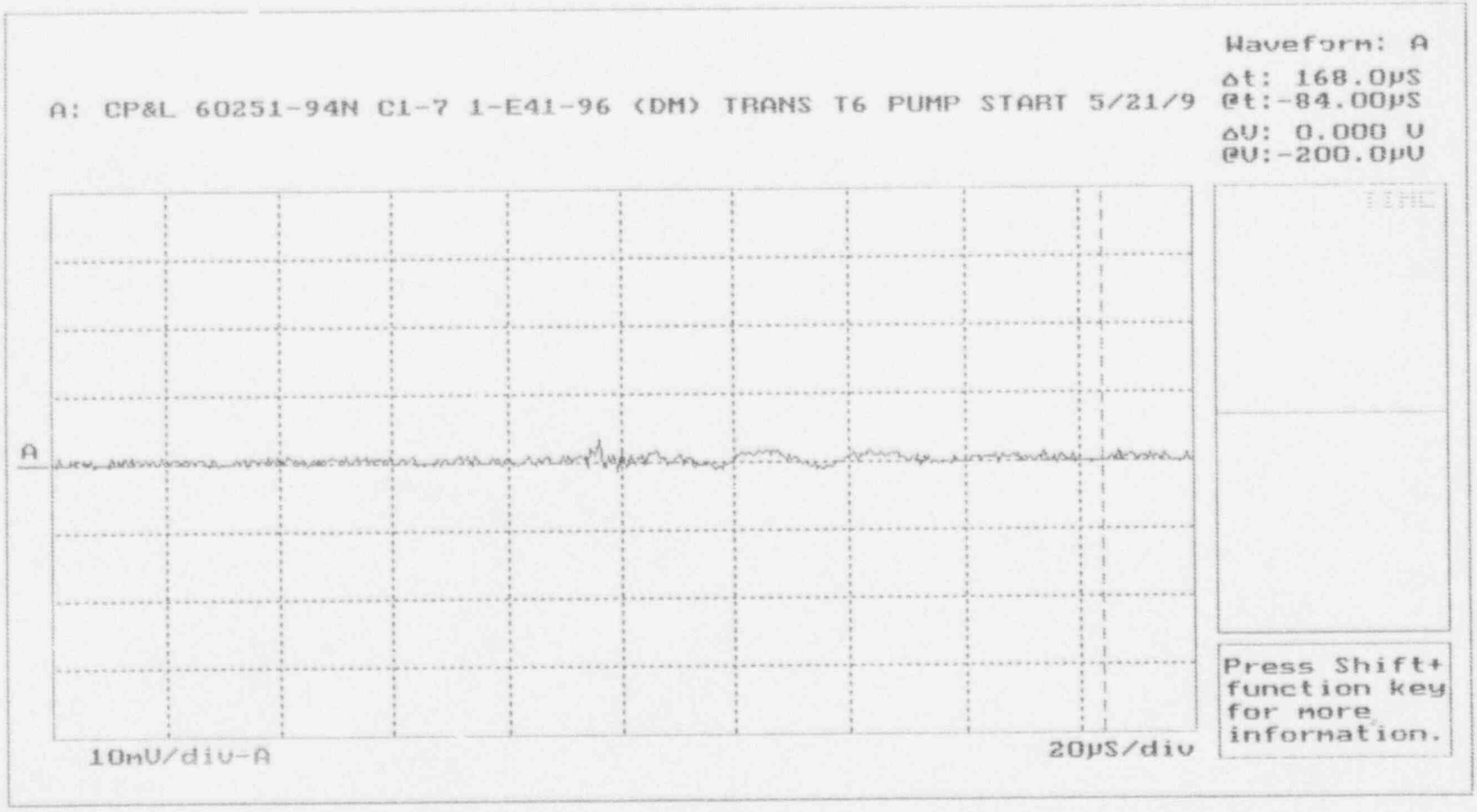


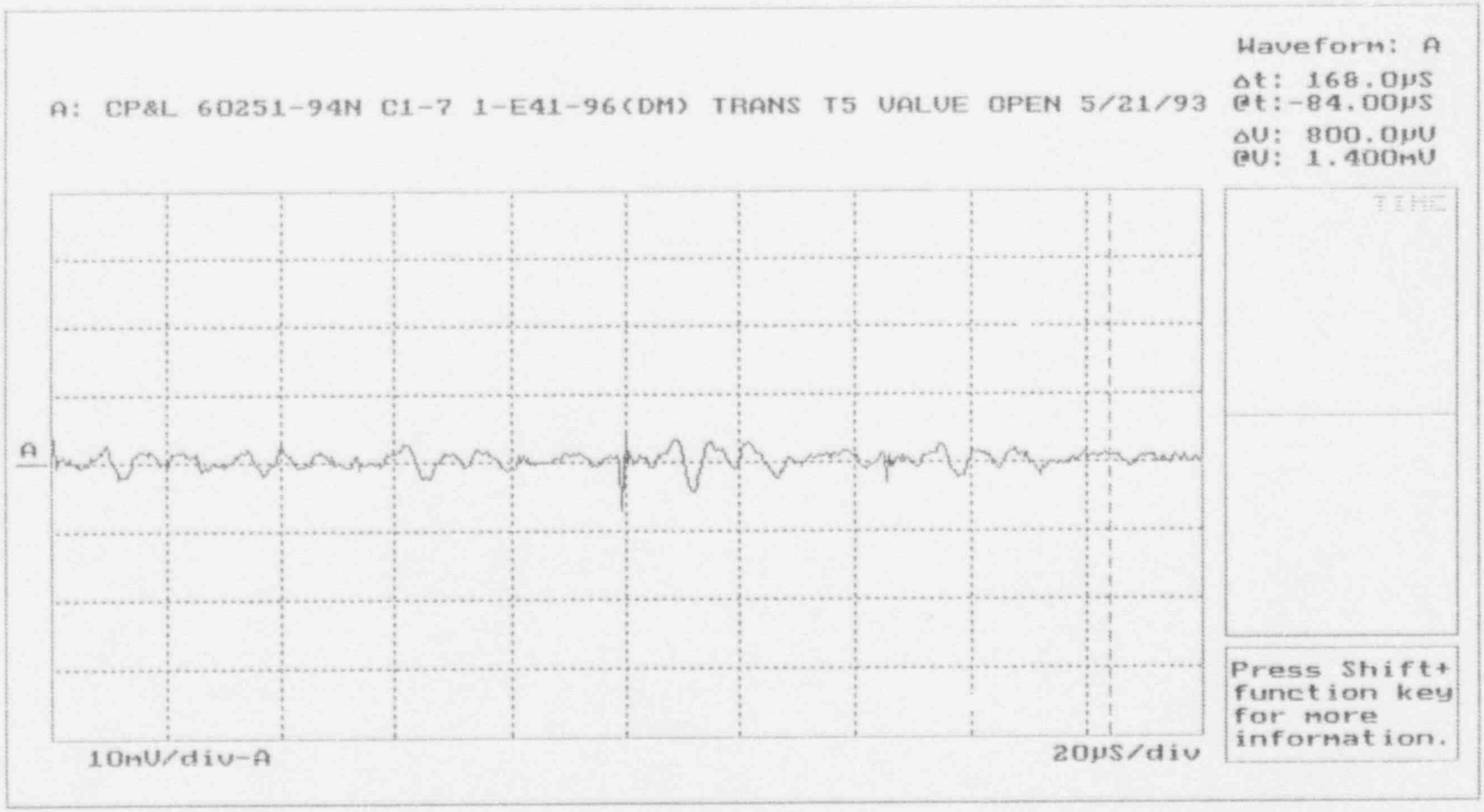
CONDUCTED EMISSIONS, METHOD CE07, TYPICAL TEST SETUP

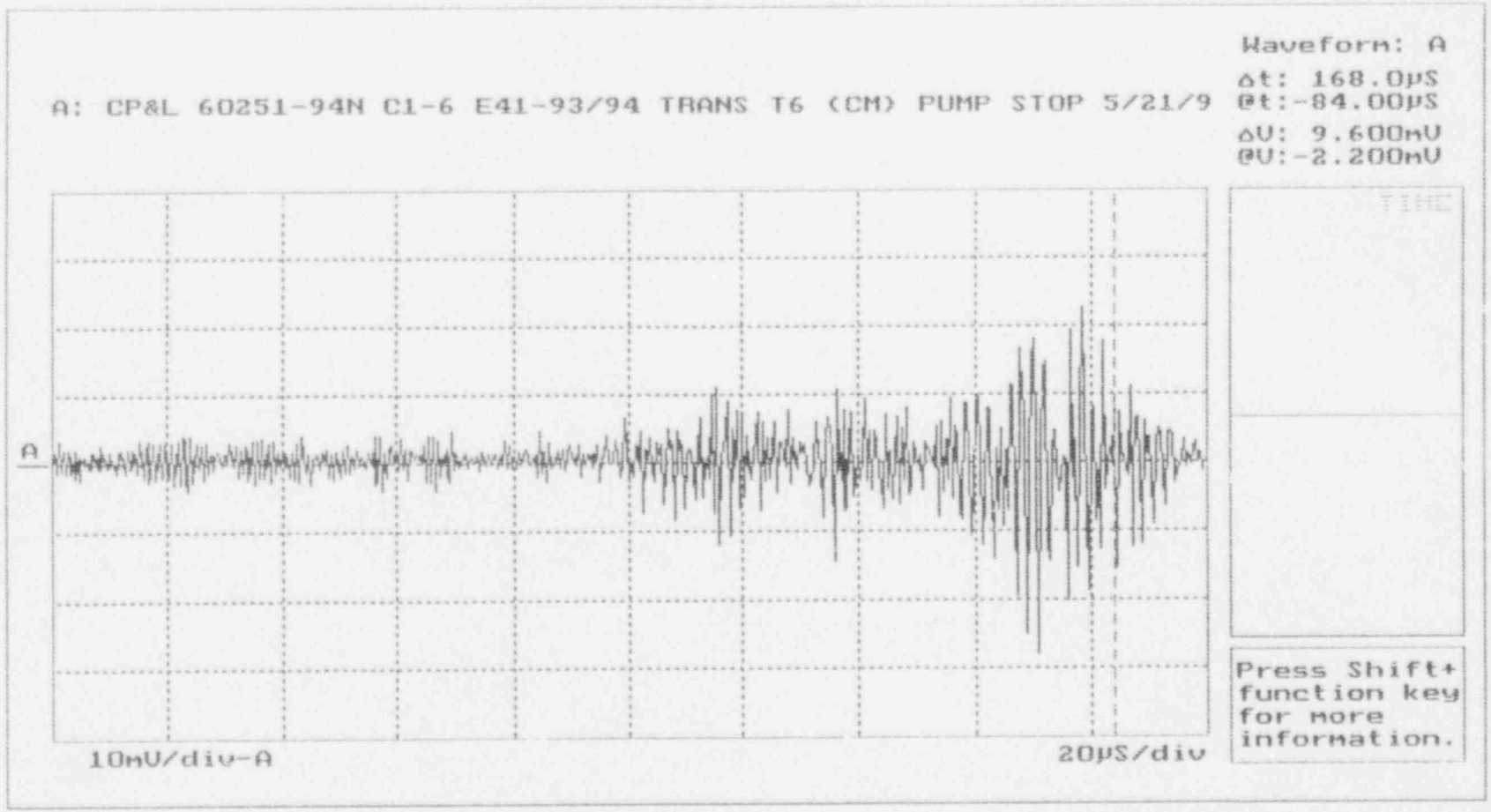
CE07 DATA SHEETS

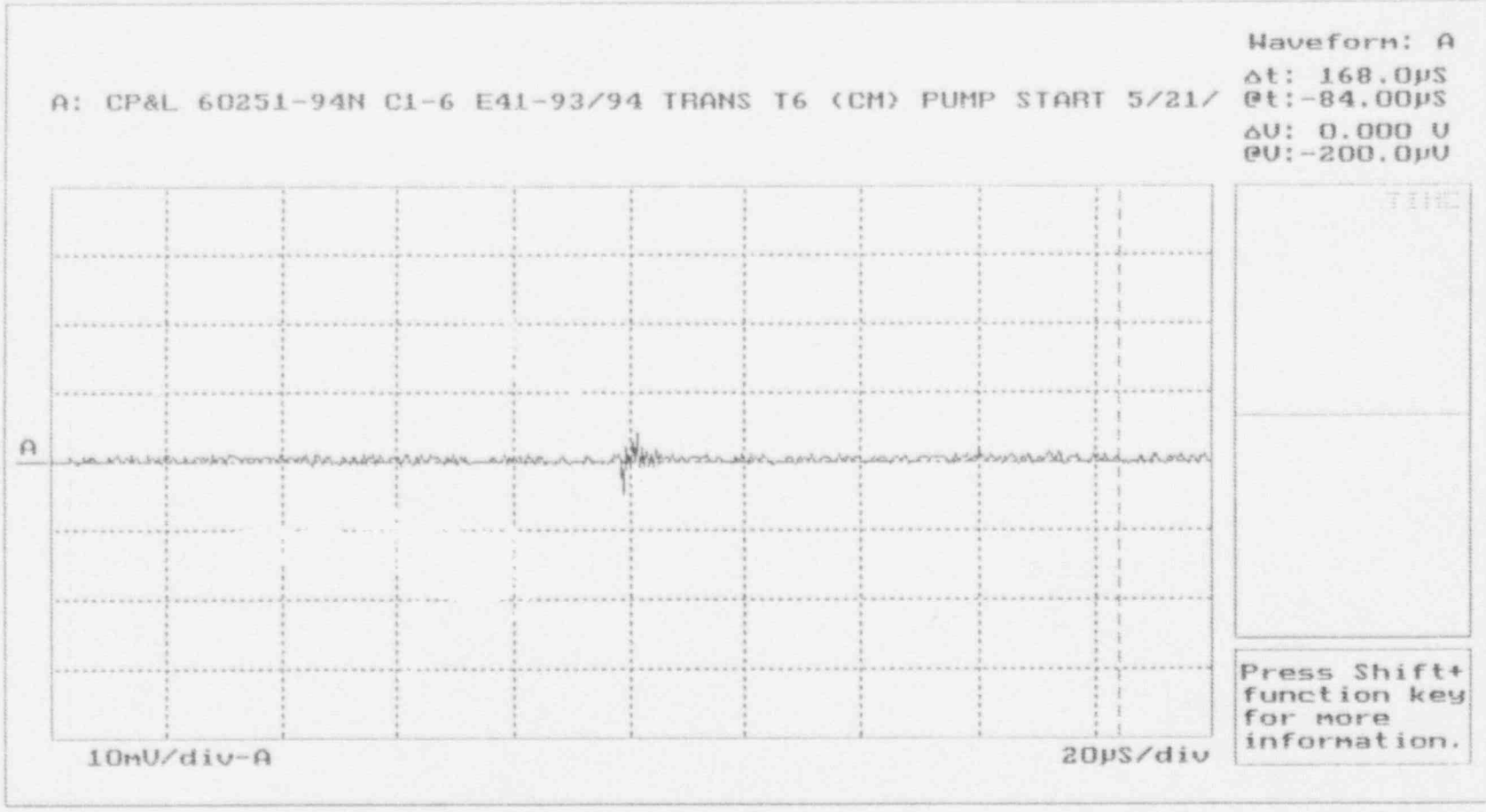

Waveform: A
Δt: 168.0μS
@t:-84.00μS
A: CP&L 60251-94N C1-7 1-E41-95/96 (CM) TRANS T5 VALVE CLOSE 5/
21/03
ΔV: 1.200mV
@V: 600.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

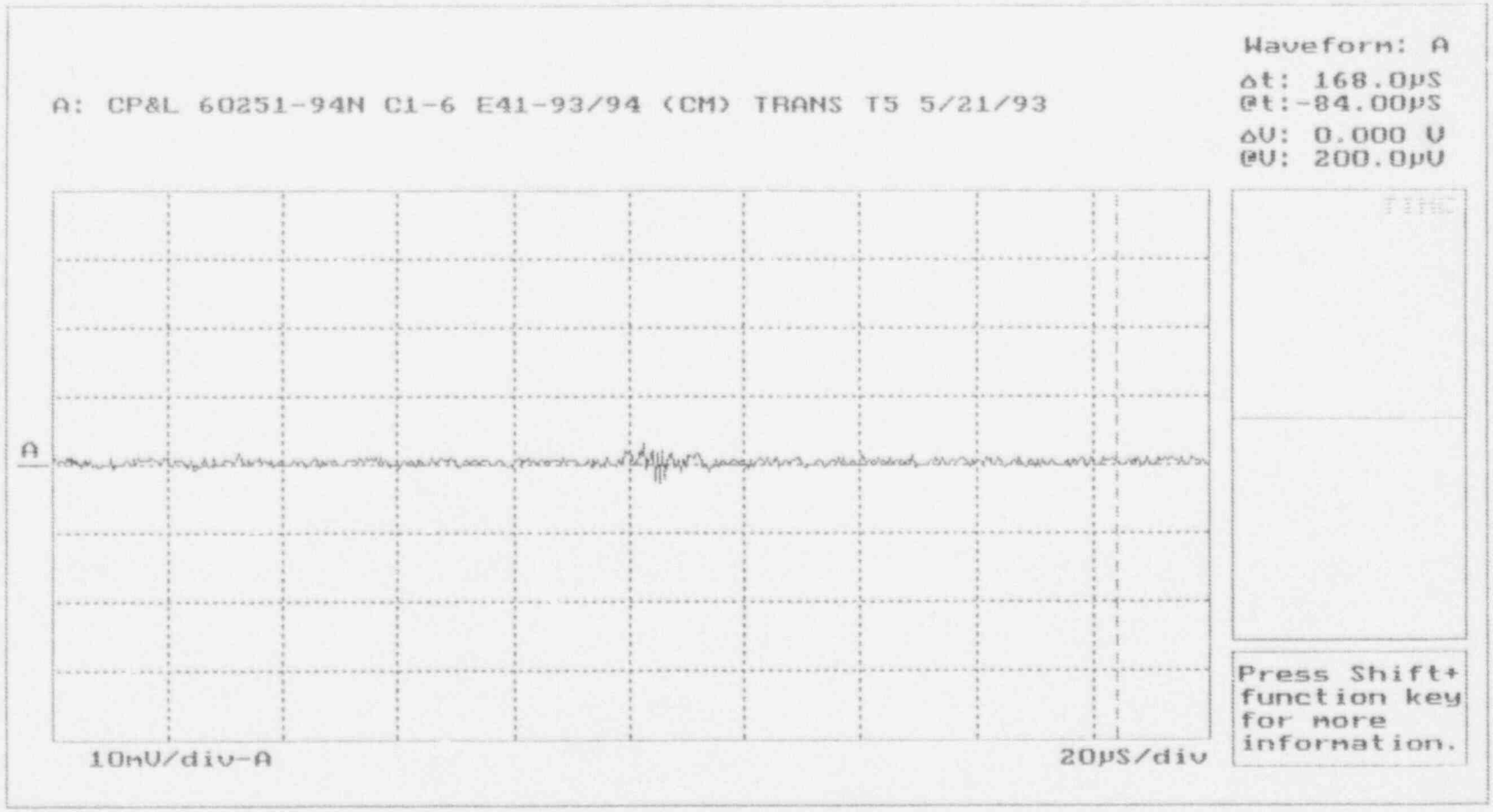

A: CP&L 60251-94N C1-7 1-E41-96 (DM) TRANS T6 PUMP STOP 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 1.200mV
@V: 600.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

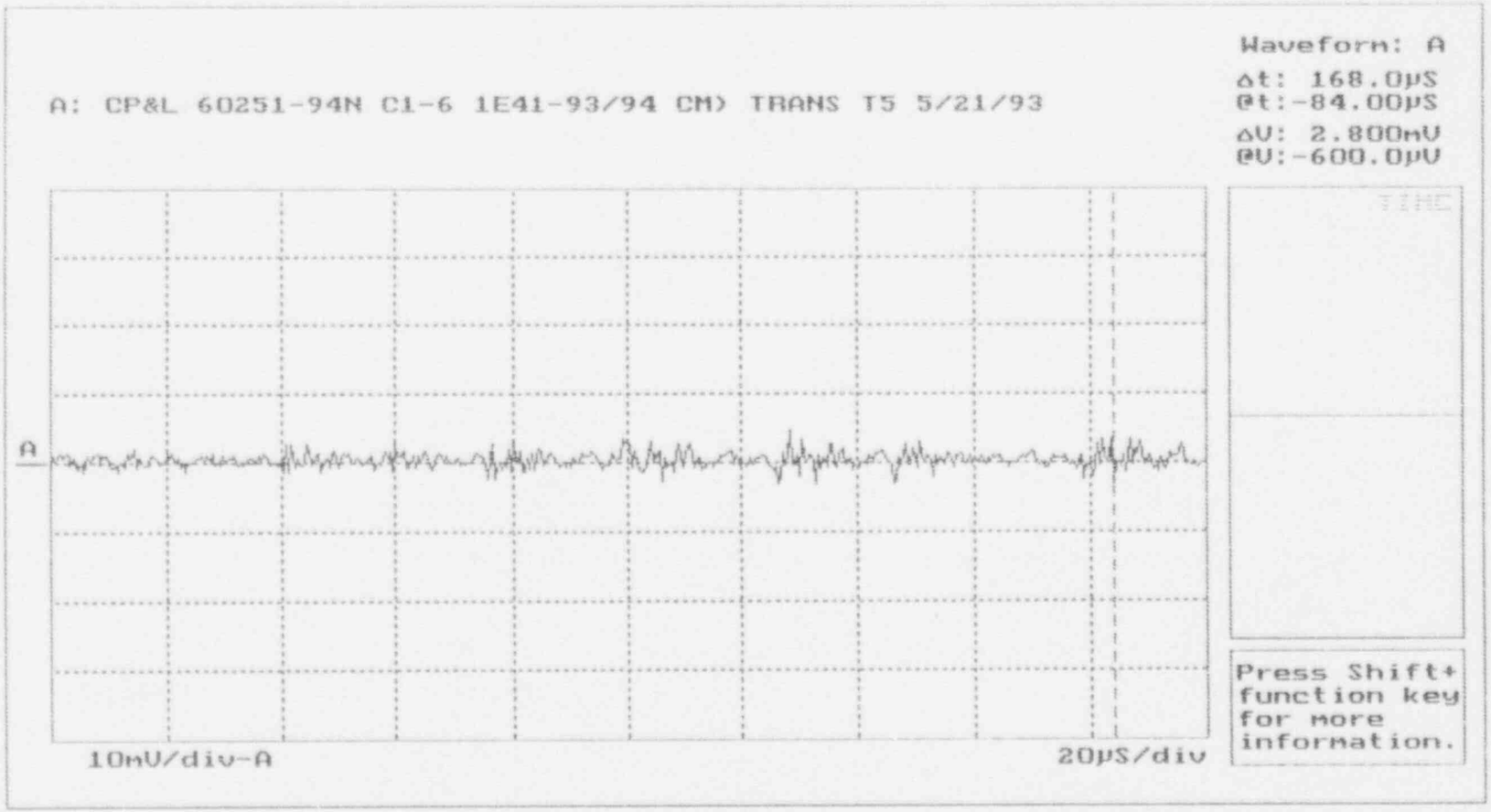

Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V:-200.0μV
A: CP&L 60251-94N C1-7 1-E41-96 (DM) TRANS T6 PUMP START 5/21/9
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

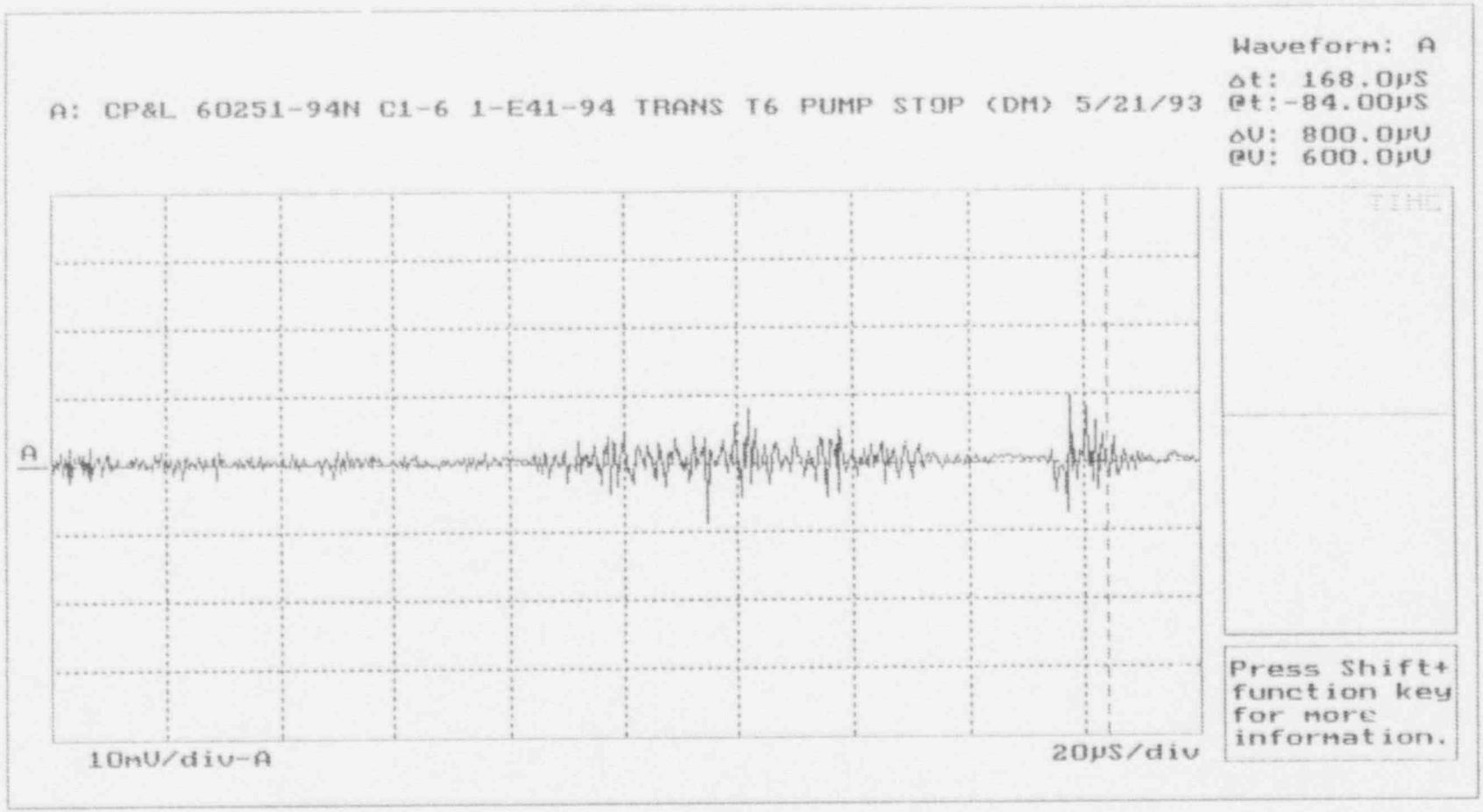

A: CP&L 60251-94N C1-7 1-E41-96(DM) TRANS T5 VALUE OPEN 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔU: 800.0μV
@U: 1.400mV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

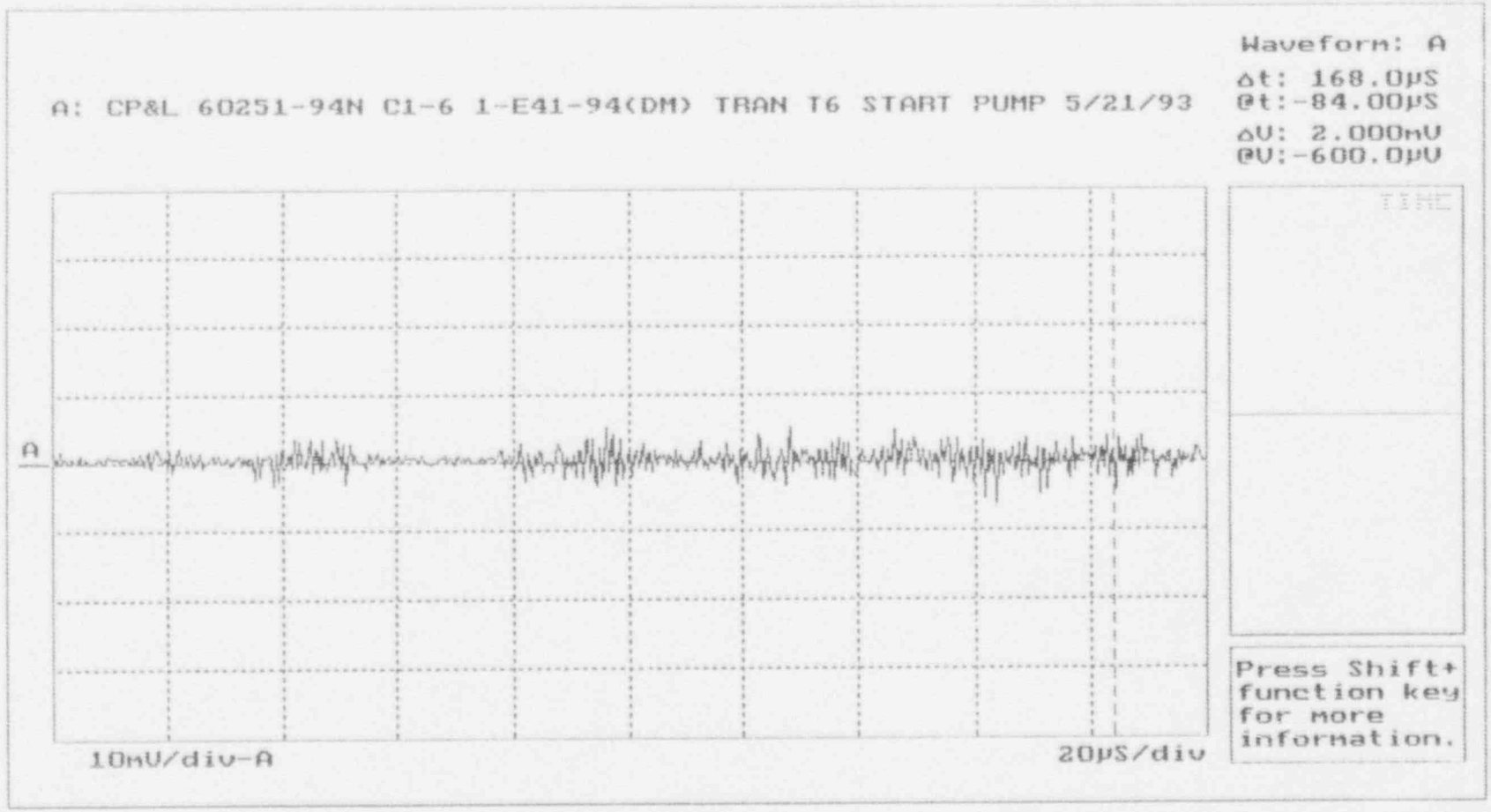

A: CP&L 60251-94N C1-6 E41-93/94 TRANS T6 (CM) PUMP STOP 5/21/9
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔU: 9.600mU
@U:-2.200mU
A
10mU/div-A
20μS/div
Press Shift+ function key for more information.

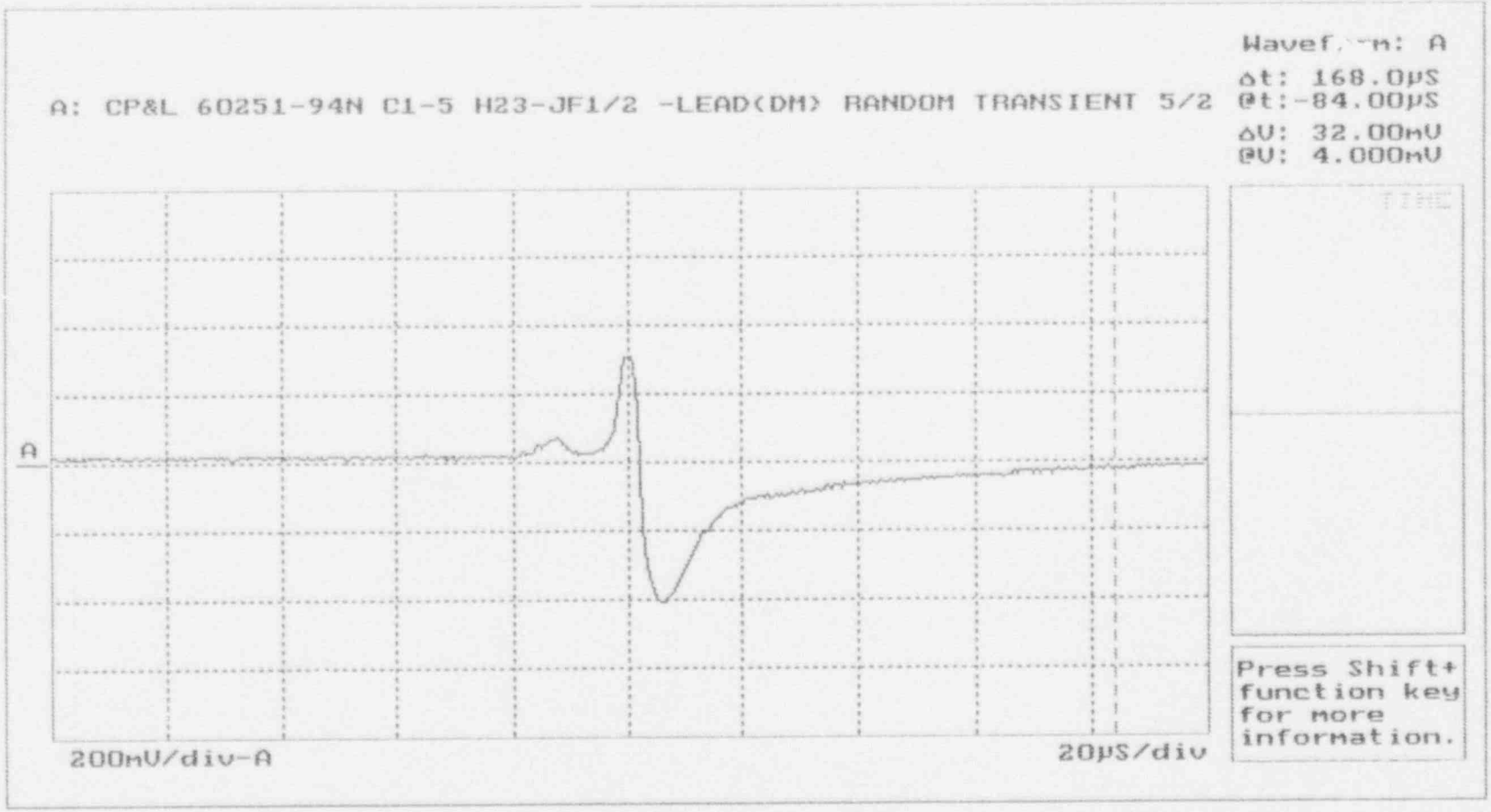

A: CP&L 60251-94N C1-6 E41-93/94 TRANS T6 (CM) PUMP START 5/21/
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V:-200.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

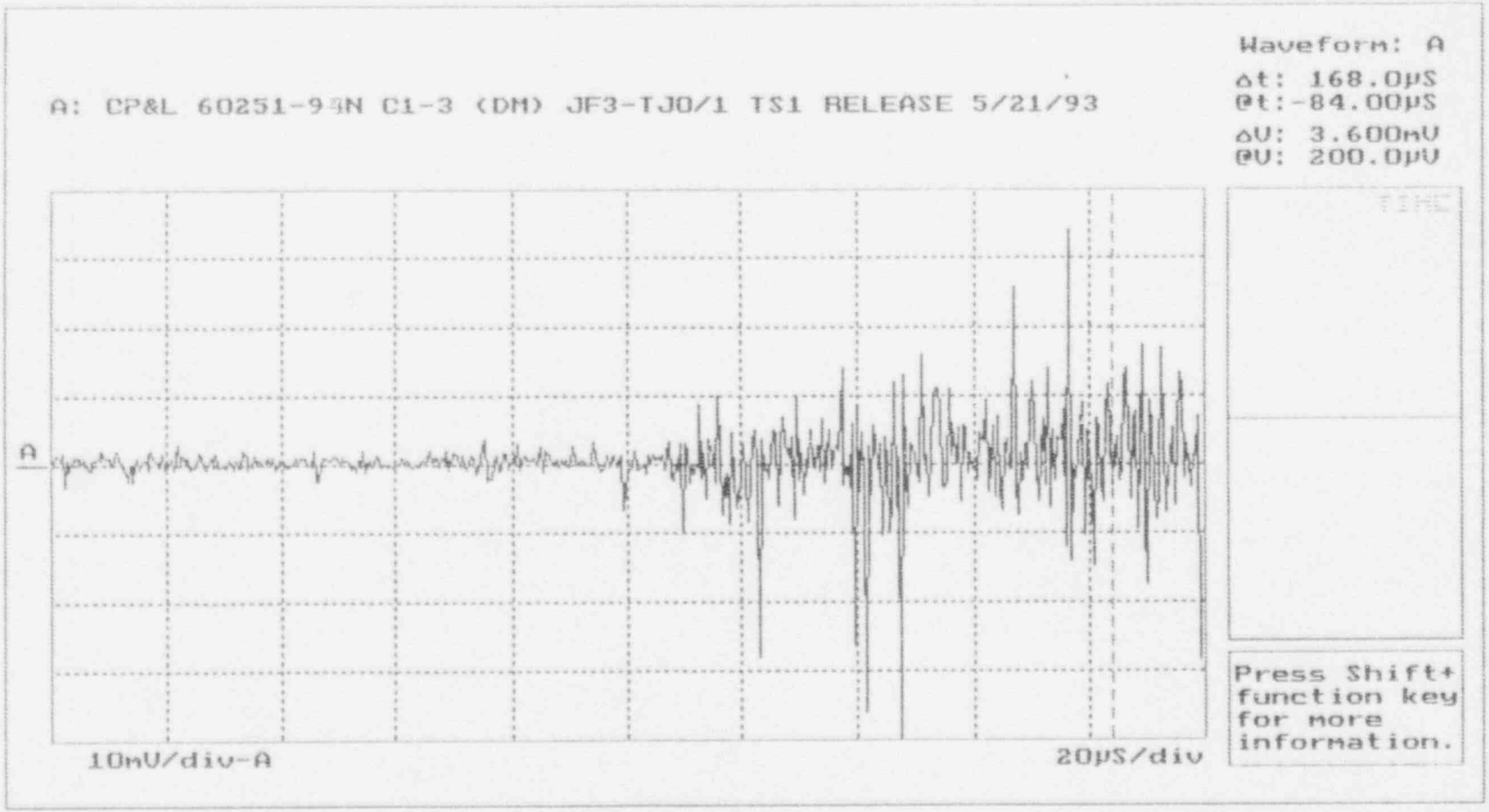

A: CP&L 60251-94N C1-6 E41-93/94 (CM) TRANS T5 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V: 200.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

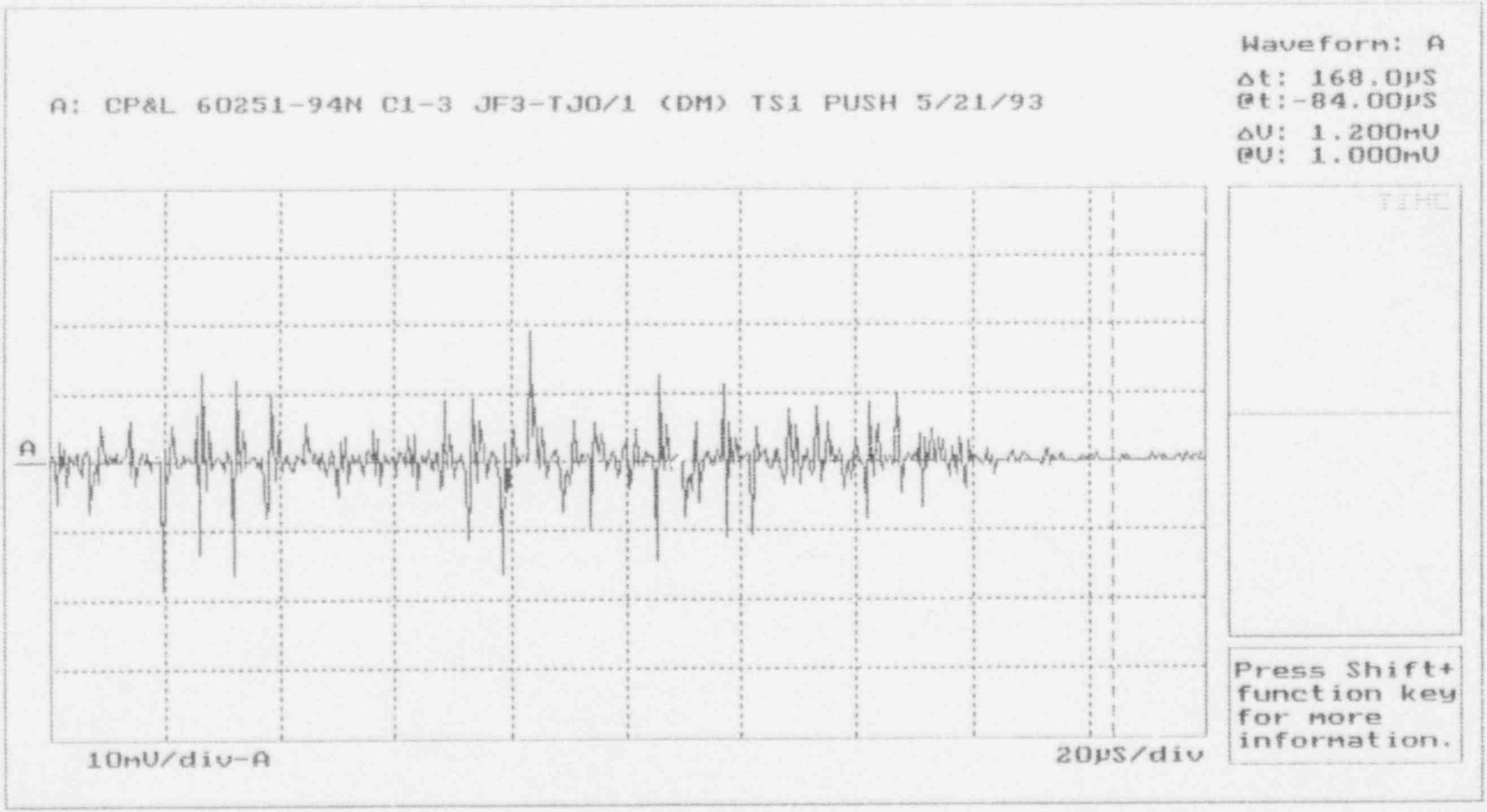

A: CP&L 60251-94N C1-6 1E41-93/94 CM) TRANS T5 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 2.800mV
@V:-600.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

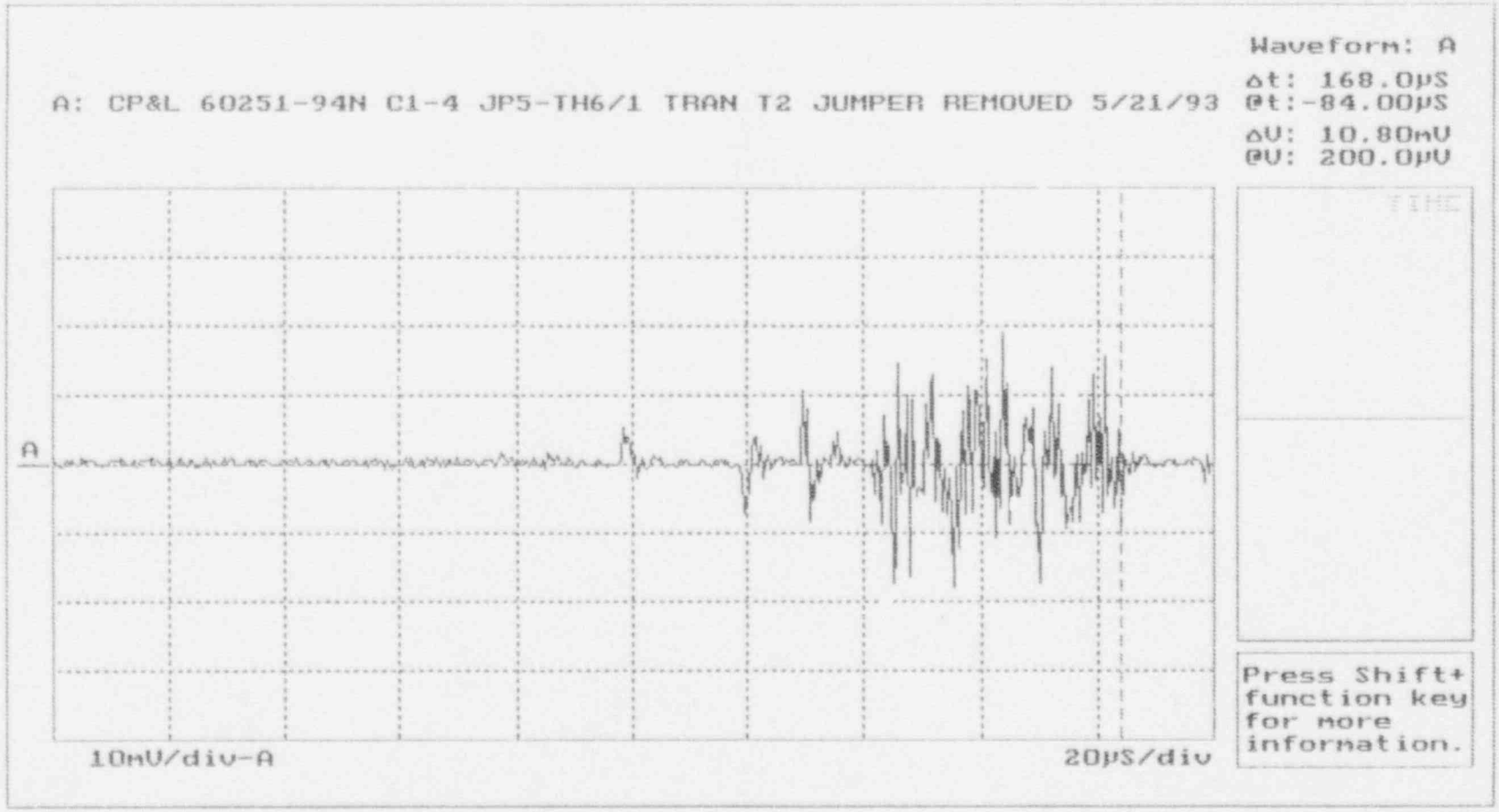

A: CP&L 60251-94N C1-6 1-E41-94 TRANS T6 PUMP STOP (DM) 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 800.0μV
@V: 600.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

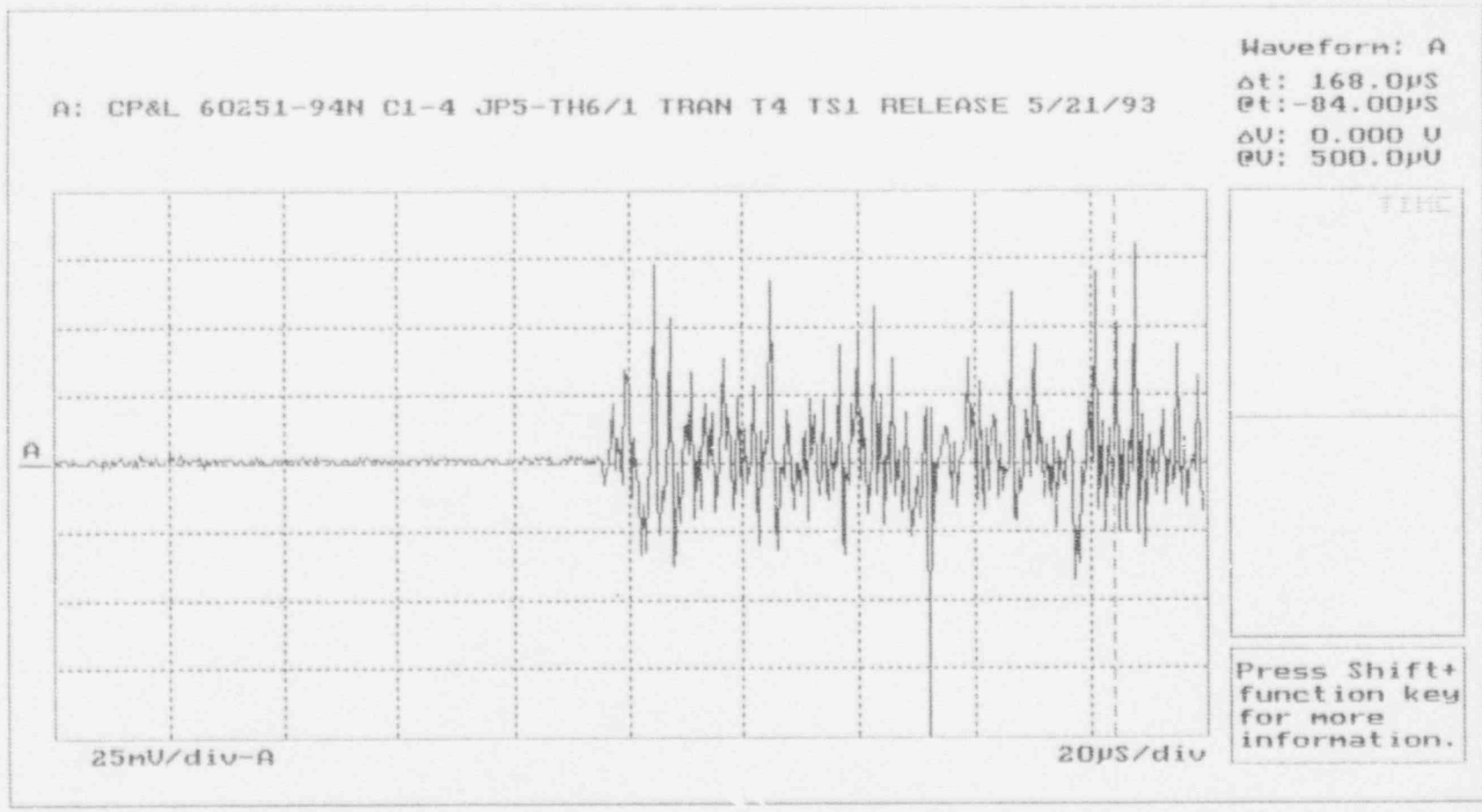

A: CP&L 60251-94N C1-6 1-E41-94(DM) TRAN T6 START PUMP 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 2.000mV
@V:-600.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

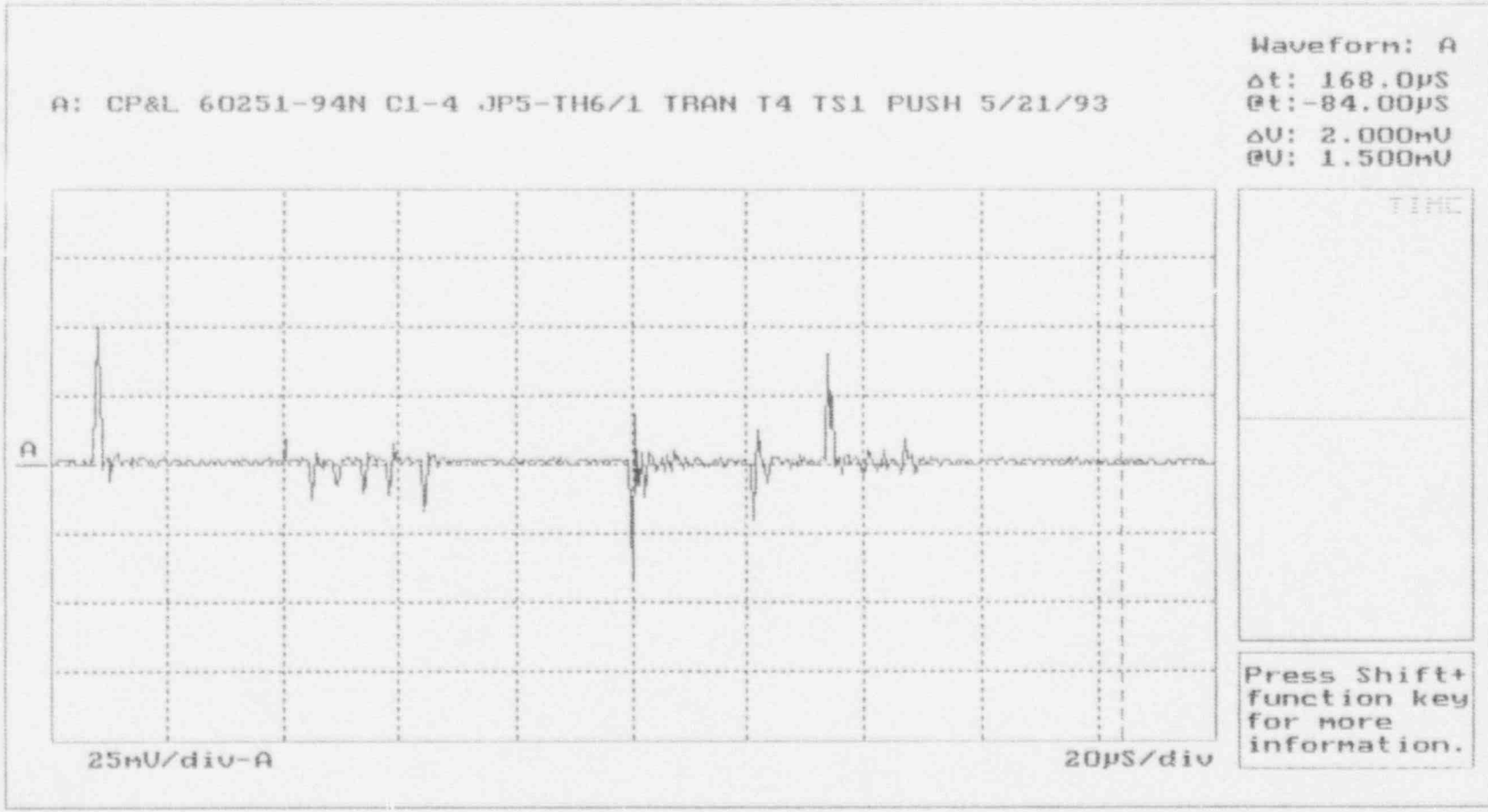

A: CP&L 60251-94N C1-5 H23-JF1/2 -LEAD(DM) RANDOM TRANSIENT 5/2
Wavef.rm: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 32.00mV
@V: 4.000mV
A
200mV/div-A
20μS/div
Press Shift+ function key for more information.

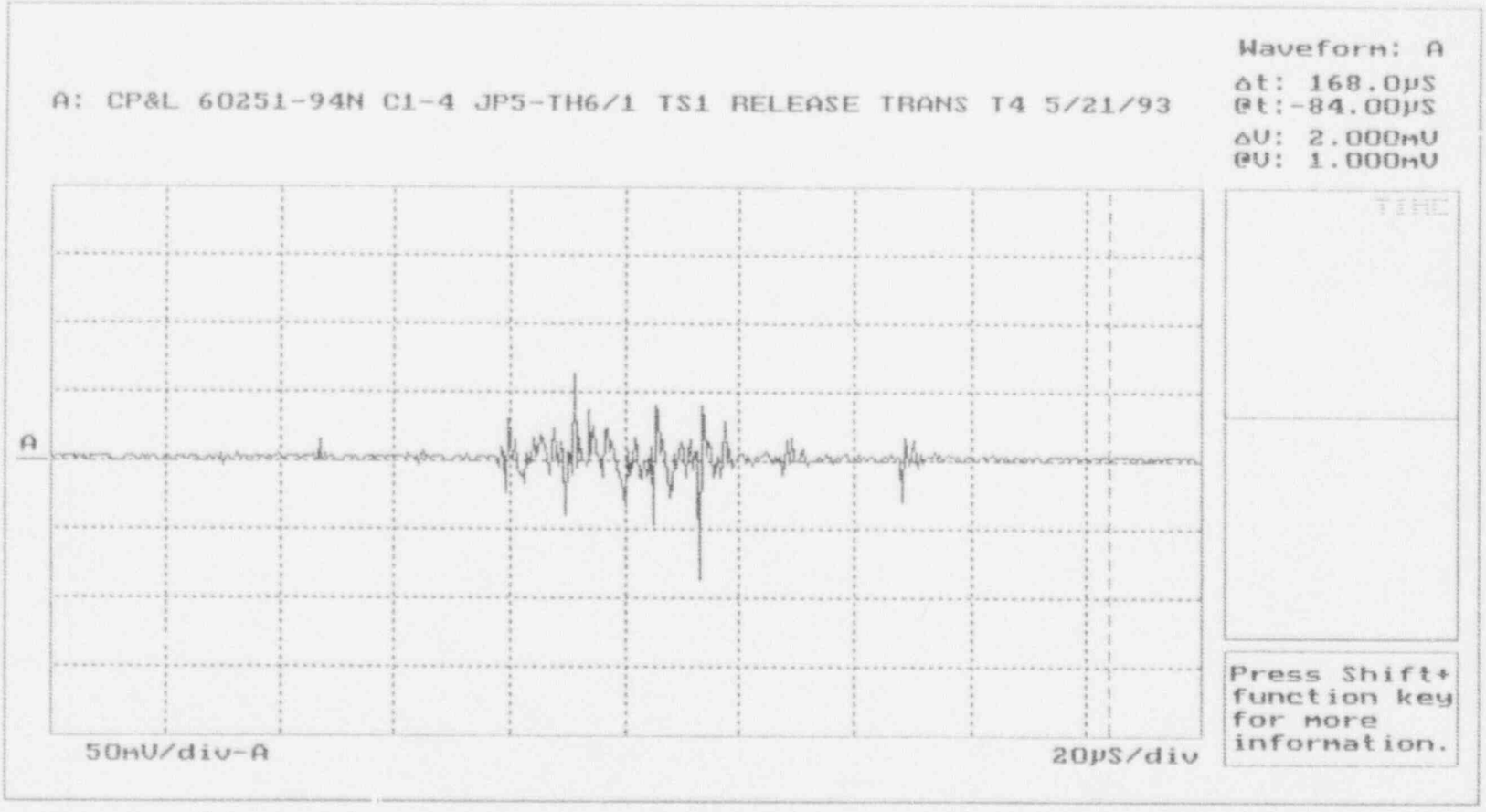

A: CP&L 60251-99N C1-3 (DM) JF3-TJO/1 TS1 RELEASE 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 3.600mV
@V: 200.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

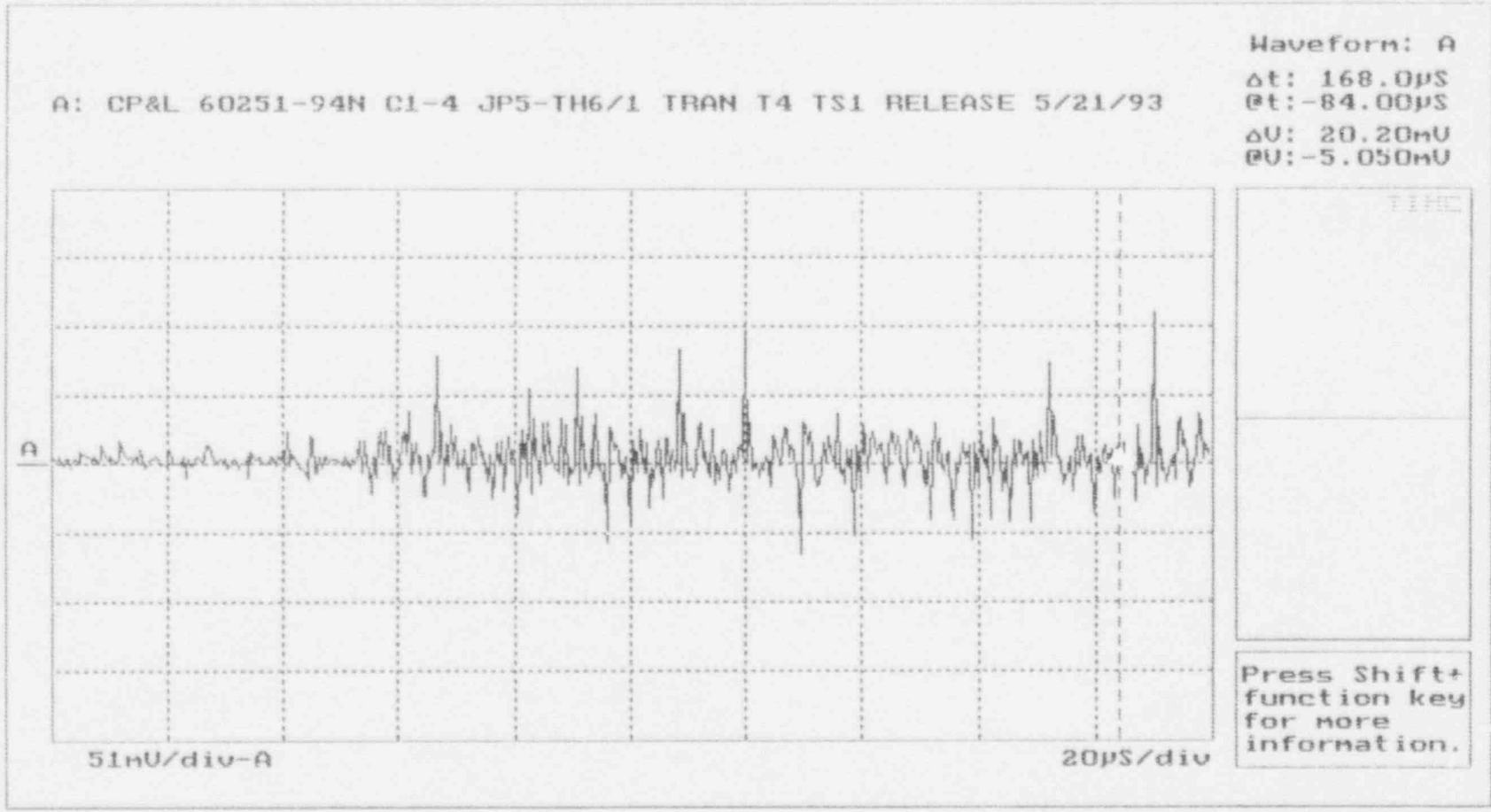

A: CP&L 60251-94N C1-3 JF3-TJ0/1 (DM) TS1 PUSH 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 1.200mV
@V: 1.000mV
TIME
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C1-4 JP5-TH6/1 TRAN T2 JUMPER REMOVED 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 10.80mV
@V: 200.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

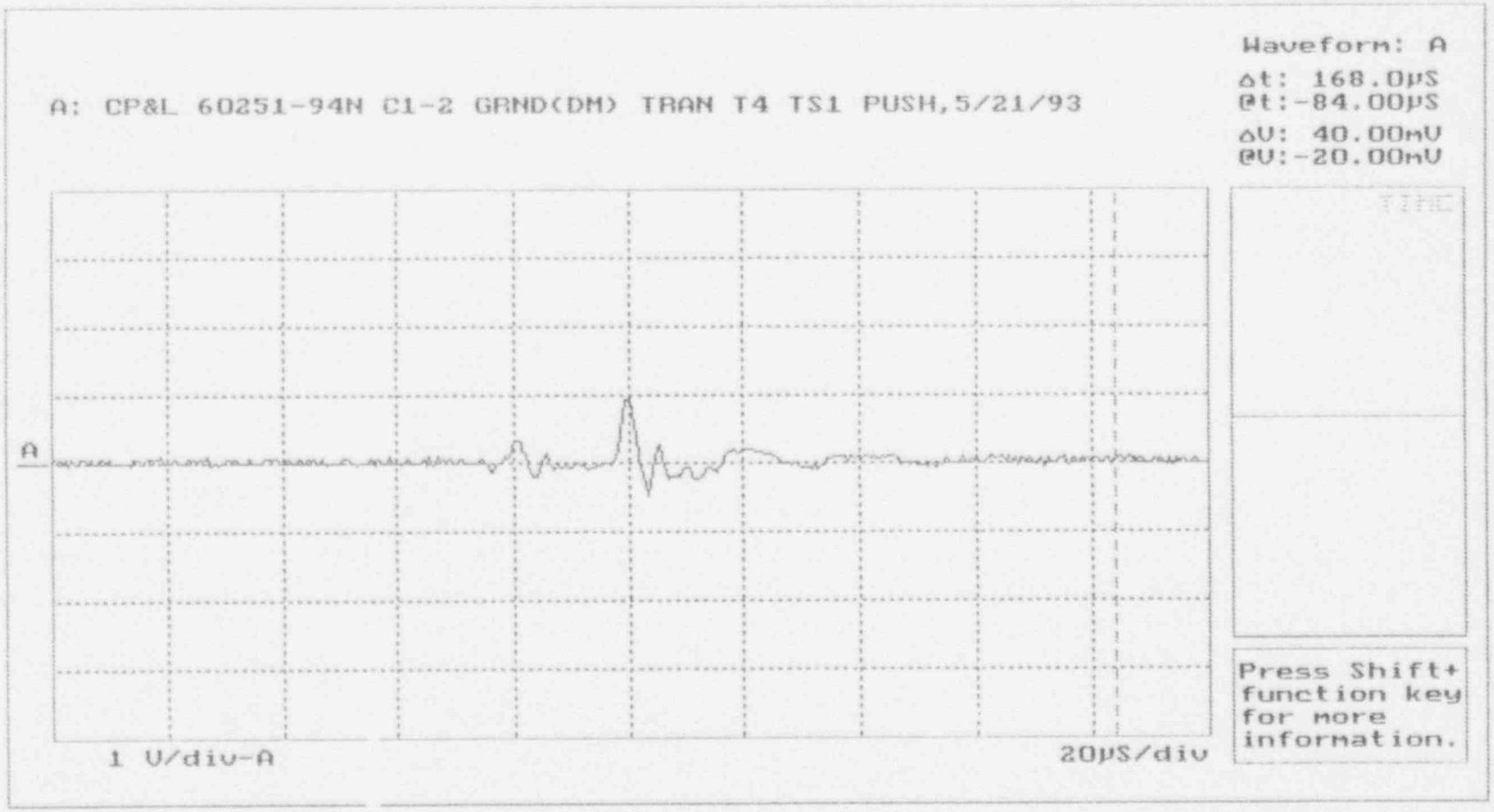

A: CP&L 60251-94N C1-4 JP5-TH6/1 TRAN T4 TS1 RELEASE 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V: 500.0μV
TIME
A
25mV/div-A
20μS/div
Press Shift+ function key for more information.

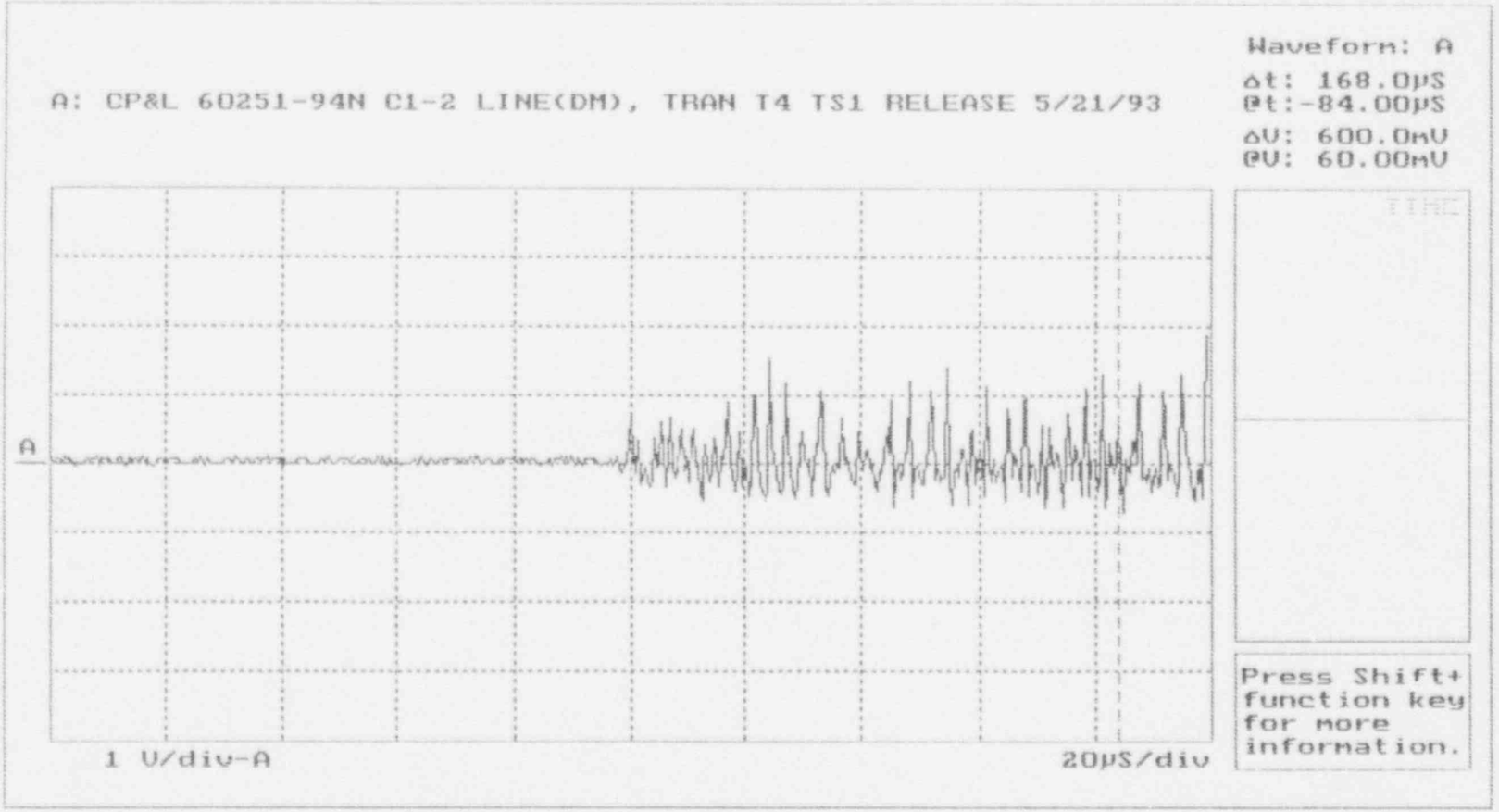

A: CP&L 60251-94N C1-4 JP5-TH6/1 TRAN T4 TS1 PUSH 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 2.000mV
@V: 1.500mV
TIME
A
25mV/div-A
20μS/div
Press Shift+ function key for more information.

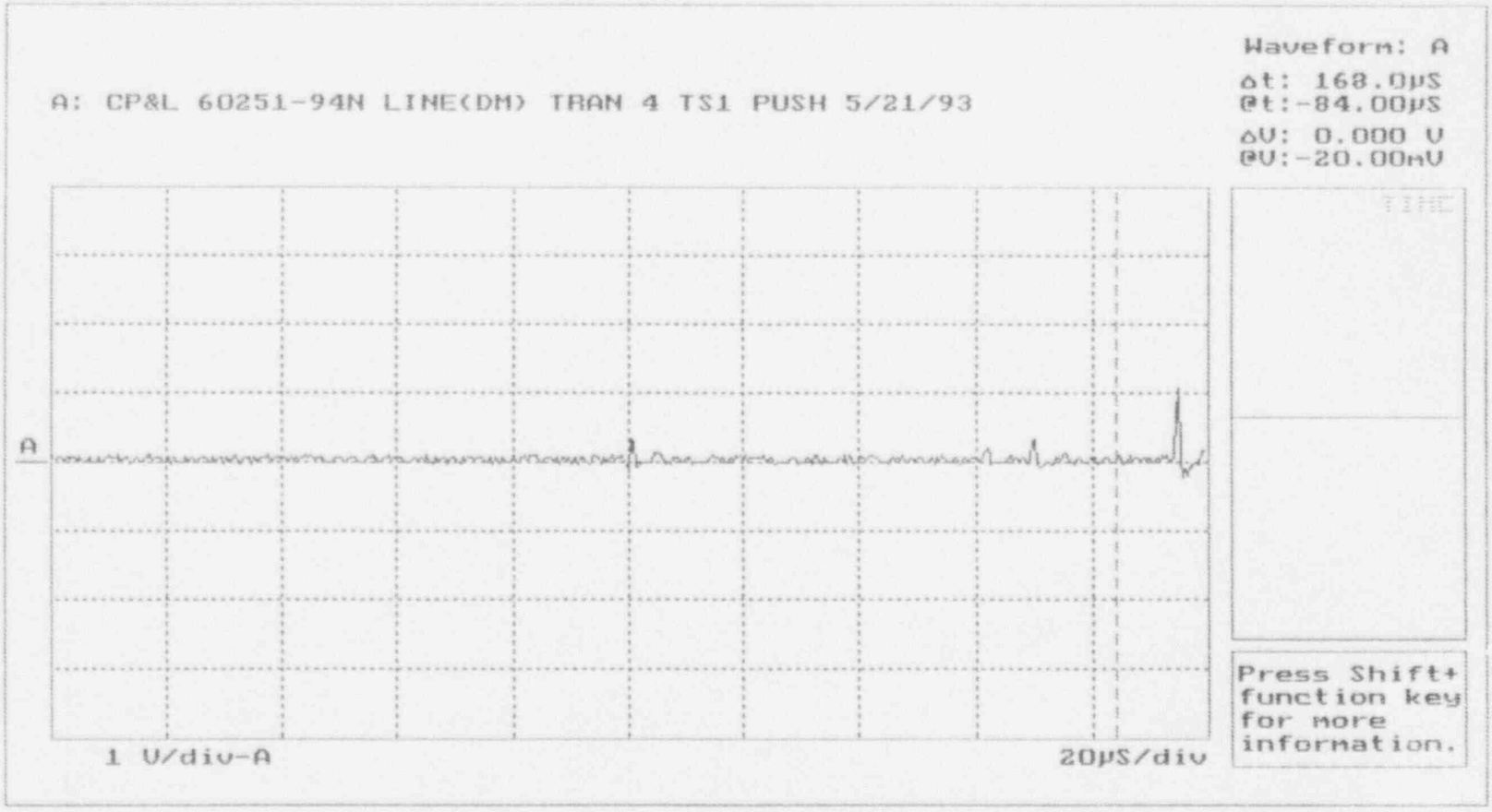

A: CP&L 60251-94N C1-4 JP5-TH6/1 TS1 RELEASE TRANS T4 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 2.000mV
@V: 1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

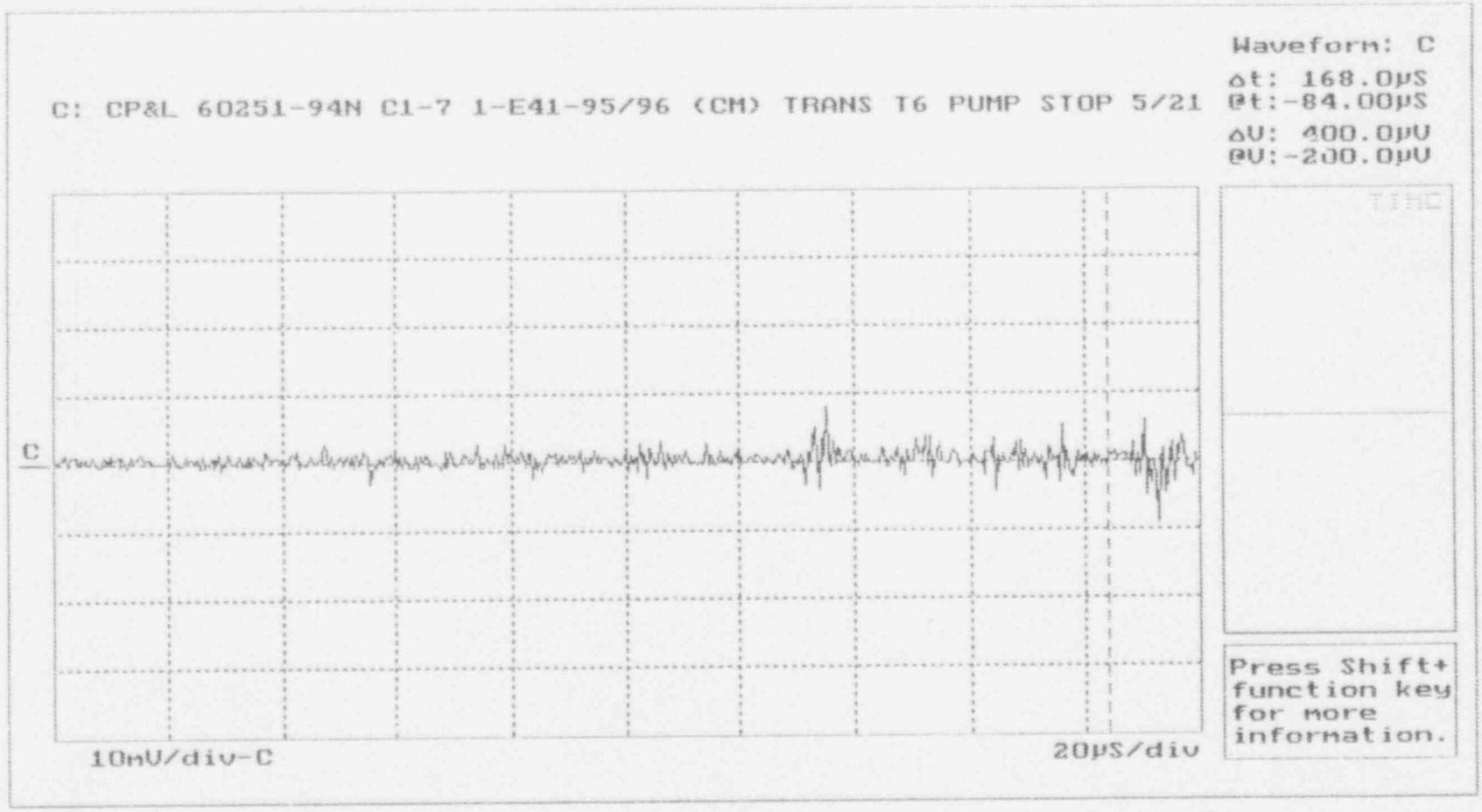

A: CP&L 60251-94N C1-4 JP5-TH6/1 TRAN T4 TS1 RELEASE 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 20.20mV
@V:-5.050mV
A
51mV/div-A
20μS/div
Press Shift+ function key for more information.

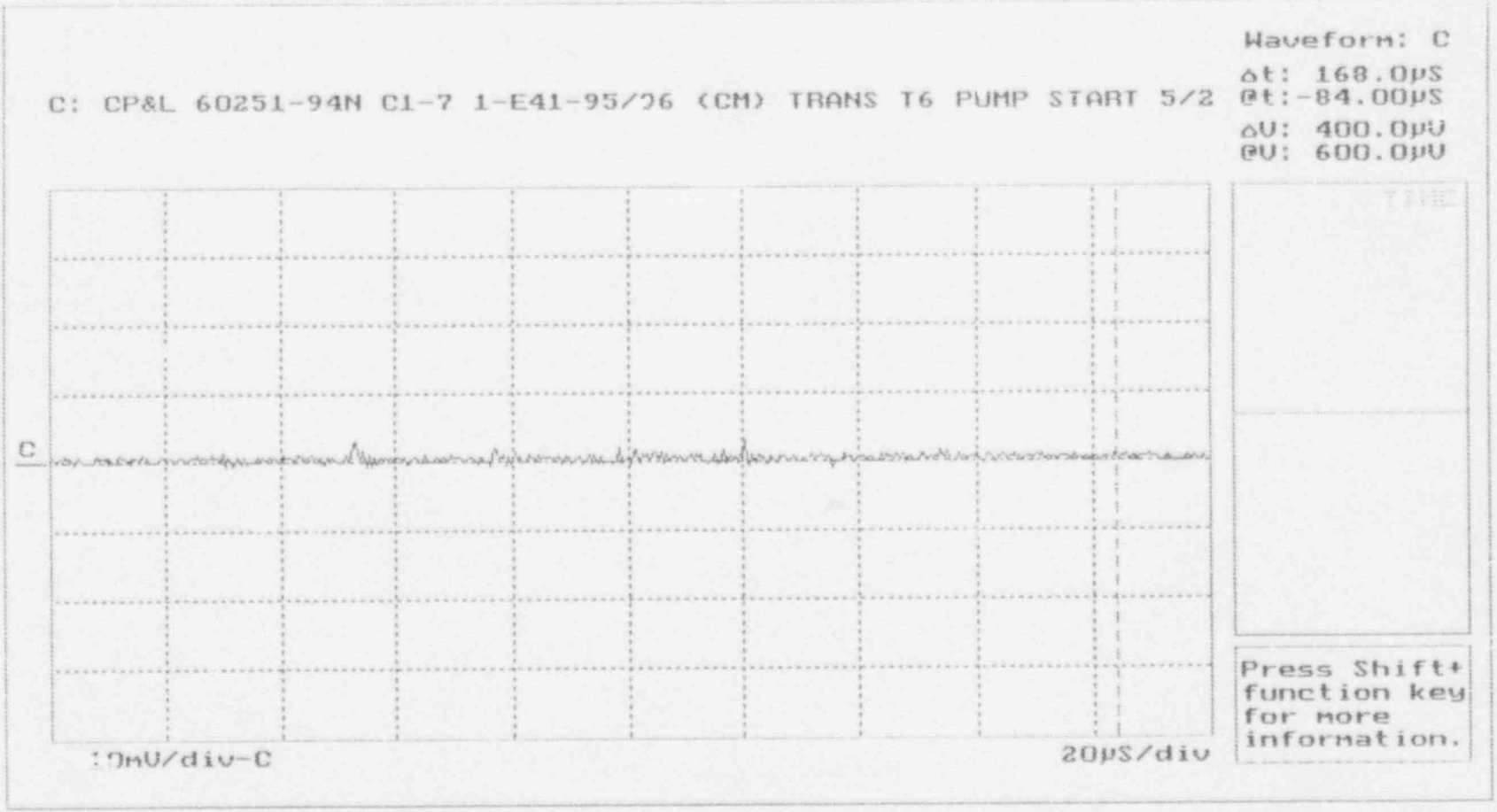
A: CP&L 60251-94N C1-2,GRND(DM) RANDOM NOISE 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V: 1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

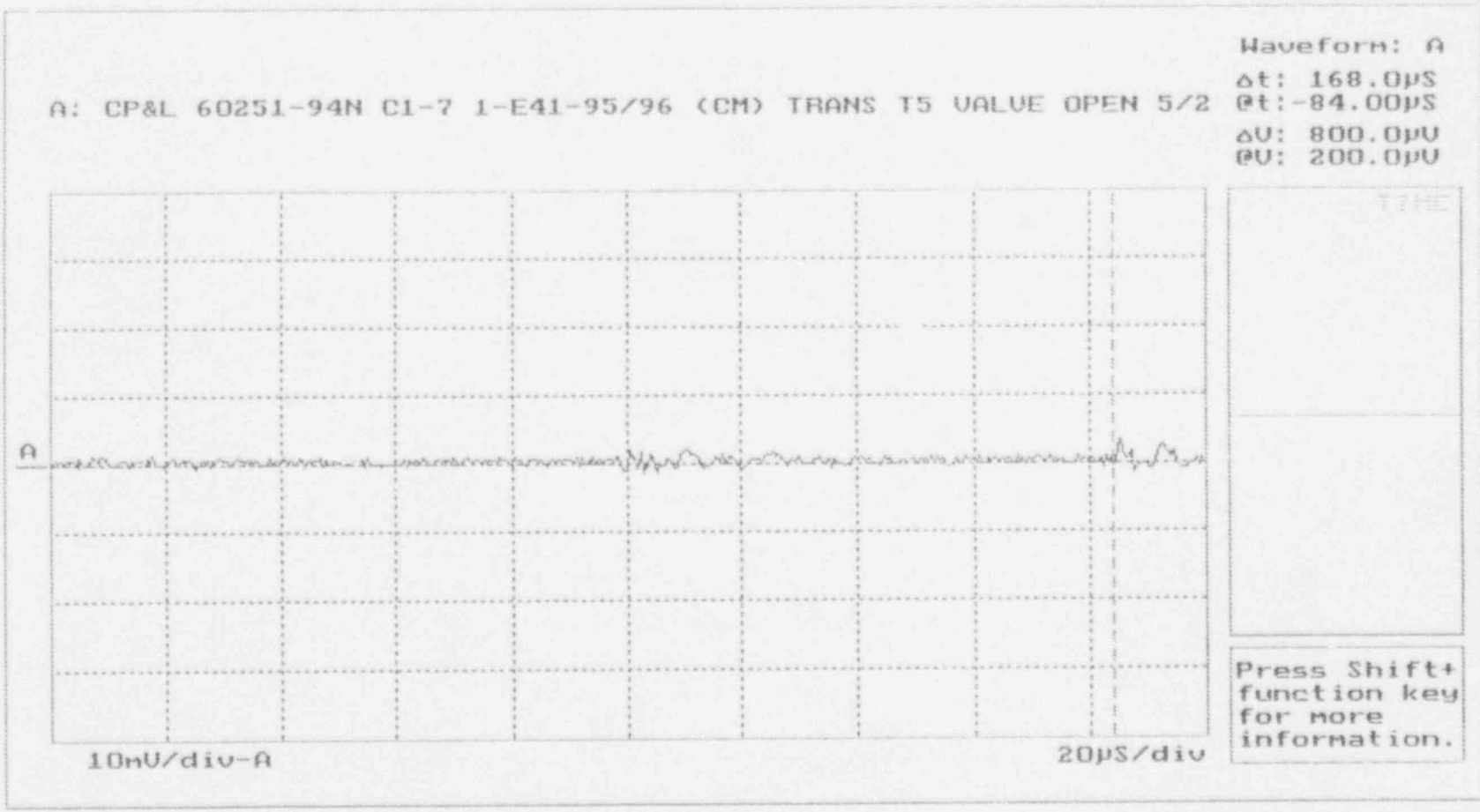

A: CP&L 60251-94N C1-2 GRND(DM) TRAN T4 TS1 PUSH,5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 40.00mV
@V:-20.00mV
A
1 V/div-A
20μS/div
Press Shift+ function key for more information.

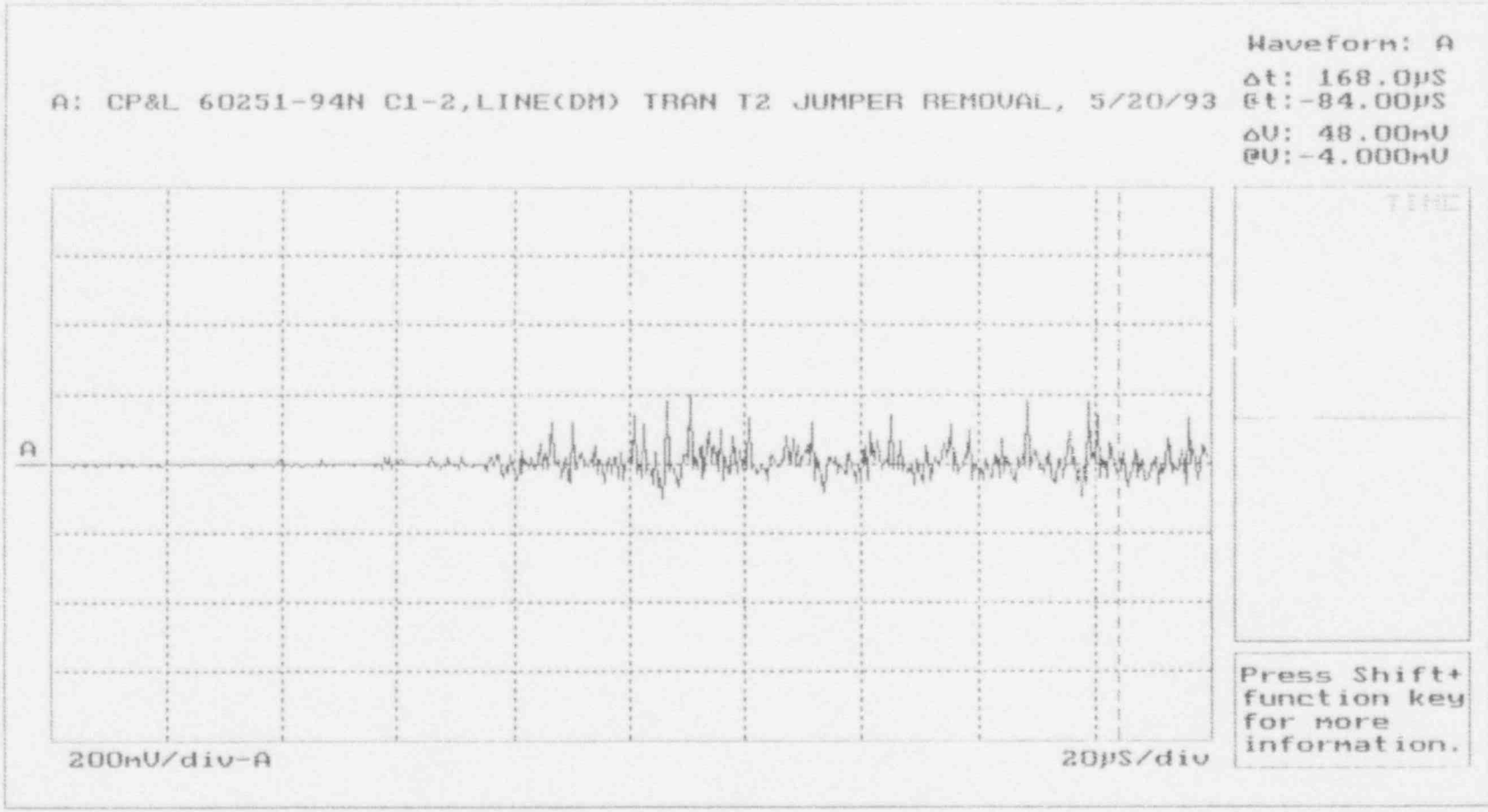

A: CP&L 60251-94N C1-2 LINE(DM), TRAN T4 TS1 RELEASE 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 600.0mV
@V: 60.00mV
A
1 V/div-A
20μS/div
Press Shift+ function key for more information.

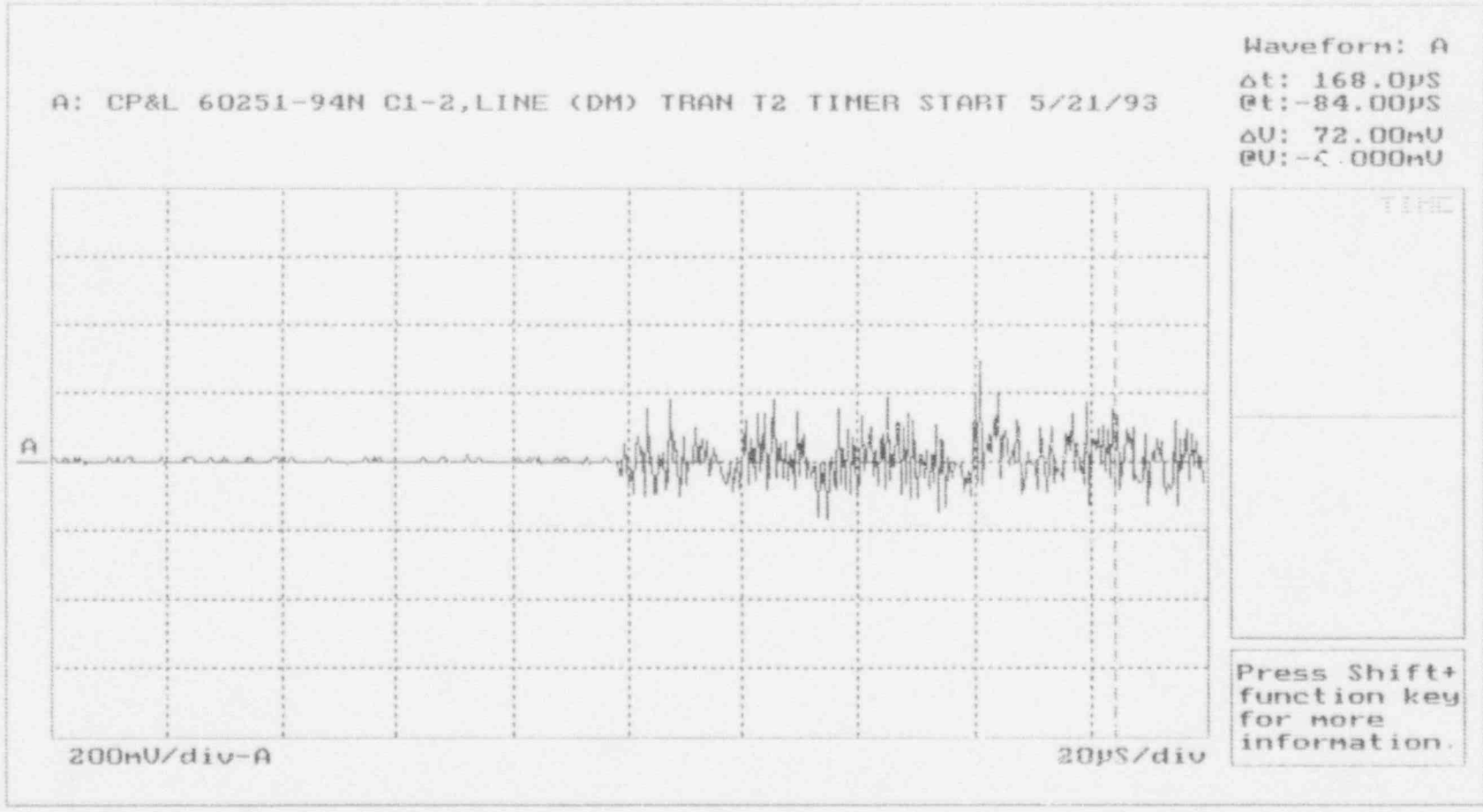

A: CP&L 60251-94N LINE(DM) TRAN 4 TS1 PUSH 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V:-20.00mV
A
1 V/div-A
20μS/div
Press Shift+ function key for more information.

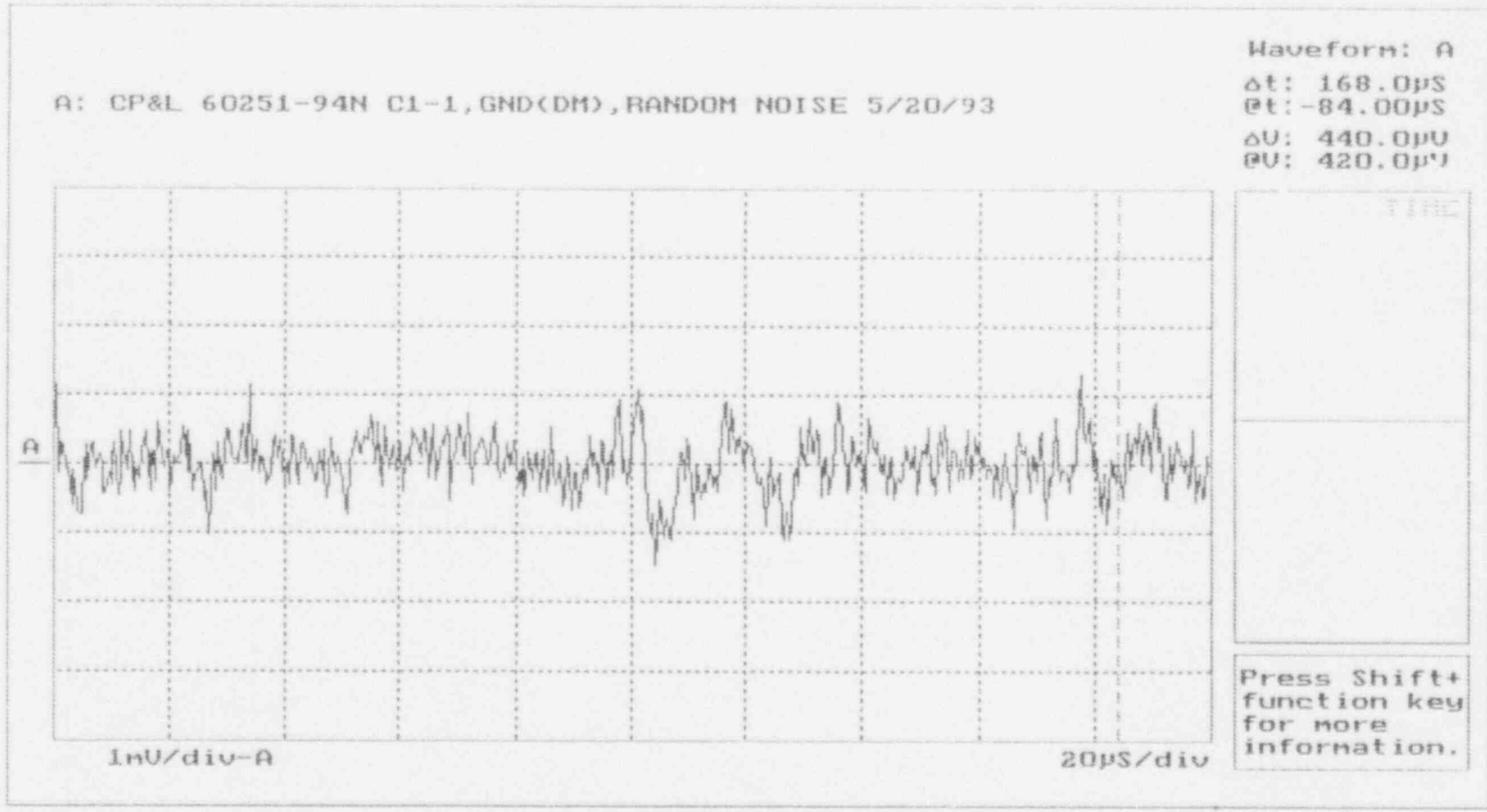

C: CP&L 60251-94N C1-7 1-E41-95/96 (CM) TRANS T6 PUMP STOP 5/21
Waveform: C
Δt: 168.0μS
@t:-84.00μS
ΔV: 400.0μV
@V:-200.0μV
C
10mV/div-C
20μS/div
Press Shift+ function key for more information.

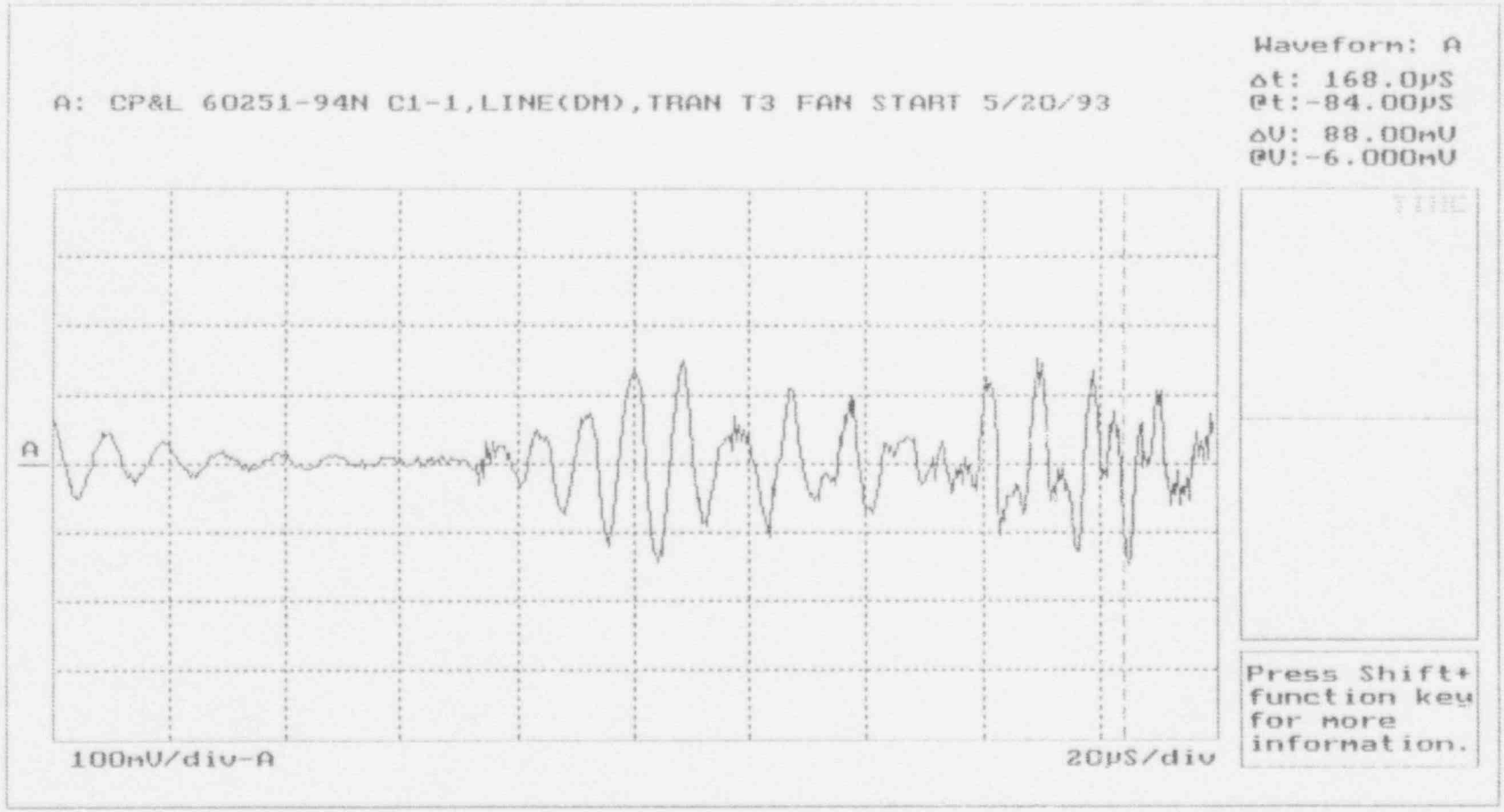

C: CP&L 60251-94N C1-7 1-E41-95/26 (CM) TRANS T6 PUMP START 5/2
Waveform: C
Δt: 168.0μS
@t:-84.00μS
ΔV: 400.0μV
@V: 600.0μV
C
:0mV/div-C
20μS/div
Press Shift+ function key for more information.

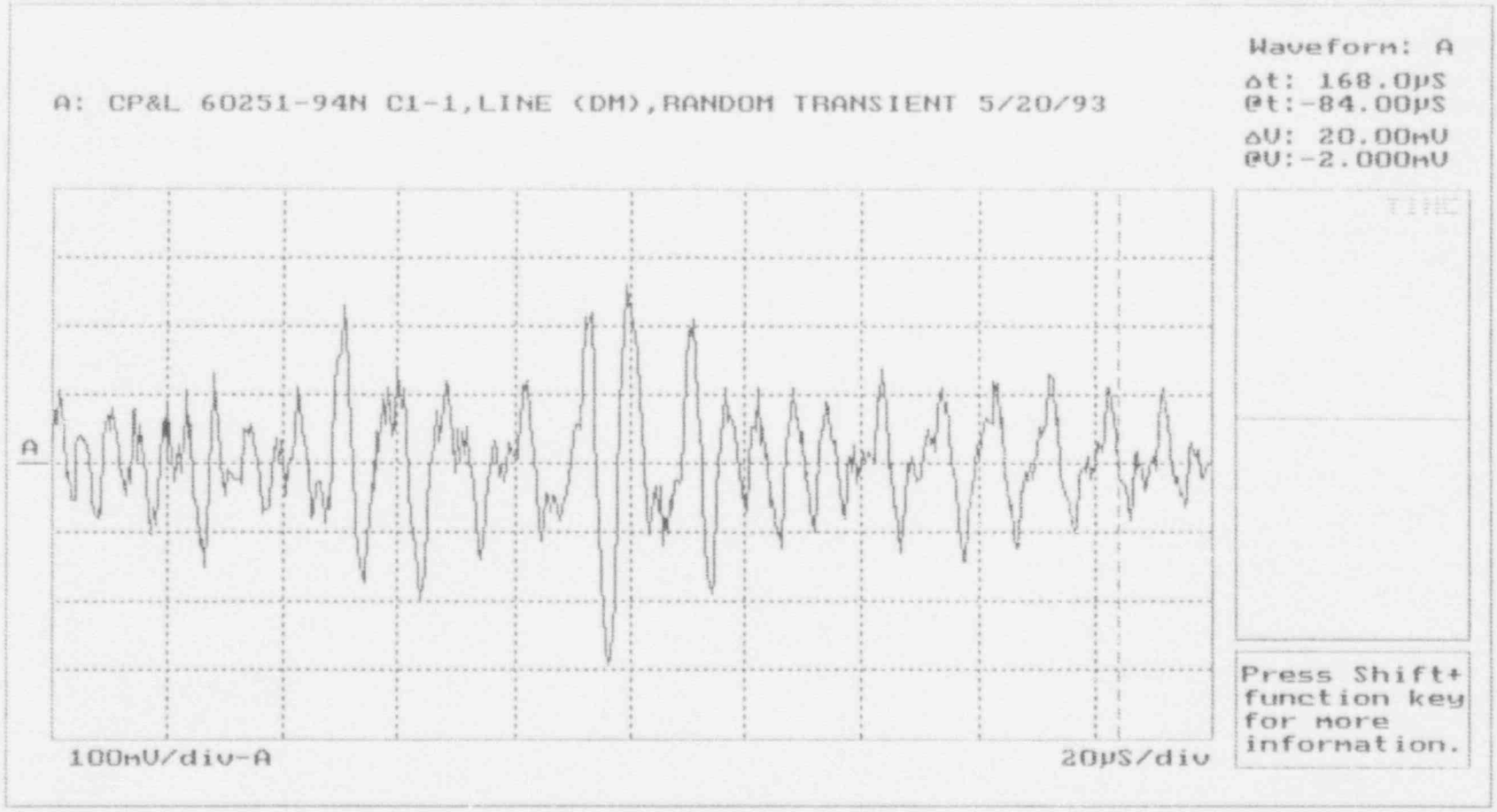

A: CP&L 60251-94N C1-7 1-E41-95/96 (CM) TRANS T5 VALVE OPEN 5/2
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 800.0μV
@V: 200.0μV
A
10mV/div-A
20μS/div
Press Shift+ function key for more information.

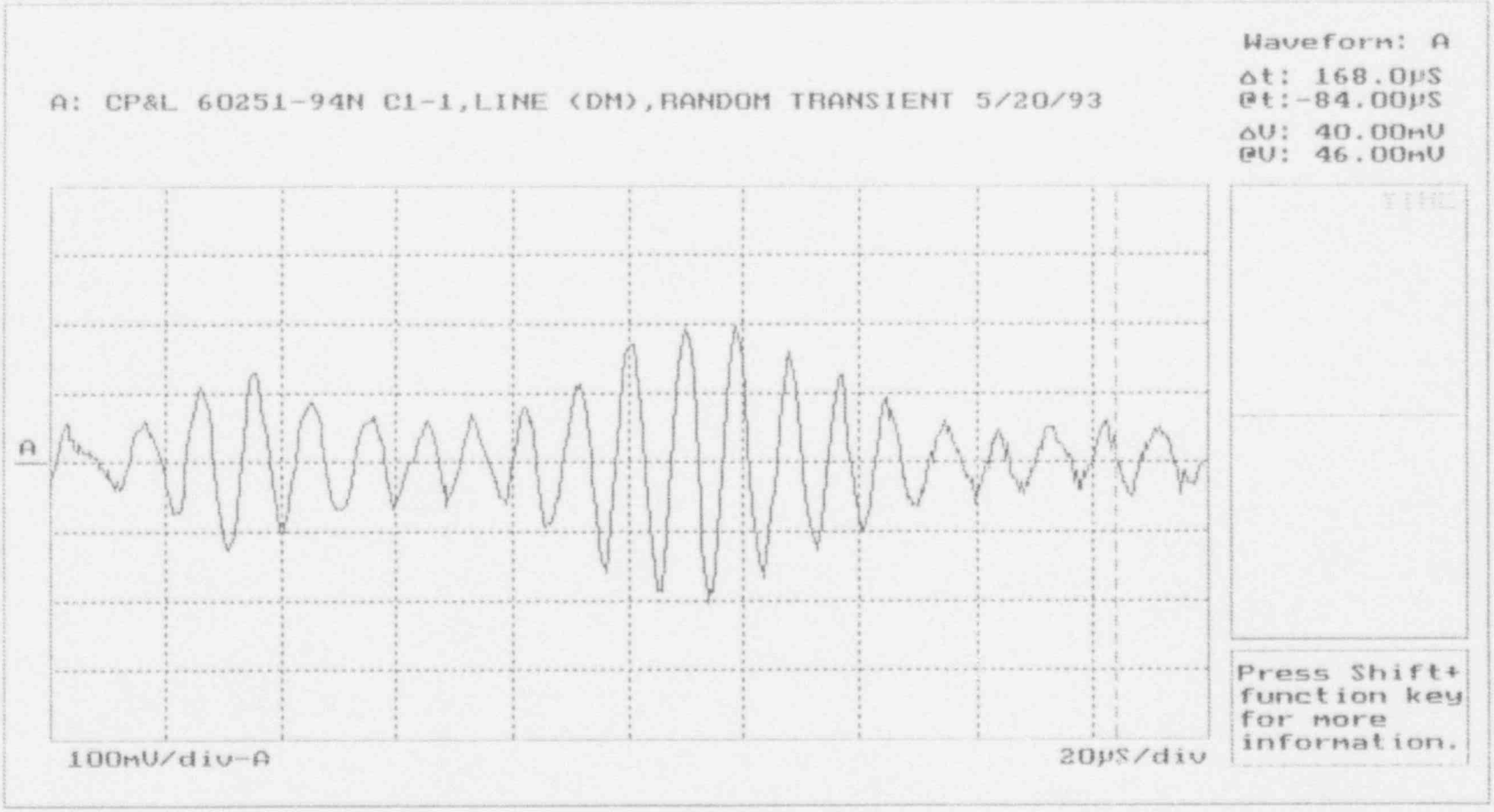

A: CP&L 60251-94N C1-2,LINE(DM) TRAN T2 JUMPER REMOVAL, 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 48.00mV
@V:-4.000mV
A
200mV/div-A
20μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C1-2,LINE (DM) TRAN T2 TIMER START 5/21/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 72.00mV
@V:-6.000mV
TIME
A
200mV/div-A
20μS/div
Press Shift+ function key for more information.

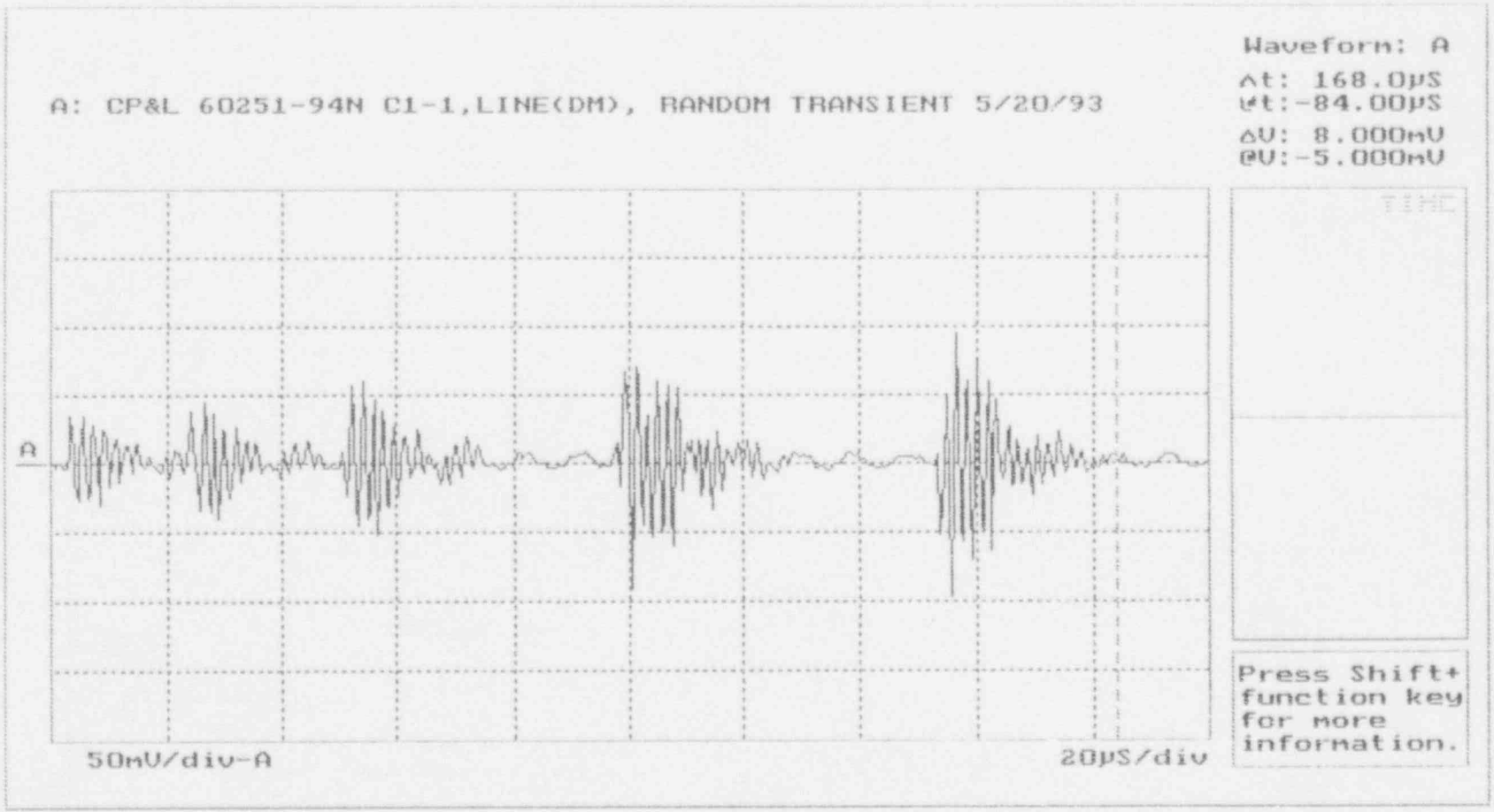

A: CP&L 60251-94N C1-1,GND(DM),RANDOM NOISE 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 440.0μV
@V: 420.0μV
A
1mV/div-A
20μS/div
Press Shift+ function key for more information.

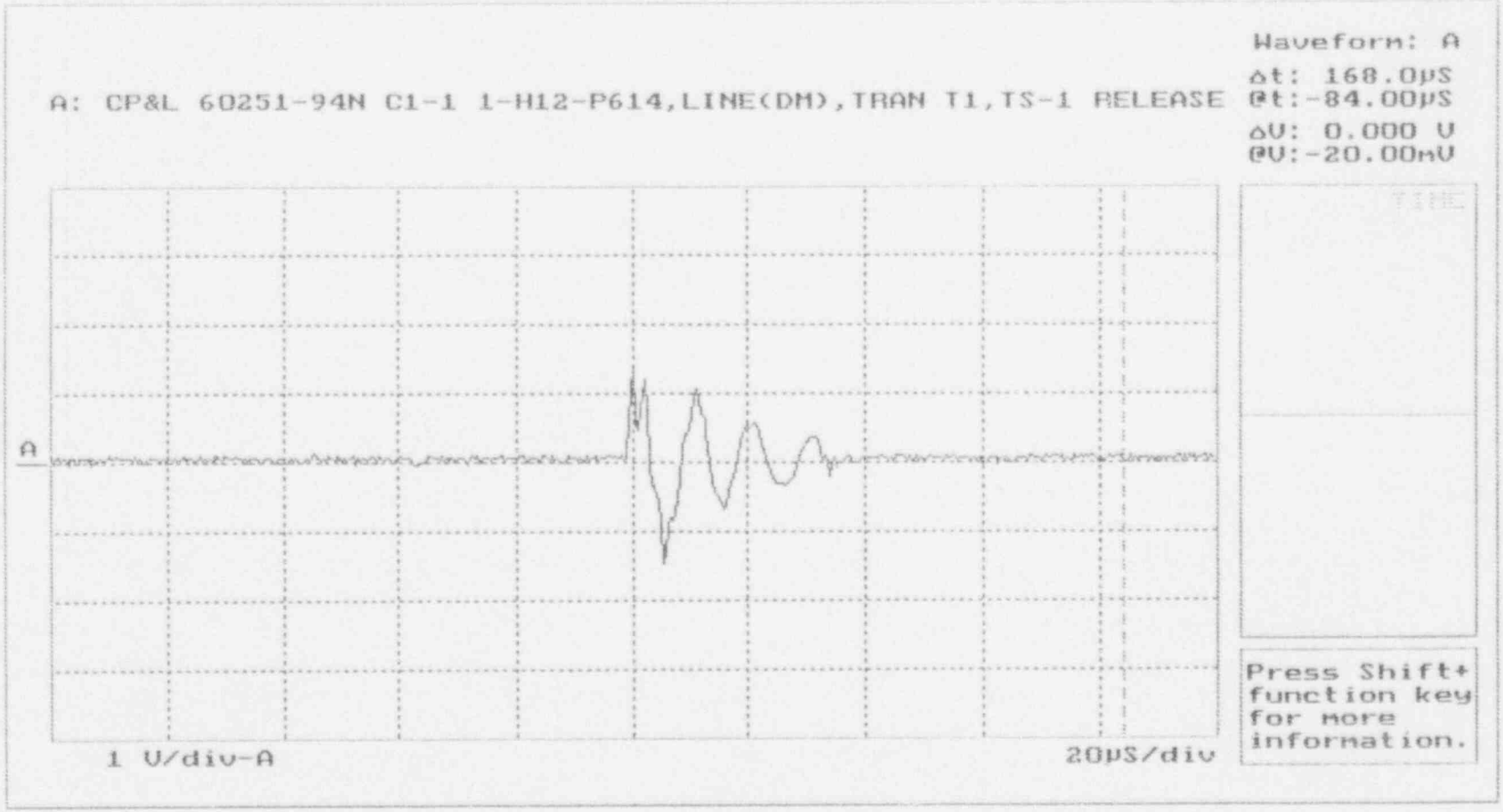

A: CP&L 60251-94N C1-1,LINE(DM),TRAN T3 FAN START 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 88.00mV
@V:-6.000mV
A
100mV/div-A
20μS/div
Press Shift+ function key for more information.

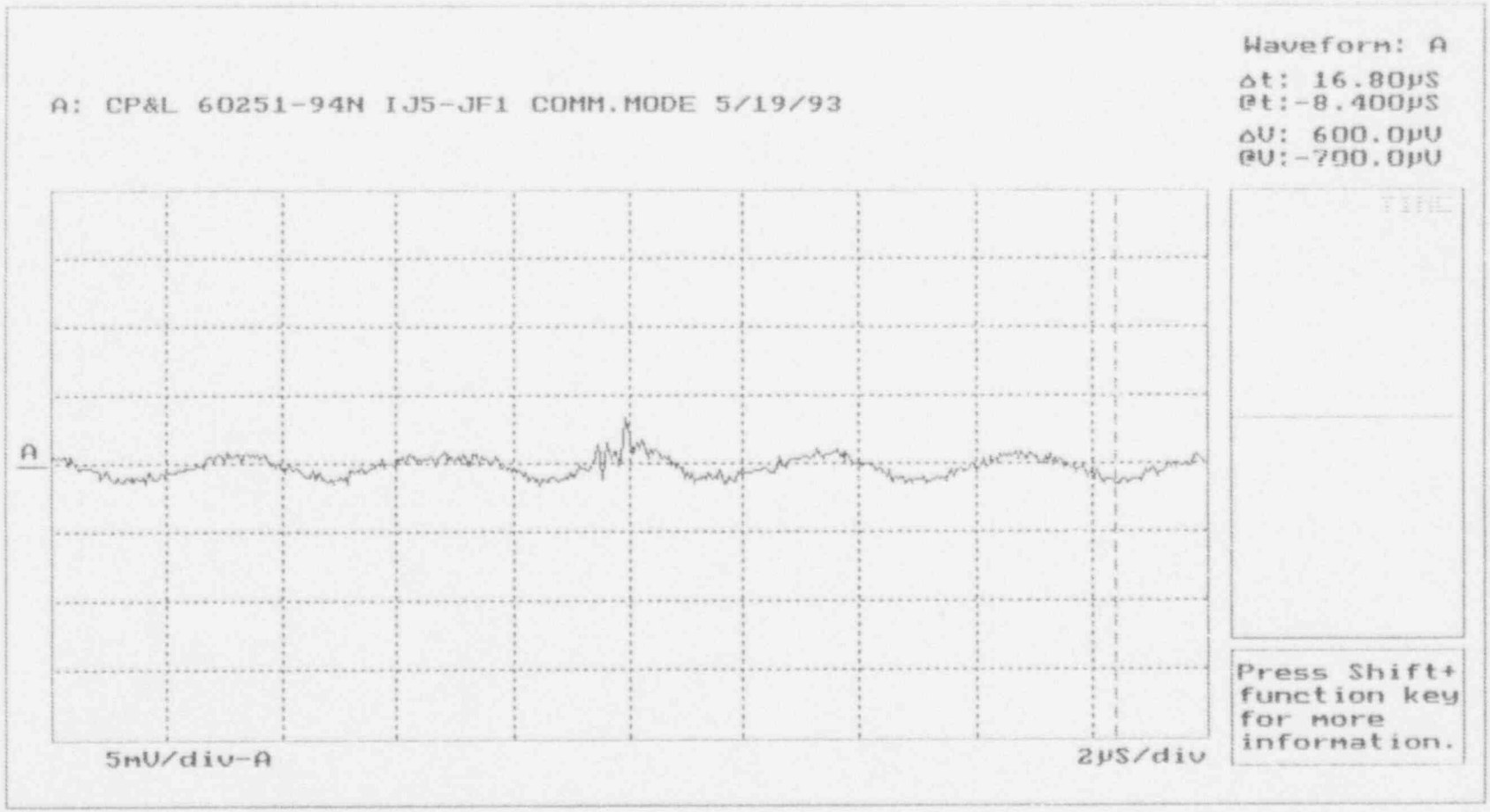

A: CP&L 60251-94N C1-1,LINE (DM),RANDOM TRANSIENT 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 20.00mV
@V:-2.000mV
A
100mV/div-A
20μS/div
Press Shift+ function key for more information.

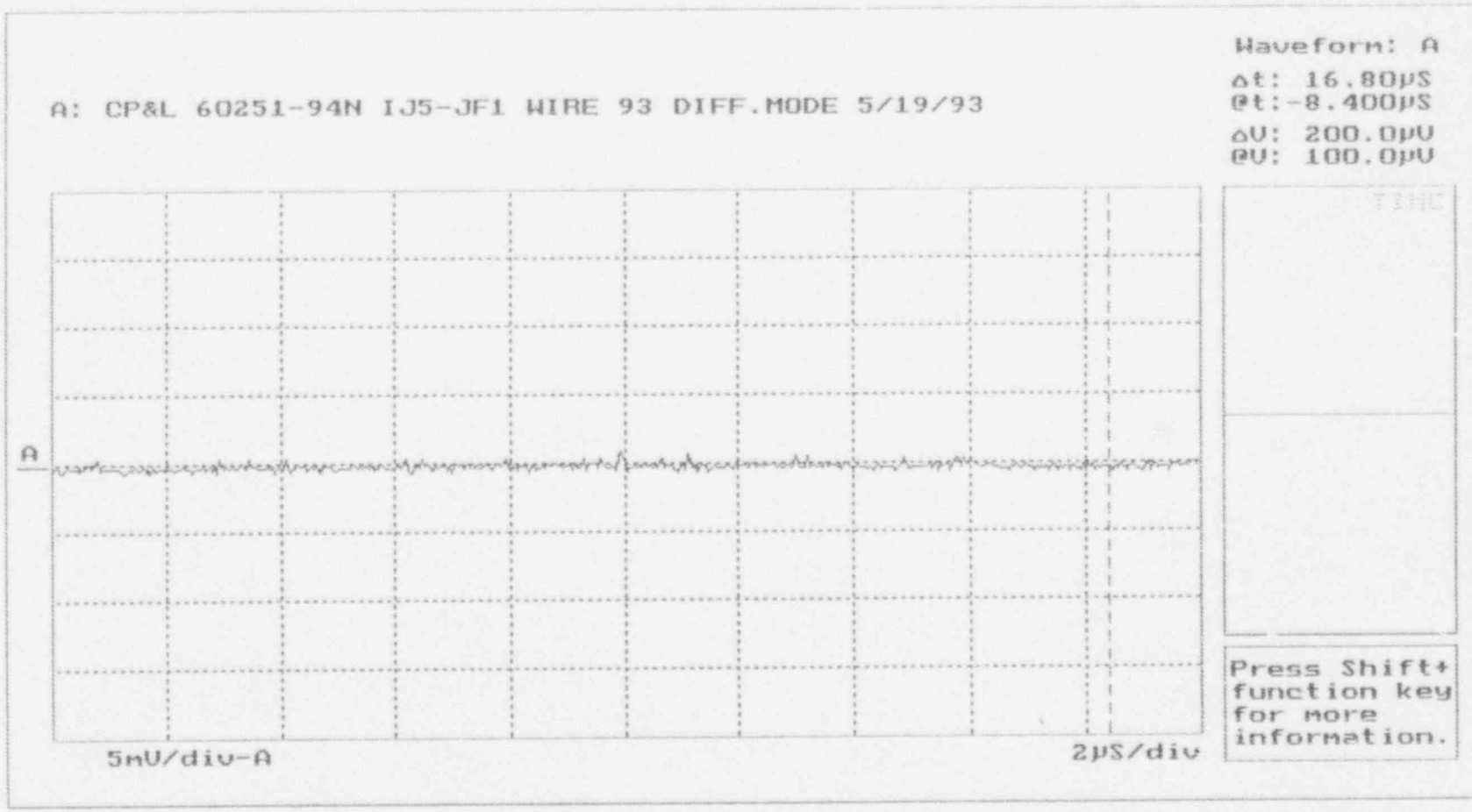

A: CP&L 60251-94N C1-1,LINE (DM),RANDOM TRANSIENT 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 40.00mV
@V: 46.00mV
A
100mV/div-A
20μS/div
Press Shift+ function key for more information.

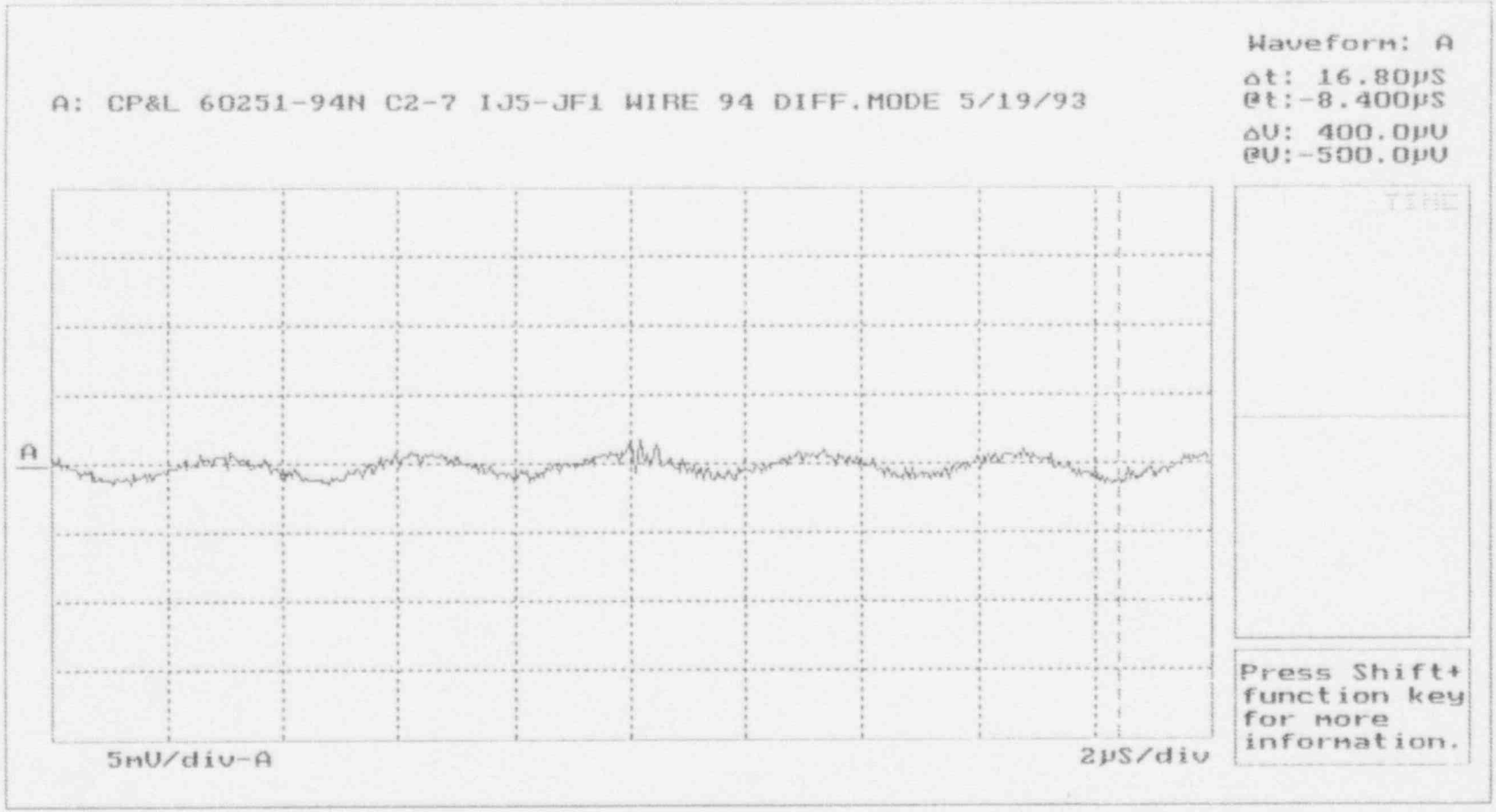
A: CP&L 60251-94N C1-1,LINE (DM),RANDOM TRANSIENT 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V: 1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

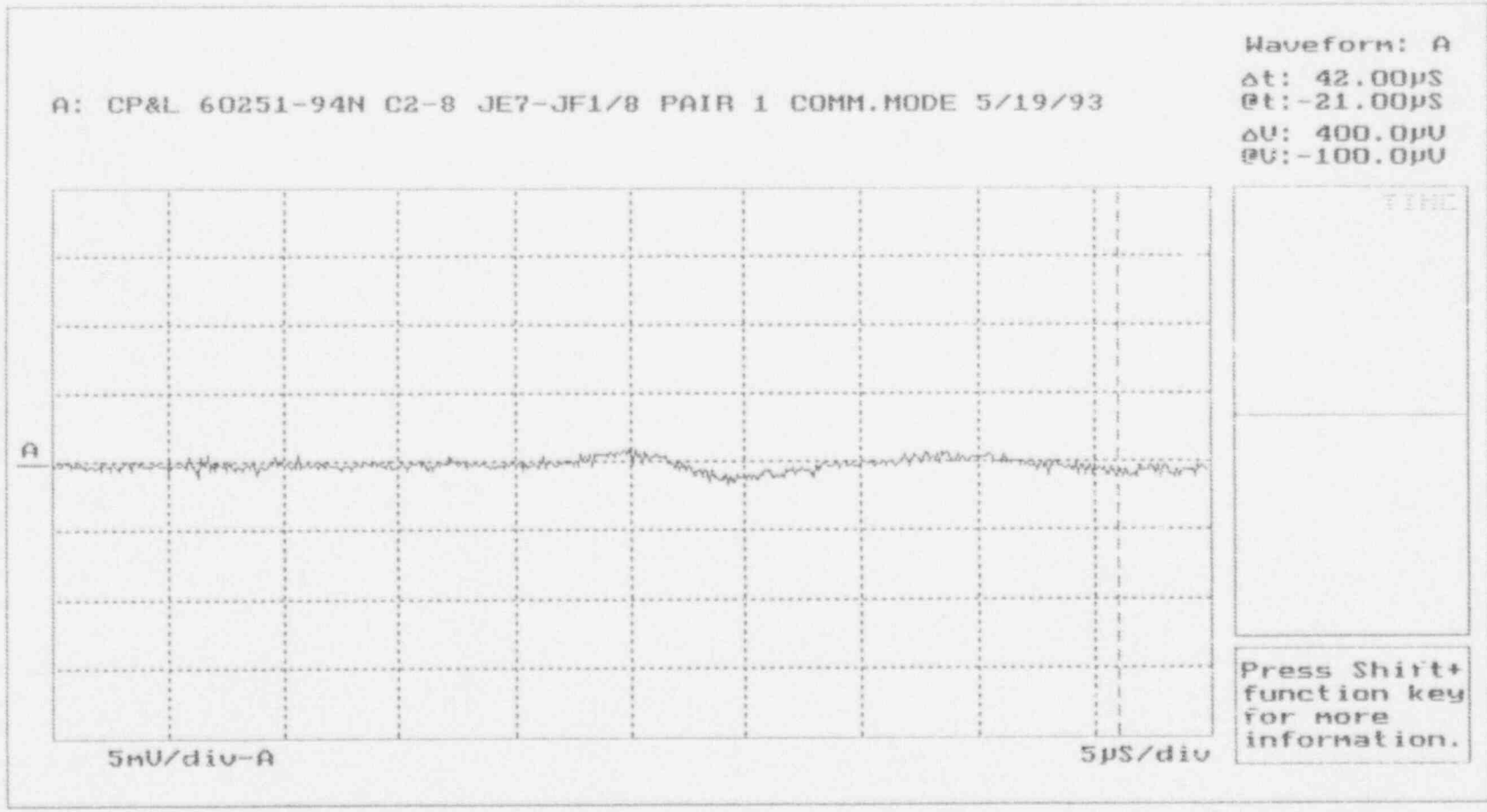

A: CP&L 60251-94N C1-1,LINE(DM), RANDOM TRANSIENT 5/20/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 8.000mV
@V:-5.000mV
TIME
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

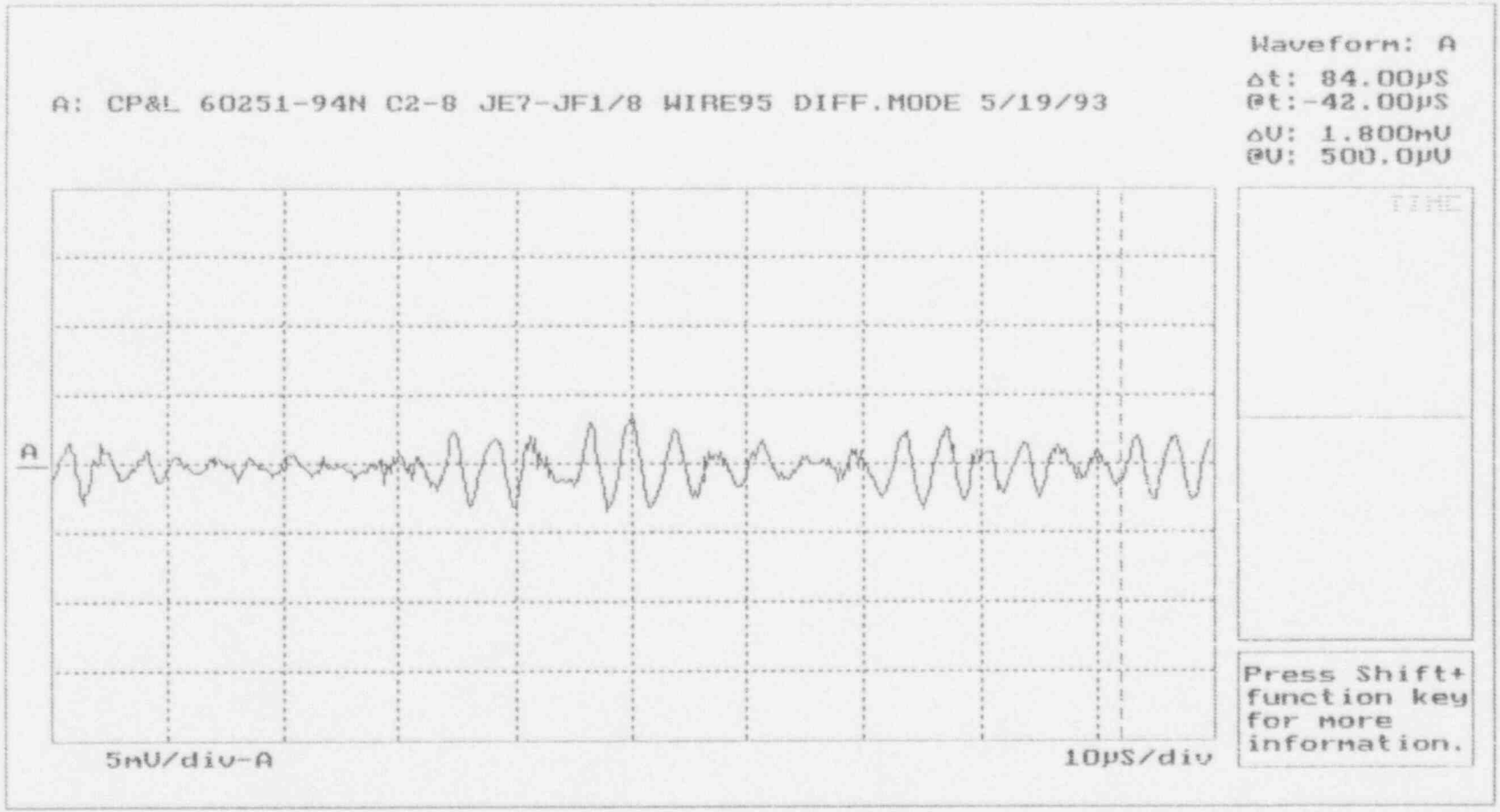

A: CP&L 60251-94N C1-1 1-H12-P614,LINE(DM),TRAN T1,TS-1 RELEASE
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 0.000 V
@V:-20.00mV
A
1 V/div-A
20μS/div
Press Shift+ function key for more information.

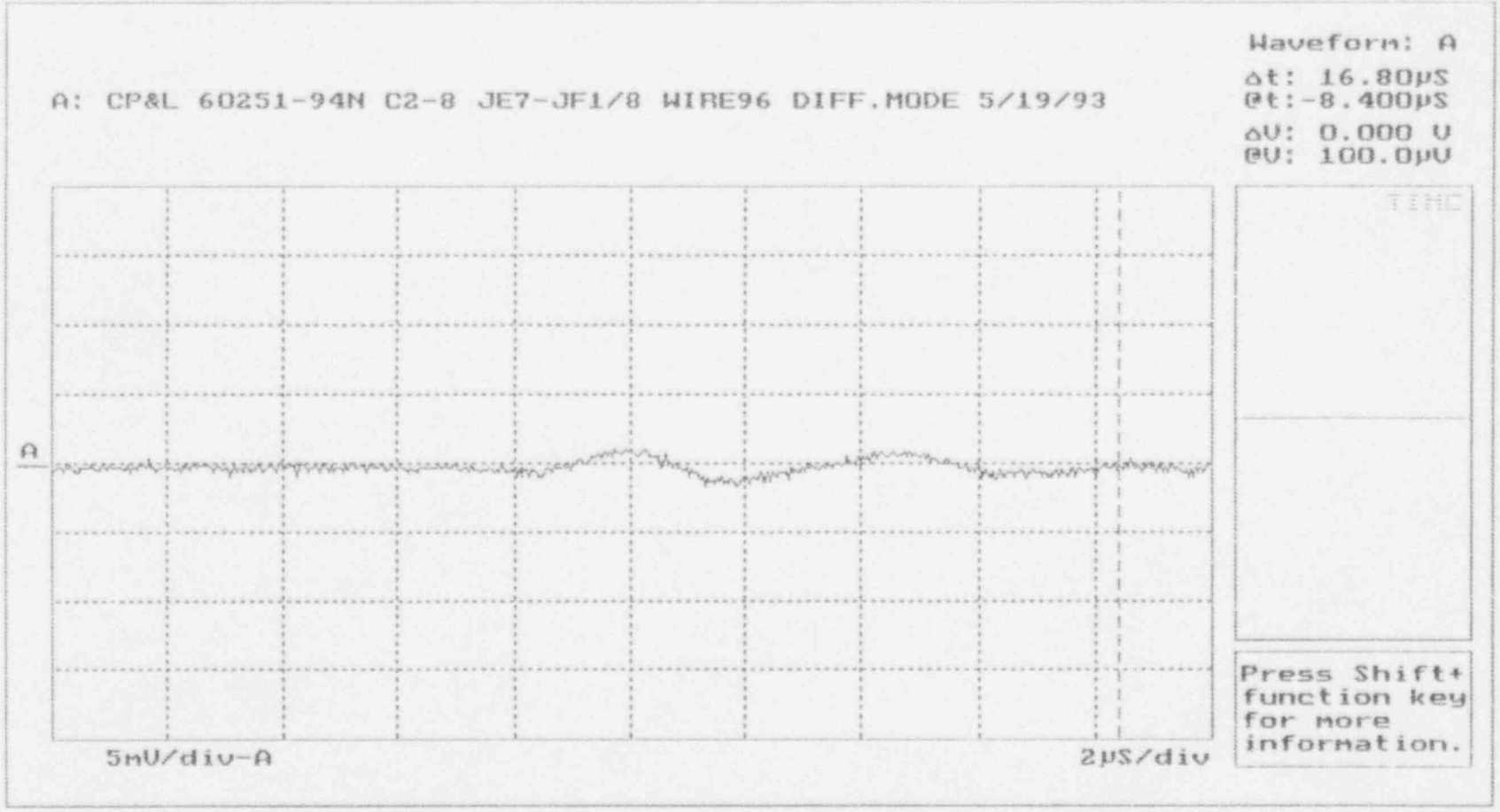

A: CP&L 60251-94N IJ5-JF1 COMM.MODE 5/19/93
Waveform: A
Δt: 16.80μS
@t:-8.400μS
ΔV: 600.0μV
@V:-700.0μV
A
5mV/div-A
2μS/div
Press Shift+ function key for more information.

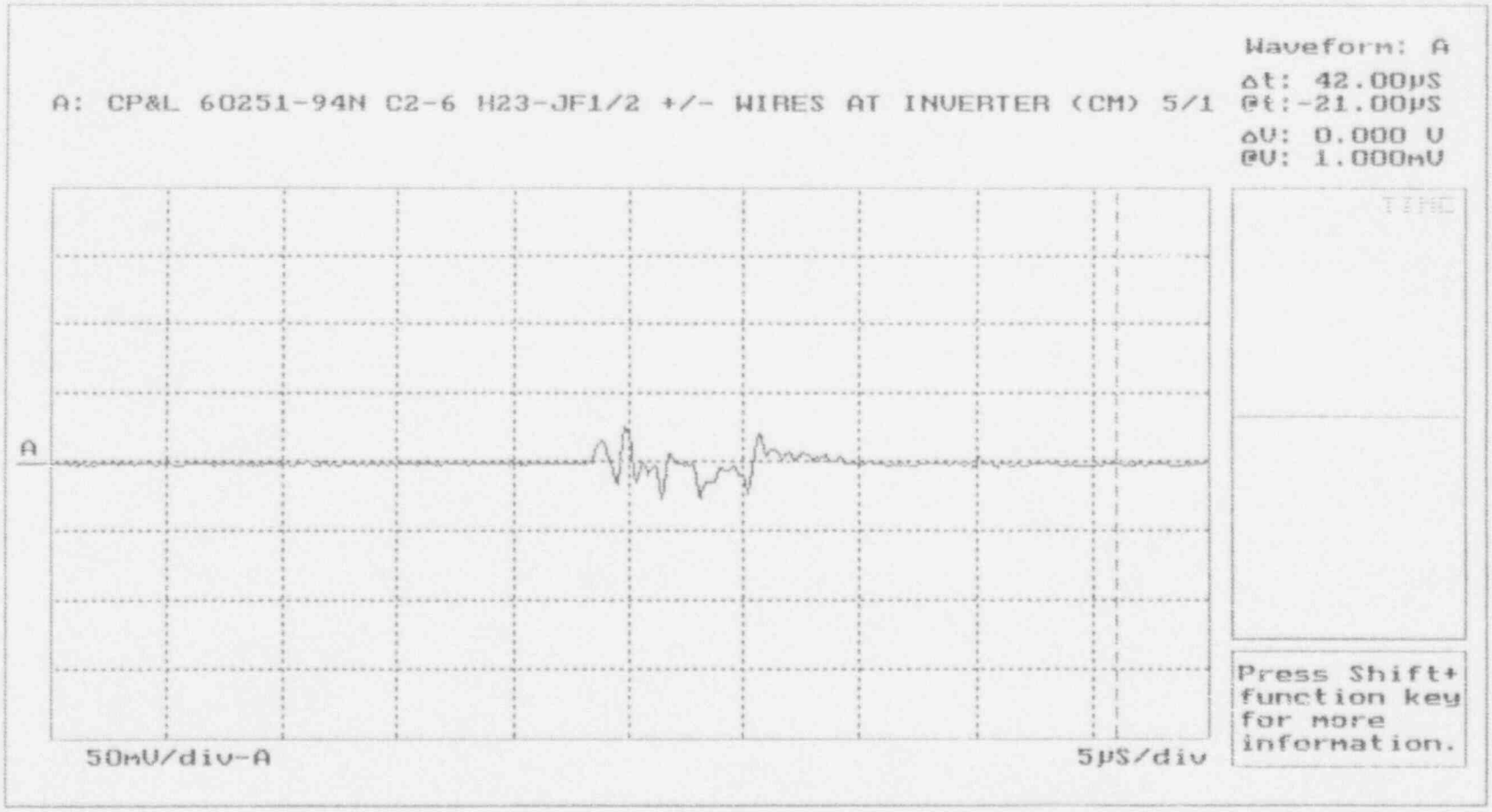

A: CP&L 60251-94N IJ5-JF1 WIRE 93 DIFF.MODE 5/19/93
Waveform: A
Δt: 16.80µS
@t:-8.400µS
ΔV: 200.0µV
@V: 100.0µV
A
5mV/div-A
2µS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-7 1J5-JF1 WIRE 94 DIFF.MODE 5/19/93
Waveform: A
Δt: 16.80μS
@t:-8.400μS
ΔV: 400.0μV
@V:-500.0μV
A
5mV/div-A
2μS/div
Press Shift+ function key for more information.

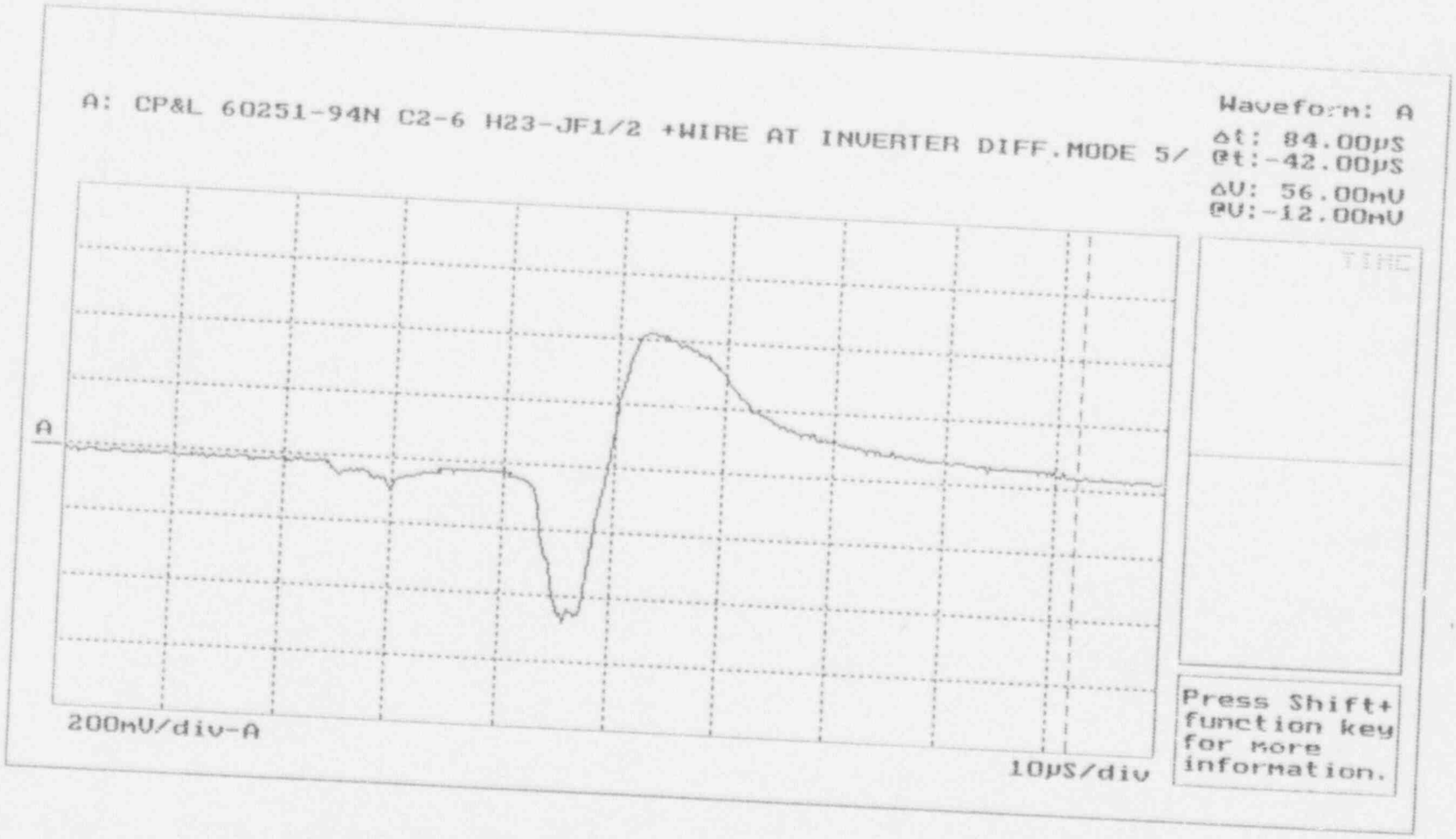

A: CP&L 60251-94N C2-8 JE7-JF1/8 PAIR 1 COMM.MODE 5/19/93
Waveform: A
Δt: 42.00μS
@t:-21.00μS
ΔV: 400.0μV
@V:-100.0μV
A
5mV/div-A
5μS/div
Press Shift+ function key for more information.

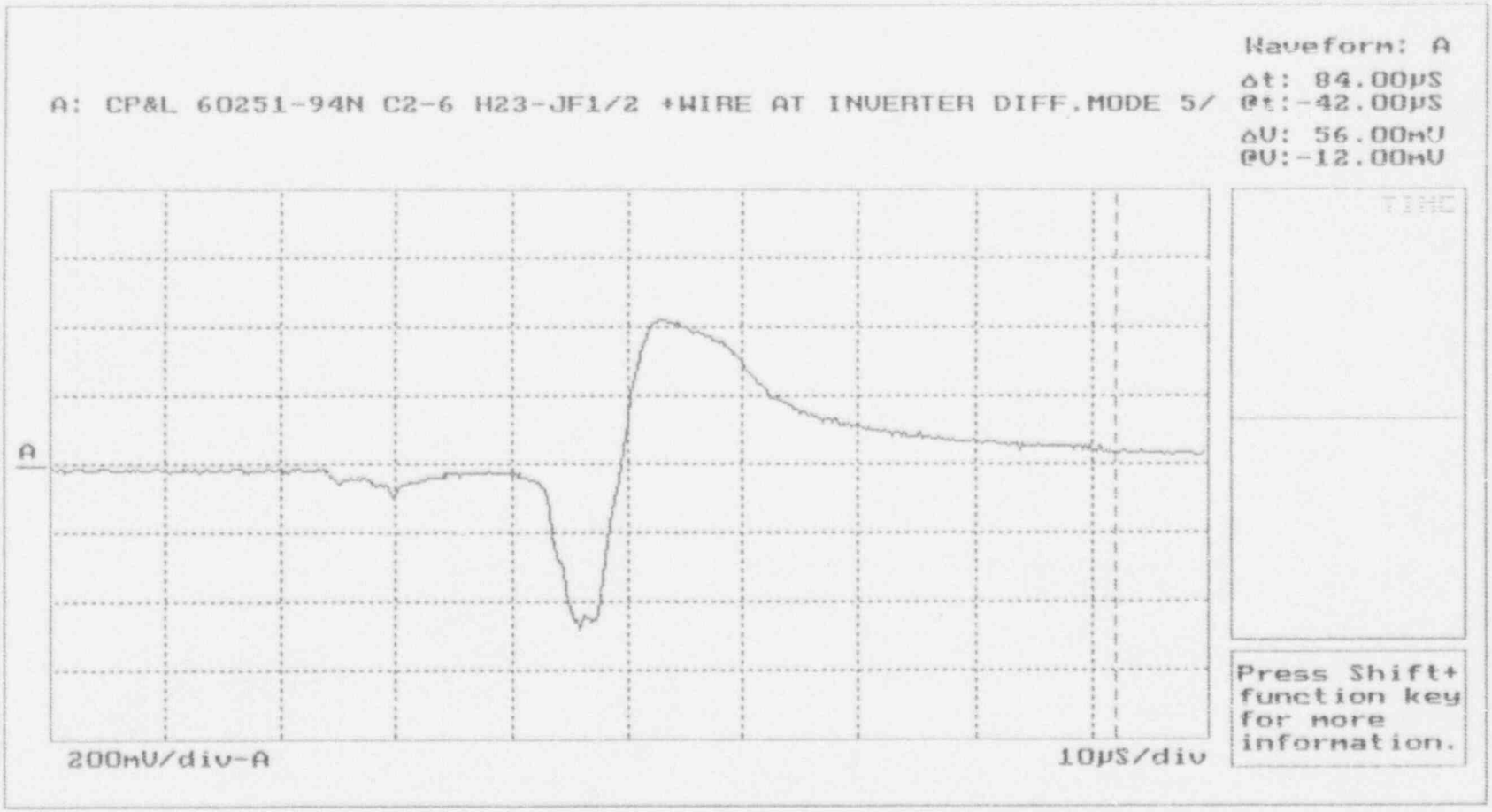

A: CP&L 60251-94N C2-8 JE7-JF1/8 WIRE95 DIFF.MODE 5/19/93
Waveform: A
Δt: 84.00µS
@t:-42.00µS
ΔV: 1.800mV
@V: 500.0µV
TIME
A
5mV/div-A
10µS/div
Press Shift+ function key for more information.

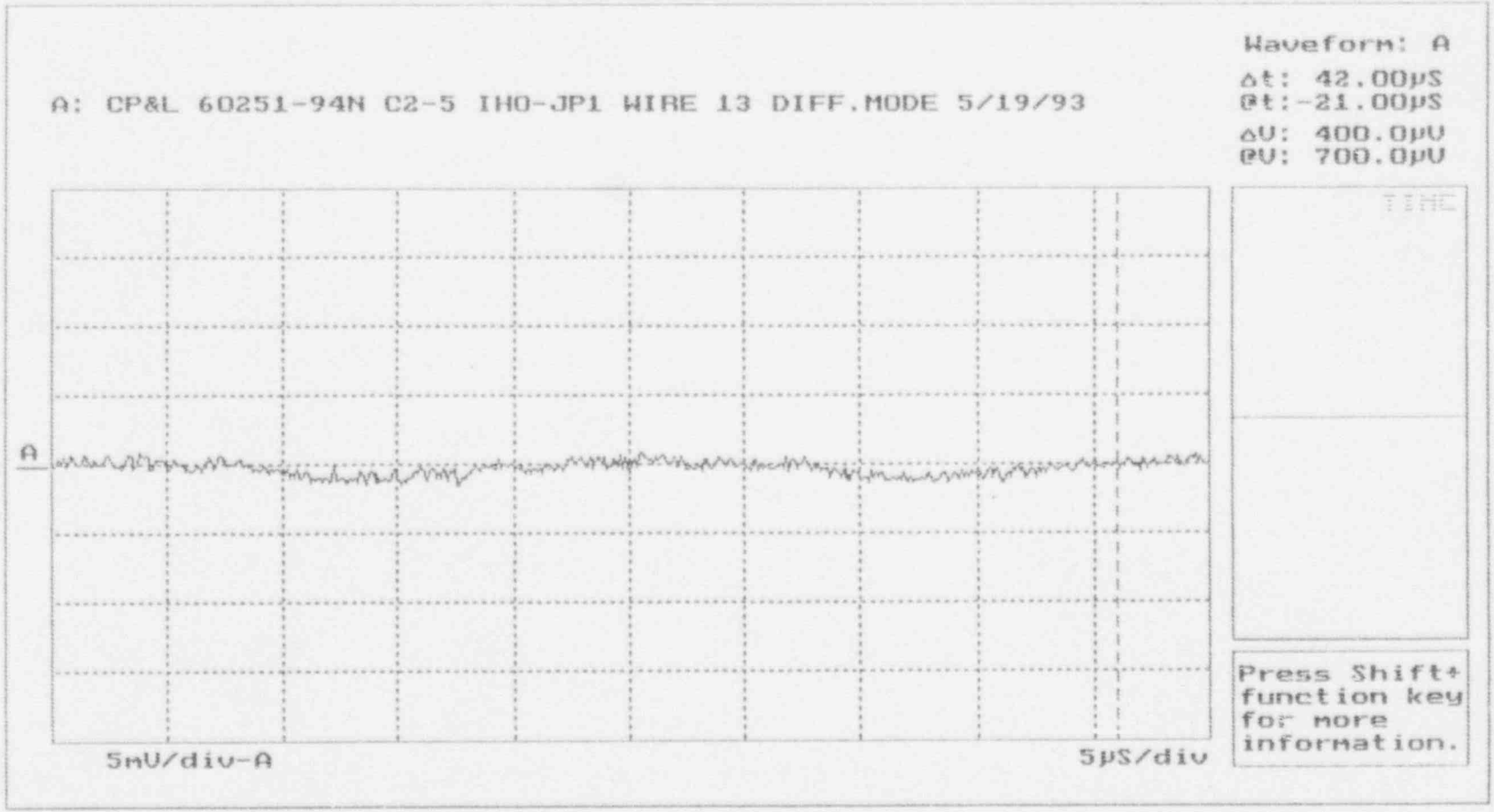

A: CP&L 60251-94N C2-8 JE7-JF1/8 WIRE96 DIFF.MODE 5/19/93
Waveform: A
Δt: 16.80µS
@t:-8.400µS
ΔV: 0.000 V
@V: 100.0µV
A
5mV/div-A
2µS/div
Press Shift+ function key for more information.

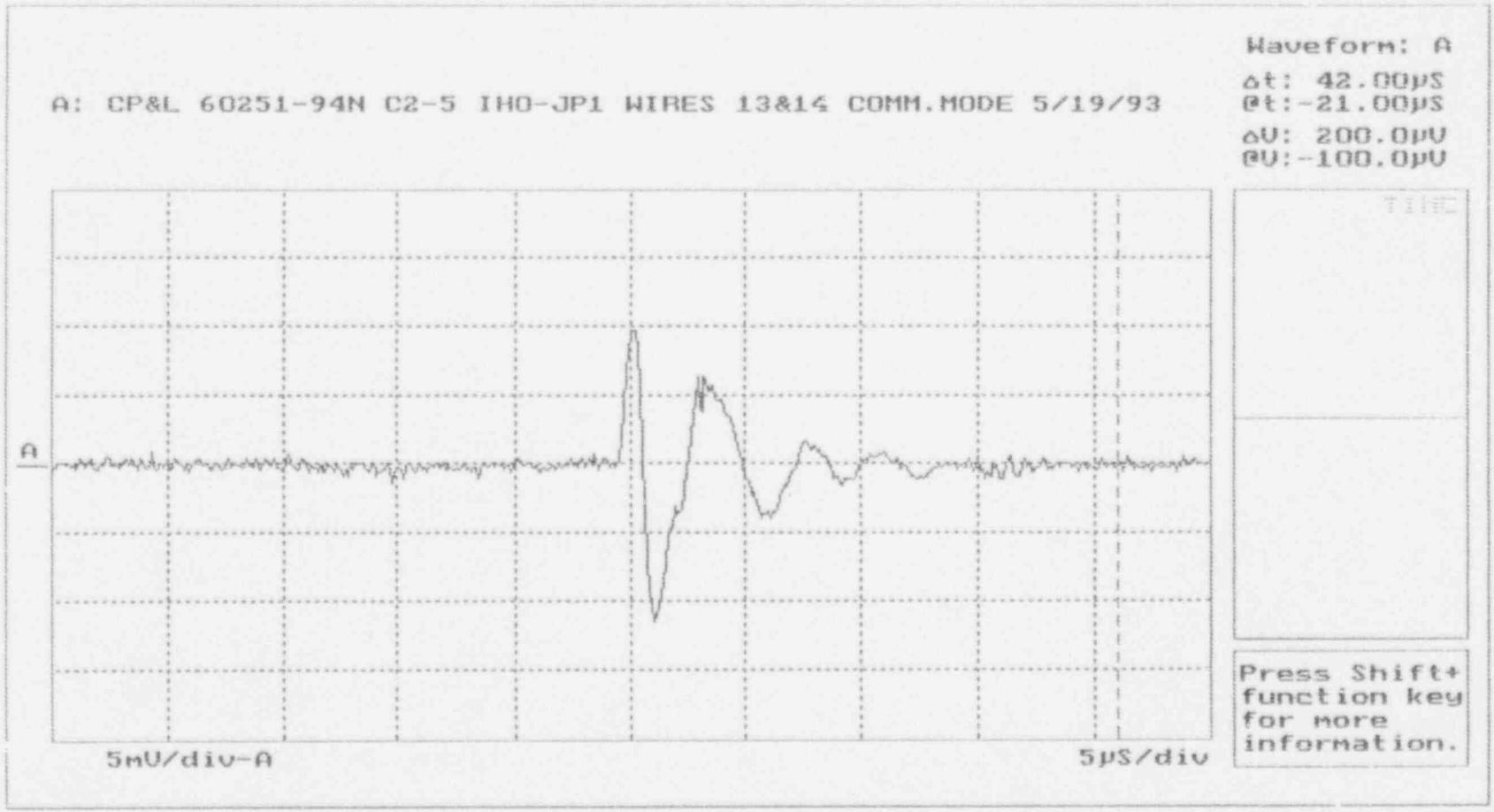

A: CP&L 60251-94N C2-6 H23-JF1/2 +/- WIRES AT INVERTER (CM) 5/1
Waveform: A
Δt: 42.00µS
@t:-21.00µS
ΔV: 0.000 V
@V: 1.000mV
A
50mV/div-A
5µS/div
Press Shift+ function key for more information.

Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔU: 32.00mV
@U: 12.00mV
A: CP&L 60251-94N C2-6 H23-JF1/2 -WIRE AT INVERTER DIFF.MODE 5/
A
200mV/div-A
20μS/div
Press Shift+ function key for more information.

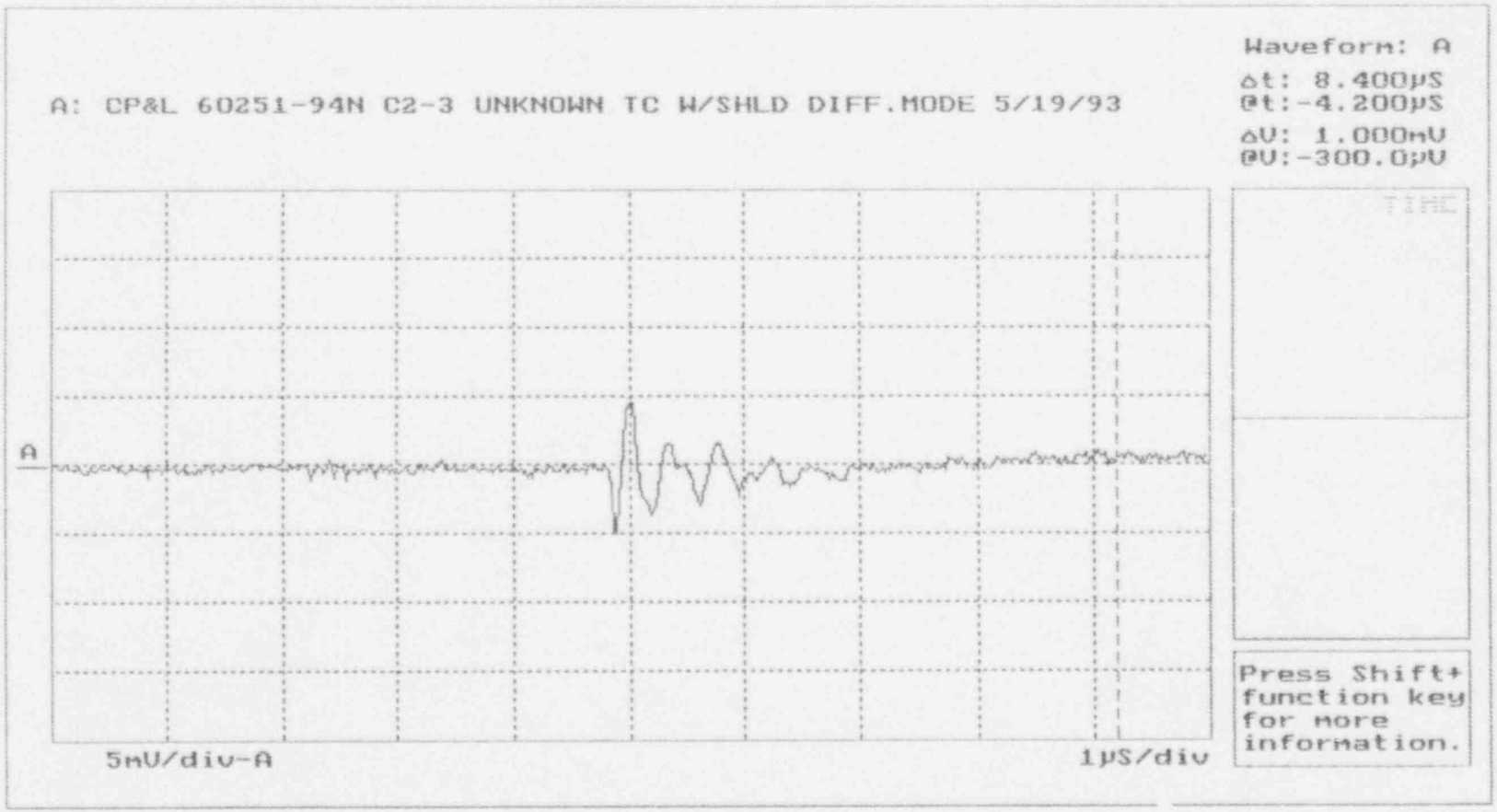

A: CP&L 60251-94N C2-6 H23-JF1/2 +WIRE AT INVERTER DIFF.MODE 5/
Waveform: A
Δt: 84.00µS
@t:-42.00µS
ΔV: 56.00mV
@V:-12.00mV
A
200mV/div-A
10µS/div
Press Shift+ function key for more information.

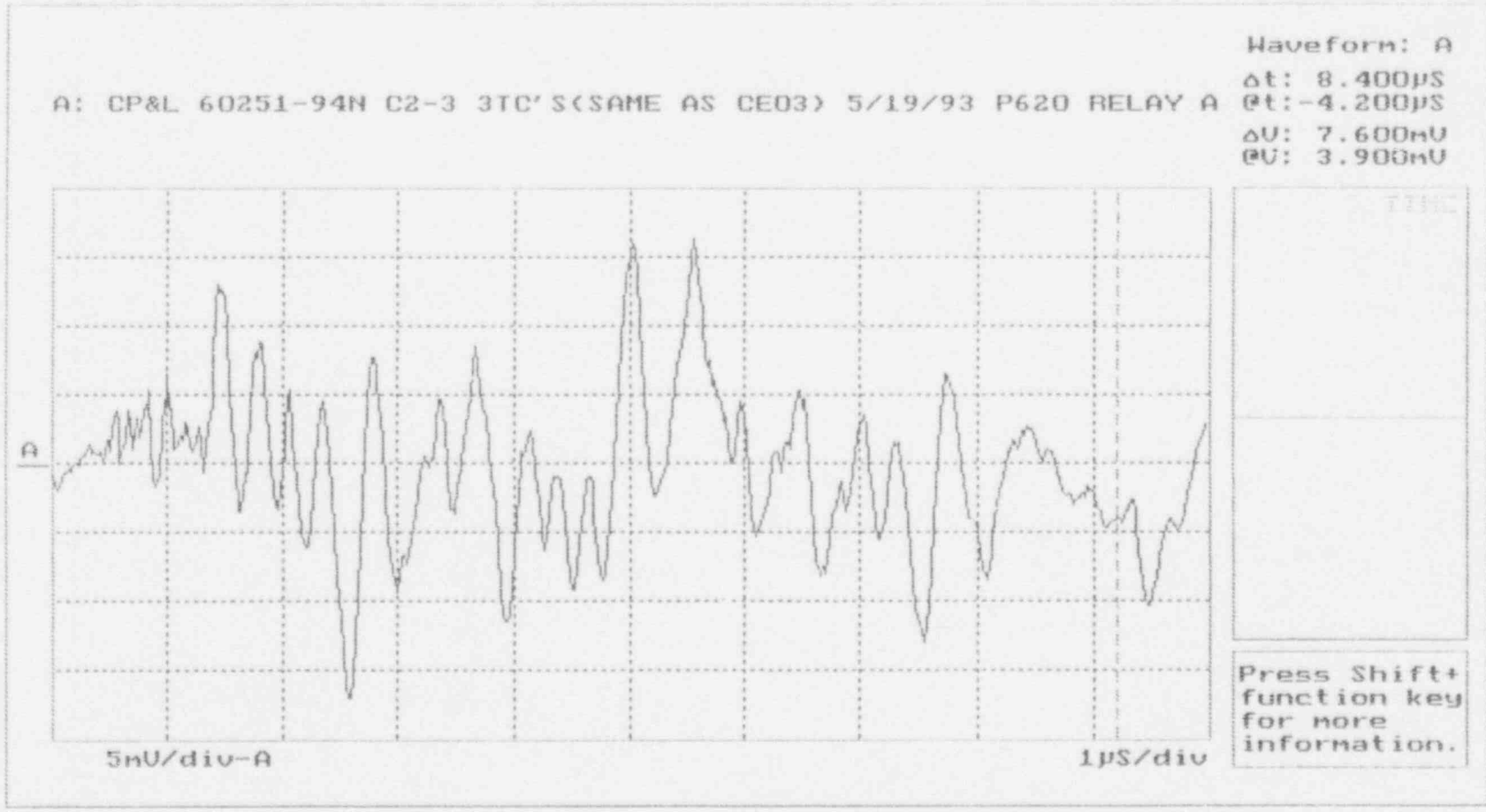

A: CP&L 60251-94N C2-6 H23-JF1/2 +WIRE AT INVERTER DIFF.MODE 5/
Waveform: A
Δt: 84.00μS
@t:-42.00μS
ΔV: 56.00mV
@V:-12.00mV
A
200mV/div-A
10μS/div
Press Shift+ function key for more information.

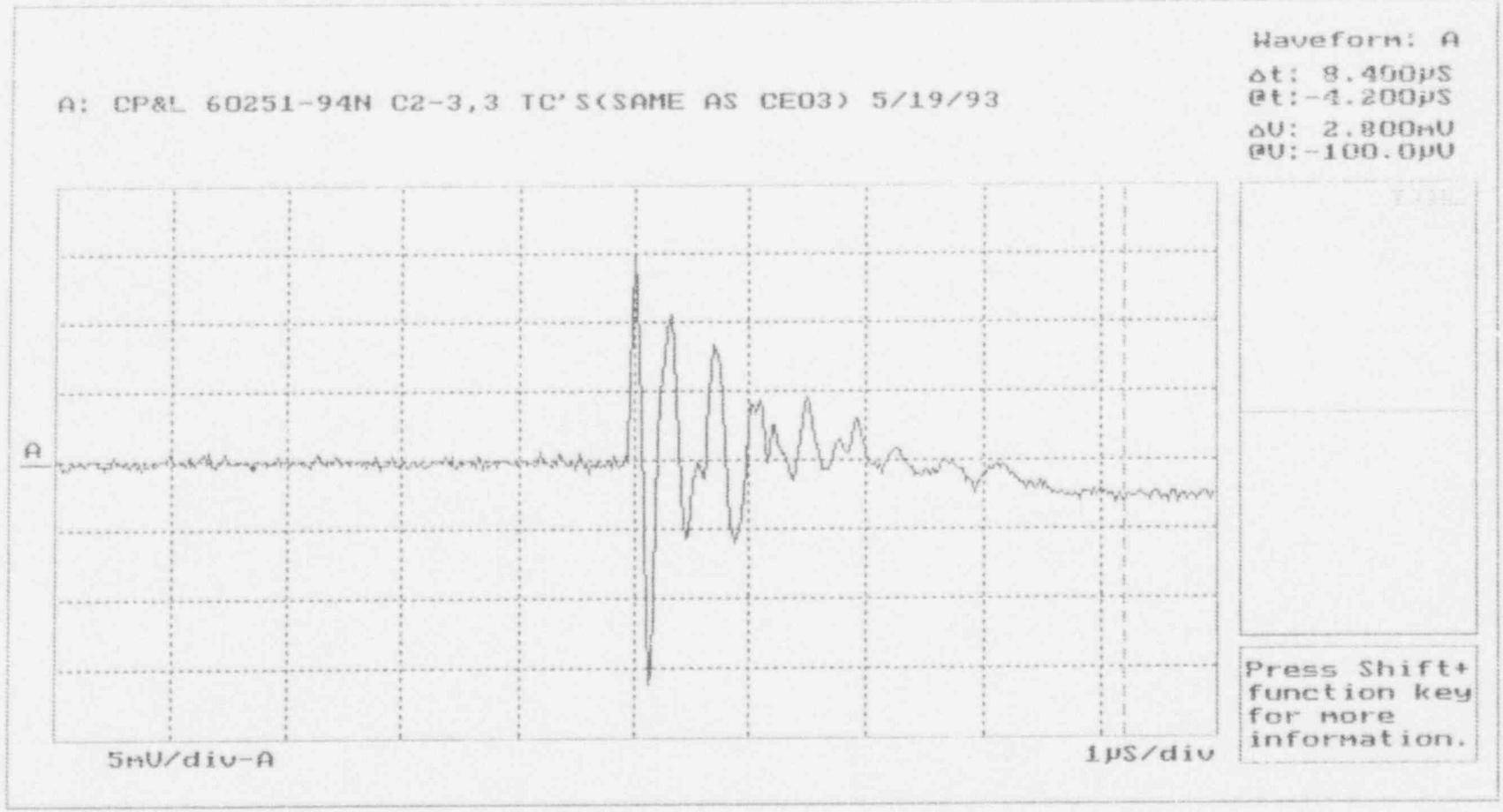

A: CP&L 60251-94N C2-5 IHO-JP1 WIRE 13 DIFF.MODE 5/19/93
Waveform: A
Δt: 42.00μS
@t:-21.00μS
ΔV: 400.0μV
@V: 700.0μV
A
5mV/div-A
5μS/div
Press Shift+ function key for more information.

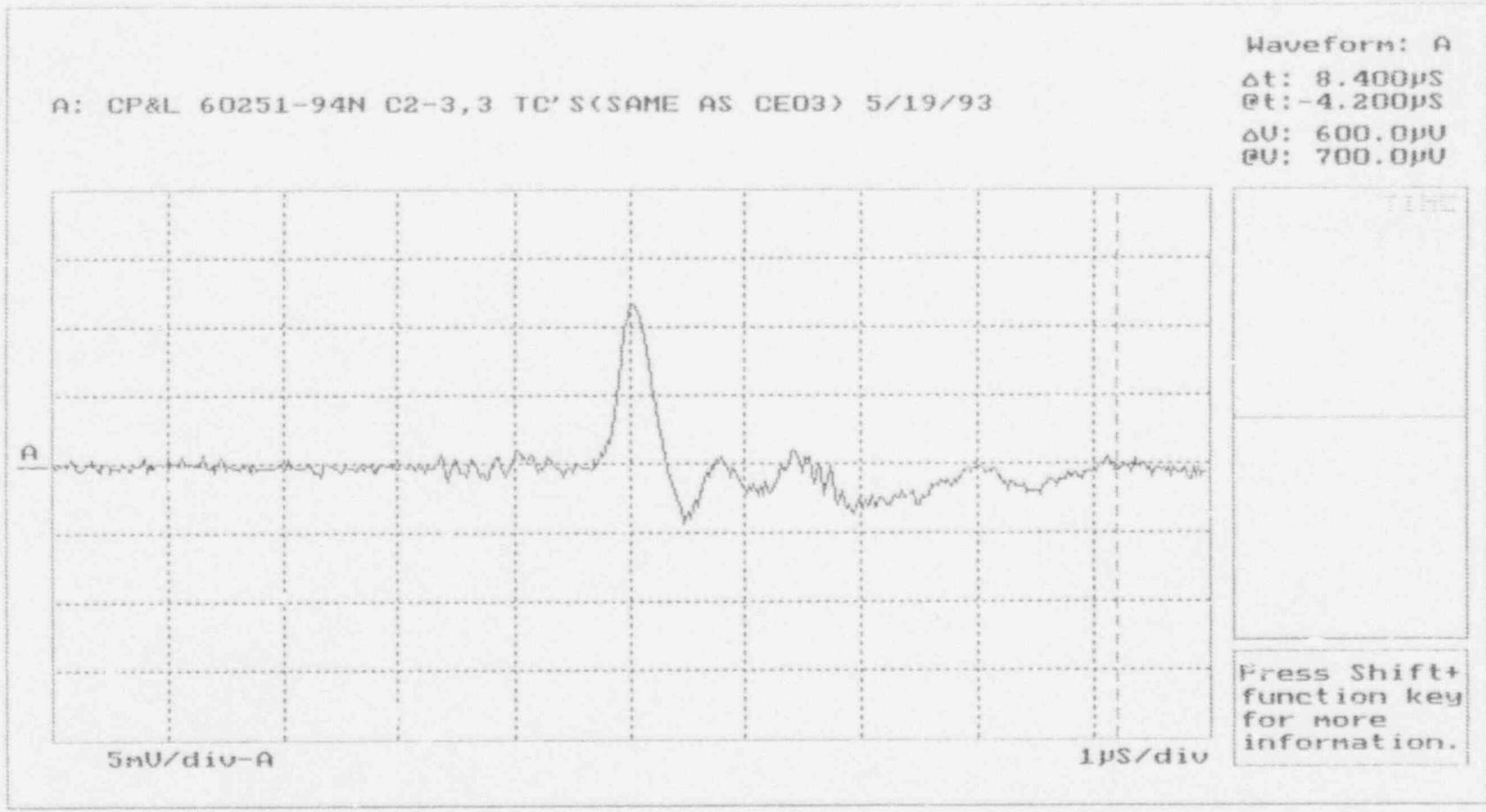

A: CP&L 60251-94N C2-5 IHO-JP1 WIRES 13&14 COMM.MODE 5/19/93
Waveform: A
Δt: 42.00μS
@t:-21.00μS
ΔV: 200.0μV
@V:-100.0μV
A
5mV/div-A
5μS/div
Press Shift+ function key for more information.

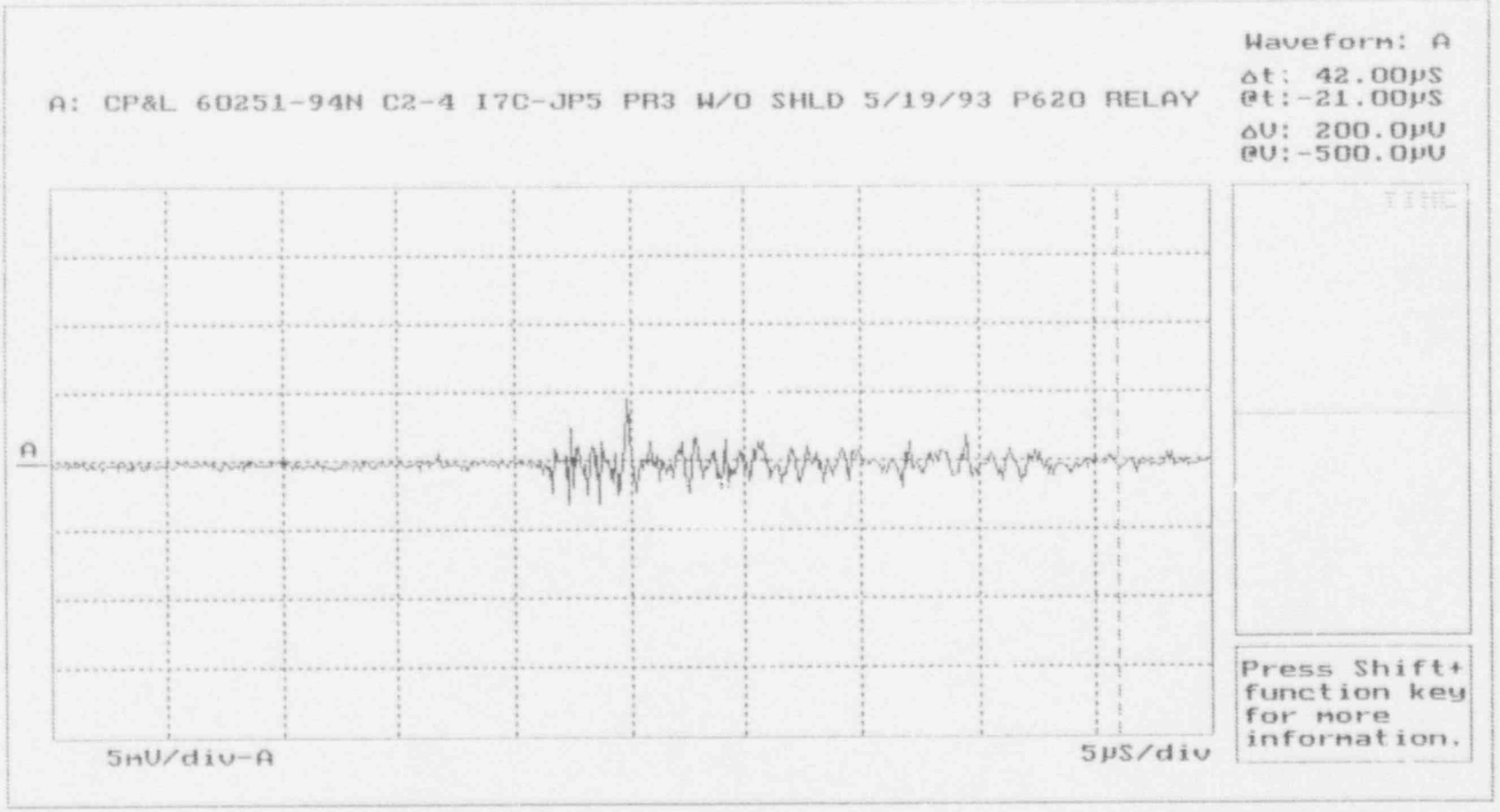
A: CP&L 60251-94N C2-2,LINE/NEUTRAL/GND - COMM.MODE F=180Hz 5/1
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 4.000mV
@V:-1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

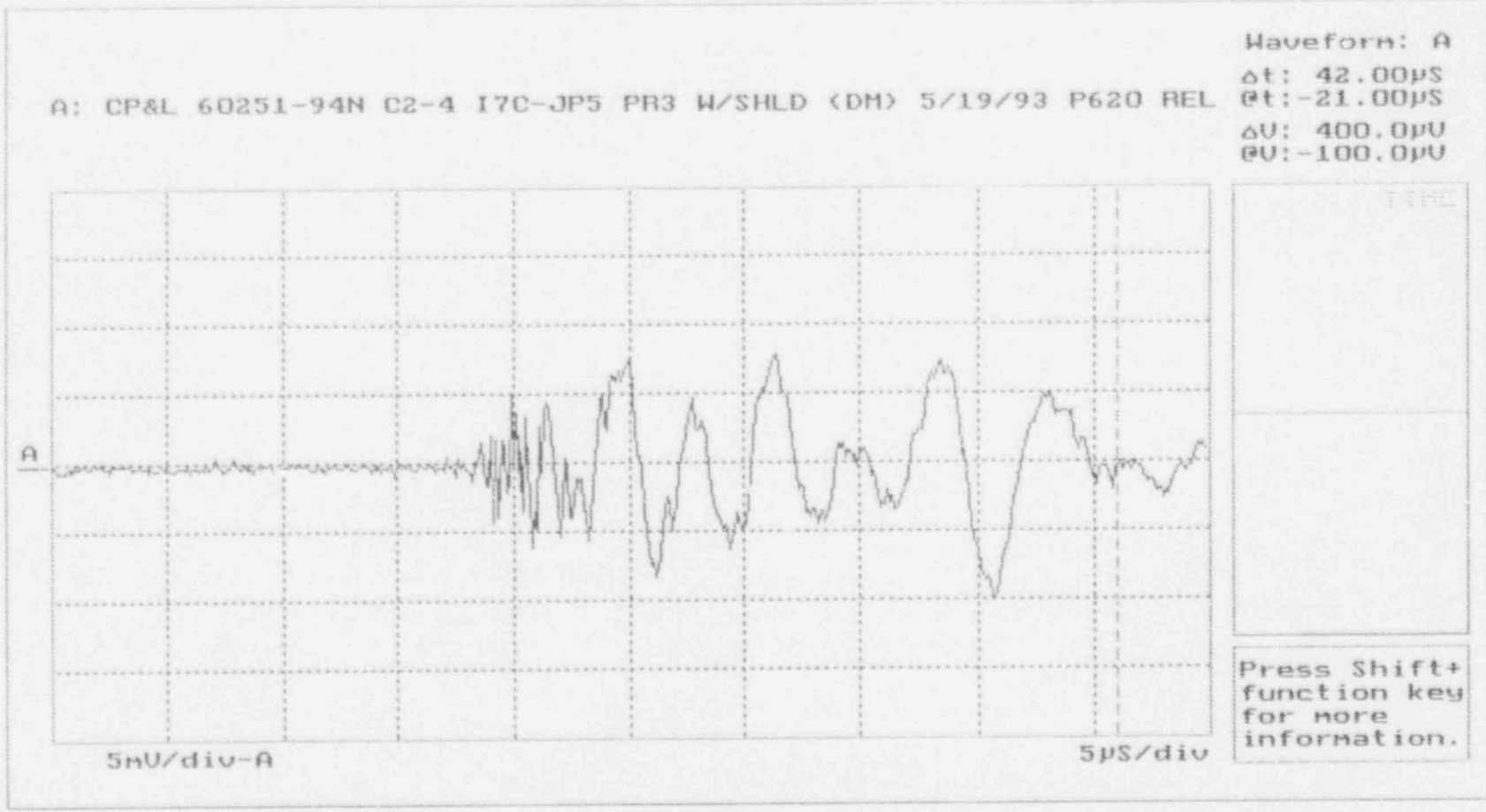

A: CP&L 60251-94N C2-3 UNKNOWN TC W/SHLD DIFF.MODE 5/19/93
Waveform: A
Δt: 8.400μS
@t:-4.200μS
ΔV: 1.000mV
@V:-300.0μV
A
5mV/div-A
1μS/div
Press Shift+ function key for more information.

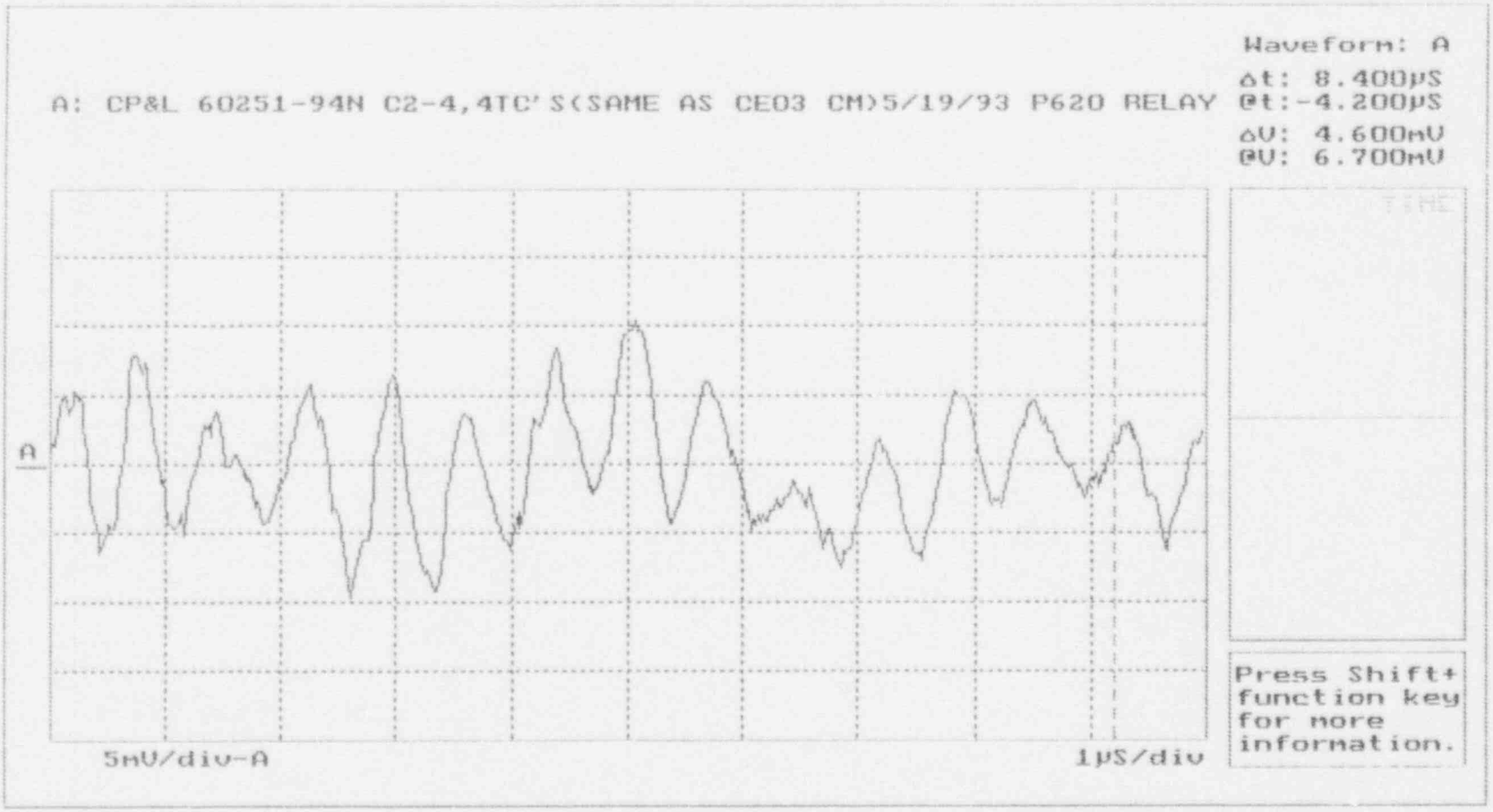

A: CP&L 60251-94N C2-3 3TC'S(SAME AS CE03) 5/19/93 P620 RELAY A
Waveform: A
Δt: 8.400μS
@t:-4.200μS
ΔV: 7.600mV
@V: 3.900mV
A
5mV/div-A
1μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-3,3 TC'S(SAME AS CE03) 5/19/93
Waveform: A
Δt: 8.400μS
@t:-4.200μS
ΔV: 2.800mV
@V:-100.0μV
A
5mV/div-A
1μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-3,3 TC'S(SAME AS CE03) 5/19/93
Waveform: A
Δt: 8.400μS
@t:-4.200μS
ΔV: 600.0μV
@V: 700.0μV
A
5mV/div-A
1μS/div
Press Shift+ function key for more information.

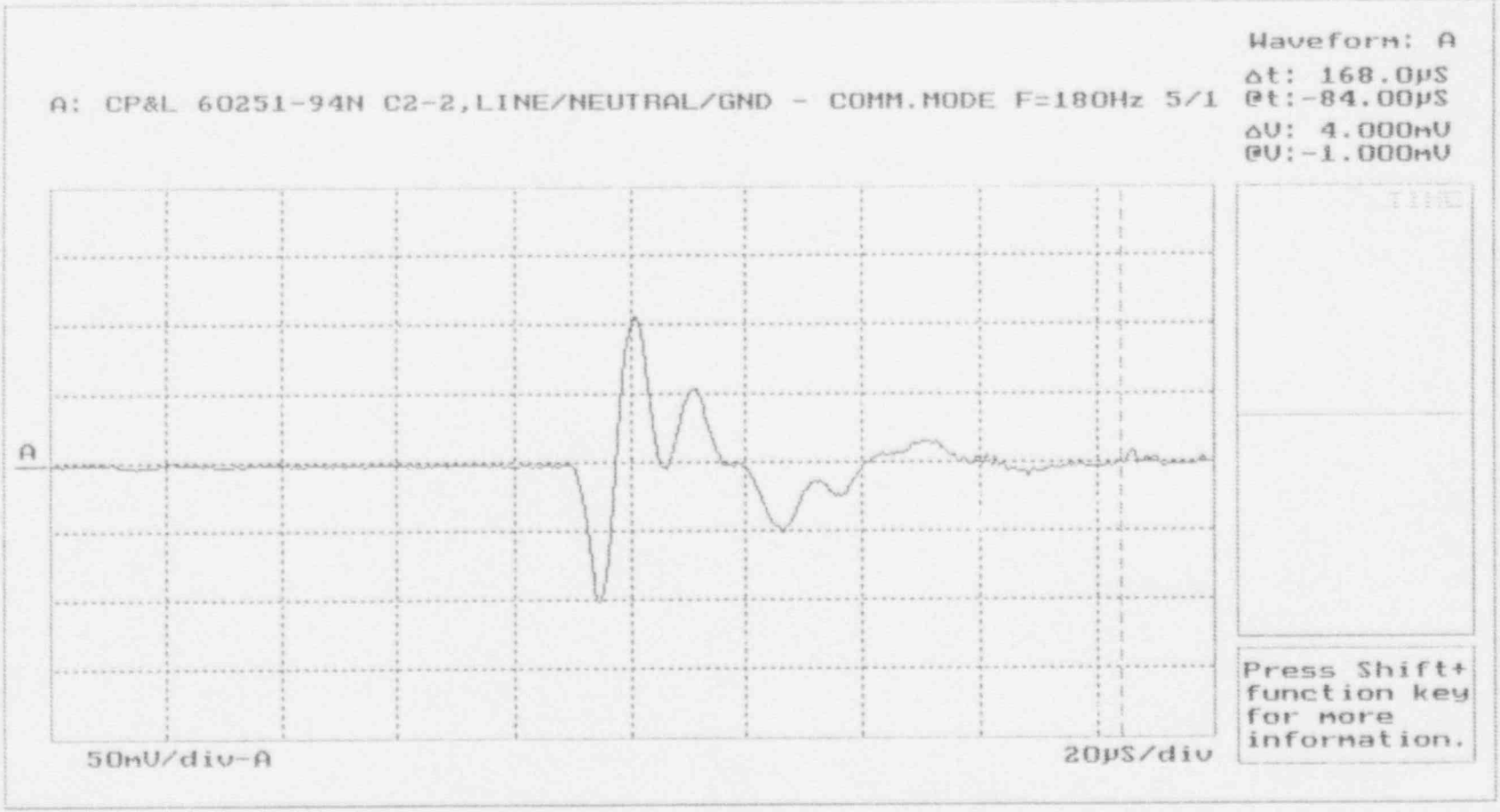

A: CP&L 60251-94N C2-4 I7C-JP5 PR3 W/O SHLD 5/19/93 P620 RELAY
Waveform: A
Δt: 42.00μS
@t:-21.00μS
ΔV: 200.0μV
@V:-500.0μV
A
5mV/div-A
5μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-4 I7C-JP5 PR3 W/SHLD (DM) 5/19/93 P620 REL
Waveform: A
Δt: 42.00µS
@t:-21.00µS
ΔV: 400.0µV
@V:-100.0µV
A
5mV/div-A
5µS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-4,4TC'S(SAME AS CE03 CM)5/19/93 P620 RELAY
Waveform: A
Δt: 8.400μS
@t:-4.200μS
ΔV: 4.600mV
@V: 6.700mV
A
5mV/div-A
1μS/div
Press Shift+ function key for more information.

A: CP&L 60251-94N C2-1,LINE/NEUTRAL/GND COMM.MODE 5/18/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 2.000mV
@V: 1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

A: CP&L 60251-94N C2-1,LINE 5/18/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 6.000mV
@V: 1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.


A: CP&L 60251-94N C2-2,LINE/NEUTRAL/GND - COMM.MODE F=180Hz 5/1
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 4.000mV
@V:-1.000mV
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

A: CP&L 60251-94N CE07 C2-2, line, f=180Hz, 5/18/93
Waveform: A
Δt: 168.0μS
@t:-84.00μS
ΔV: 6.000mV
@V:-1.000mV
TIME
A
50mV/div-A
20μS/div
Press Shift+ function key for more information.

6.4 Radiated Emissions, Method REXX, DC Magnetic Field

Requirements

Radiated emissions, DC Magnetic Field, were measured in accordance with NTS TP #60251-94N-1 and with the applicable portions of MIL-STD-1399, Section 070, Part 1. Reference Section 6.4, Test Setup.

Procedures

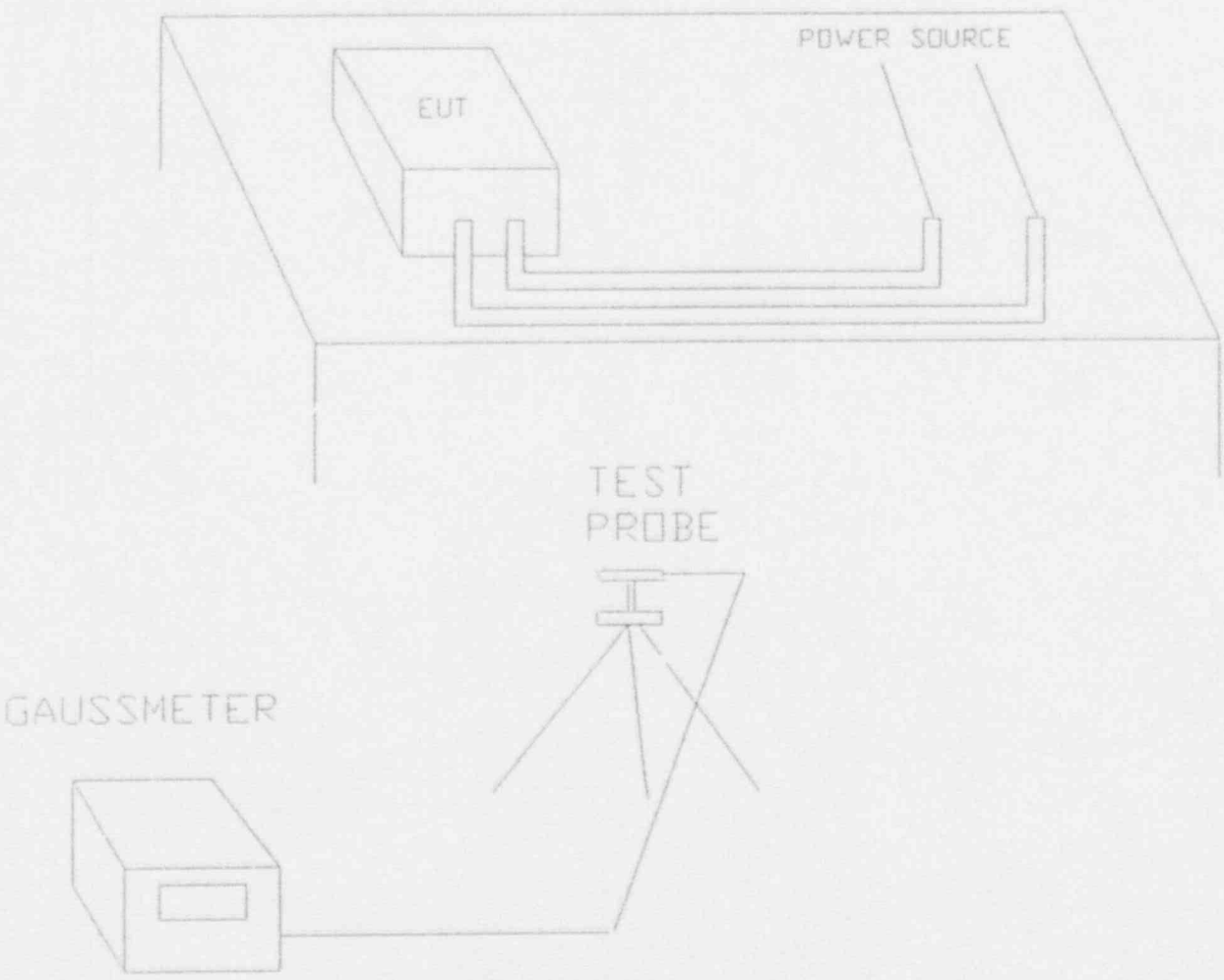
The Control Room Environment was set up and operated as specified in Section 4.0 of this report. A Magnetic Instrumentation Gaussmeter, Model 912, was set up with its measurement probe located in the "X axis" location of the units' probe fixture. The measurement probe orientation was changed through multiple axes until a worst case level was detected. Measurements of the DC magnetic field were taken and recorded on data sheets. Reference Section 6.4, Data Sheets.

The remaining mapping locations were measured following the preceding procedure.

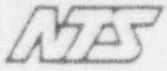
Test Results

Test		Results
REXX	Radiated Emissions, DC Magnetic Field	TBD*

*See NTS Report #60251-94N-2.



RADIATED EMISSIONS, METHOD REXX, TYPICAL TEST SETUP



REXX DATA SHEETS

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 1

Test REXX - DC Magnetic Field Emissions

Mode of Operation ____

Purchase Order XTA3000098

Remarks GENERAL AREA

HIGHEST LEVEL WERE RECORDED AT HOT SPOT

LOCATION	ELEV.	SOURCE	LEVEL(Guass)	Drop-off Rate		
1	52'-56'	DC Relays 1-H12-P622	8-15	.4-.5 @ 6"-1'		
2	52'-56'	1-H12-P609	1.127	.4-.5 @ 6"-1'		
3	52'-56'	1-XU-7	.607	.4-.5 @ 6"-1'		
4	52'-56'	1-H12-P604	.720	.4-.5 @ 6"-1'		
5	52'-56'	IRM/APRM RBM meters 1-H12-P608	13 max 6-8 min	.4-.5 @ 6"-1'		
6	52'-56'	1-XU-21	.623	.4-.5 @ 6"-1'		
7	52'-56'	1-XU-61	16.721	.4-.5 @ 6"-1"		
8	52'-56'	1-H12-P044 Bay F	1.201	.4-.5 @ 6"-1"		
9	52'-56'	1-XU-38	16.751 (CRT Monitor)	.4-.5 @ 6"-1'		
10	52'-56'	Relays 1-H12-P618	8-12	.4-.5 @ 6"-1'		
11	52'-56'	1-XU-27	1.702	.4-.5 @ 6"-1'		
12	52'-56'	1-XU-33	1.885	.4-.5 @ 6"-1'		
13	52'-56'	1-XU-19	2.143	.4-.5 @ 6"-1'		
14	52'-56'	1-XU-24	1.106	.4-.5 @ 6"-1"		

Test Technician D McLaughlin

Test Engineer MJ McCarthy

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 1

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks GENERAL AREA

Highest LEVEL were Recorded at hot spot

LOCATION	ELEV.	SOURCE	LEVEL(Guass)	Drop-off Rate		
15	52'-56'	1-X4-53	1.123	.4-.5" @ 6"-1'		
16	52'-56'	1-X4-64	.824	.4-.5" @ 6"-1'		
17	52'-56'	1-H12-P601	1.151	.4-.5" @ 6"-1'		
		(Back of Panel)				
18 Control Room main Floor.						
1-H12-P601 Front						
@ FIC-R600	54'-0"	1-E41 FIC-R600	.851	.62 @ 6"-1'		
Unit 1 mid Floor	54'-0	mid Room	Avg .6-.8 Max .9	.62 @ 6"-1'		
Front 2-H12-P601	54'-0	2 E41 FIC R600	.974	.532 @ 6"-1'		

Test Technician D McCarthy

Test Engineer MJ Metcalf

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 1

Test REXX - DC Magnetic Field Emissions

Mode of Operation ____

Purchase Order XTA3000098

Remarks FRONT of PANEL

HIGHEST LEVEL WERE RECORDED AT hot spot.

LOCATION	ELEV.	SOURCE	LEVEL(Guass)	Drop-off Rate		
0-2	55'	1-XU-6	1.111	.458 @ 1'		
2-4	53'	2-H12-PC14	2.137	.489 @ 1.5'		
4-6	53'	2-H12-PC14	1.504	.430 @ 1.5'		
6'-8'	53'	2-H12-PC14	1.225	.384 @ 1.5'		
8-10	54'	2-H12-PC14	1.635	.370 @ 1.5'		
10-12	53.5'	2-H12-PC37	1.421	.390 @ 1'		
ERFIS CRT	54'	ERFIS CRT VT220	.518	.338 @ 1'		
1-H12-PC13	50'	1-H12-PC12	1.205	.380 @ 1.5'		

Test Technician D McLaughlin

Test Engineer M J Metcalf

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 1

Test REXX - DC Magnetic Field Emissions

Mode of Operation ____

Purchase Order XTA3000098

Remarks Back of Panel
Highest Level were recorded at hot spot

LOCATION	ELEV.	SOURCE	LEVEL(Guass)	Drop-off Rate		
0-2	55.5'	1-X4-C	.563	.380 @ 2'		
2-4	50'	1-H12-PC14	1.256	.266 @ 1'		
4-6	54.5'	1-H12-PC14	1.060	.573 @ 1.5'		
6-8	50'	1-H12-PC14	.940	.329 @ 1'		
8-10	50'	1-H12-PC14	1.501	.330 @ 6"		
10-12	50.5'	1-H12-PC37	1.742	.250 @ 5"		

Test Technician D McLaughlin

Test Engineer M Metcalf

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Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 1

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks BACK OF PANELS

HIGHEST LEVEL WERE RECORDED AT HOTSPOT

LOCATION	ELEV.	SOURCE	LEVEL(Guass)	Drop-off Rate		
0-2 (XU-6)	54'	XU-6 PG14	2.765	.255 @ 3"		
2-4 (PG14)	54'	PG14	5.129	.255 @ 6"		
4-6 (PG14)	53' 6"	PG14	1.403	.347 @ 10"		
6-8 (PG14)	55' 6"	PG14	2.007 ~~.906~~	.349 ~~.359~~ @ 4"		
8-10 (PG14)	54' 6"	PG14	.906	.359 @ 8"		
10-12 PG	55' 6"	PG37	1.684	.275 @ 1.5"		

Test Technician D McClowgh

Test Engineer MJ Metcalf

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 2

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks GENERAL AREA DC MAGNETIC FIELD - UNIT #2

HIGHEST LEVEL IN GIVEN AREA WERE RECORDED ALONG AT HOTSPOTS

LOCATION	ELEV.	SOURCE	LEVEL (Guass)	Drop-off Rate		
1	53' - 55'	2-H12 X452	.927	.4-.5 gauss @ 1'		
2	53' - 55'	2-XU-19	.884	.4-.5 gauss @ 1'		
3	53' - 55'	2-H12-P624	2.252	.4-.5 gauss @ 1'		
4	53' - 55'	2-XU-53	1.026	.4-.5 gauss @ 1'		
5	53' - 55'	2-H12-P644	.985	.4-.5 gauss @ 1'		
6	53' - 55'	2-H12-P624	.850	.4-.5 gauss @ 1'		
7	53' - 55'	Relay EHA KN1 @ 2-H12 P617	8.8 (6-9) Sm Relays on this panel	.4-.5 gauss @ 1'		
8	53' - 55'	2-H12 P624	.685	.4-.5 gauss @ 1'		
9	53' - 55'	2XU-57	1.016	.4-.5 gauss @ 1'		
10	53' - 55'	2-XU-8	15.123	.4-.5 gauss @ 1'		
		Generator reverse power device 87G32-1				
11	53' - 55'	2-XU-61	2.240	.4-.5 gauss @ 1'		
12	53' - 55'	2-H12-P608	.765	.4-.5 gauss @ 1'		
13	53' - 55'	2-XU-23	.525	.4-.5 gauss @ 1'		
14	53' - 55'	Relays on 2 H12-P621	6-9 on dyfi	.4-.5 gauss @ 1'		
			Relays on this Panel			

Test Technician D McLaughlin

Test Engineer MJ Metcalf

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Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 2

Test REXX - DC Magnetic Field Emissions

Mode of Operation ____

Purchase Order XTA3000098

Remarks GENERAL AREA DC MAGNETIC FIELD - Unit #2

Highest LEVEL IN GIVEN AREA WERE RECORDED along at hotspots

LOCATION	ELEV.	SOURCE	LEVEL (Guass)	Drop-off Rate		
15'						
Control Room Main Floor	5'-4'	mid Floor Scan	AVG .705' MAX .705'	.5320 @ 1'		
0-2' 16 Back / 2 HR-PC01	55'	2-HR-PC01	1.112	.326 @ 1'		
2'-4'	54'	2-HR-PC01	1.014	.471 @ 1'		
4'-6'	54'	2-HR-PC01	.762	.398 @ 1'		
6'-8'	55'	2-HR-PC01	1.206	.472 @ 2'		
8'-10'	55'	2-HR-PC01	1.214	.385 @ 1'		
10'-12'	55'	2-HR-PC01 ~~2-HR-PC03~~	1.295 ~~.470~~	.415 @ 1'		
12'-14'	56'	2-HR-PC03	1.516	.551 @ 2'		
14'-16'	55'	2-HR-PC03	1.182	.554 @ 2'		
16'-18'	55'	2-HR-PC03	1.102	.659 @ 2'		
18'-20'	56'	2-HR-PC03	1.109	.691 @ 2'		

Test Technician D M Langfelder

Test Engineer W J Metcalf

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Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model / Serial Number Unit # 2

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks Back of PANELS

LOCATION	ELEV.	SOURCE	LEVEL (Guass)	Drop-off Rate		
0-2 (XU-6)	54'	XU-6 PC14	2.765	.255 gauss @ 3"		
2-4 (PC14)	54'	PC14	5.127 *	.255 gauss @ 6"		
4-6 (PC14)	53'6"	PC14	1.403	.347 gauss @ 10"		
6-8 (PC14)	55'6"	PC14	2.007	.345 gauss @ 4"		
10-12 PC37	55'6"	PC37	1.684	.275 gauss @ 1.5"		

* NOTE Due to the reflextion off of Panel XU-6 which was approx ½" separation between the walls of XU-6 and PC14 - Took a reading with Door open and measure on the inside of PC14 at the same point of Interest .600 gauss. Also open the Door on XU-6 and Took measurment at the same point and read .600 gauss

Test Technician D McLaughlin

Test Engineer MJ Metcalf

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Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 2

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks FRONT OF PANELS

HIGHEST LEVEL WERE RECORDED AT hot spot

LOCATION	ELEV.	SOURCE	LEVEL (Guass)	Drop-off Rate		
PC13	53'	PC13	1.4	.3 @ 1'		
0-2 (XU-C)	49' 8"	XU-C	1.228	.266 @ 1'		
2-4 (PC14)	55'	RECIRC Drive Temp Recorder 2-B22-TR-T2	1.329	.363 @ 8"		
4-C (PC14)	43' 6"	HPCI AREA FLR DRN Sump Fill	.803	.290 @ 7"		
		Timer (2-G/C-C0038) ~~Relay (2-B21B-KCB)~~				
C-8 (PC14)	51'	Relay 2-B21B-KCB	.820	.395 @ 1.5'		
8-10 (PC14)	51'	Relay 2-B21B-KBA	1.728	.321 @ 1.5'		
10-12 (PC37)	52'	PC37	1.456	.344 @ 1.5'		
Turbo balancer	54'	Turbo balancer	.614	.267 @ 1'		
ERFIS CRT VT220	54'	ERFIS CRT VT220	.694	.291 @ 8"		

Test Technician D McLaughlin

Test Engineer MJ Metcalf

Form 20.1

NTS

National
Technical
Systems

Acton Division
533 Main Street
Acton, MA 01720

DATA SHEET

Job Number 60251-94N

Date 5-18-93 Page _____ of _____

Customer CP&L Brunswick

Specification NTS TP#60251-94N and NOD#1

Test Sample Control Room

Model/Serial Number Unit # 2

Test REXX - DC Magnetic Field Emissions

Mode of Operation _____

Purchase Order XTA3000098

Remarks FRONT of PANELS

LOCATION	ELEV.	SOURCE	LEVEL (Guass)	Drop-off Rate		
P613	53'	P613	1.4	.3 gauss @ 1'		
0-2 (X4-6)	49' 8"	X4-6	1.228	.266 gauss @ 1'		
2-4 (P614)	55'	RECIRC DRIVE Temp Recorder (2-B32-TR-R612)	1.329	.363 gauss @ 8"		
4-6 (P614)	43' 6"	HPCL AREA FLR DRN	.803	.256 gauss @ 7"		
		Sump Fill Timer (2-LIC-4003B)	.6			
6-8 (P614)	51'	Relay 2-B21B-K19	.820	.395 @ 1.5'		
8-10 (P614)	51'	Relay 2-B21B-K54	1.728	.321 gauss @ 1.5'		
Turbo balancing	54'	Turbo balancer	.614	.267 gauss @ 1'		
ERFIS CRT VT220	54'	ERFIS CRT VT220	.694	.291 gauss @ 8"		

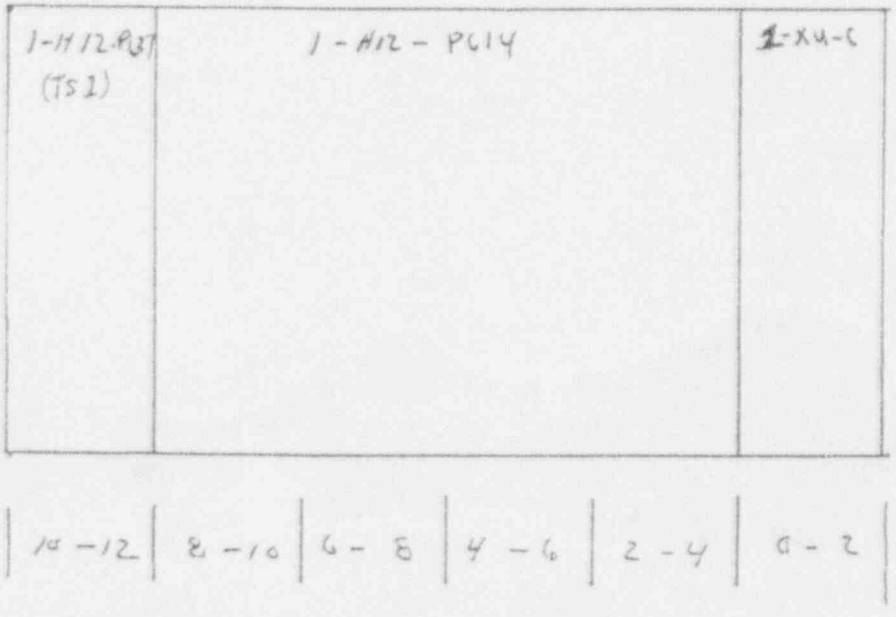
Test Technician D McLaughlin

Test Engineer MJ Metcalf

Form 20.1

CP&L Brunswick #2051-94N 5-15-93
Control Room unit #1
RE&A magnetic Field Emissions

FRONT OF PANEL



FRIS

CRT
VT220

CP&L Brunswick * 6021-94N

5-19-93

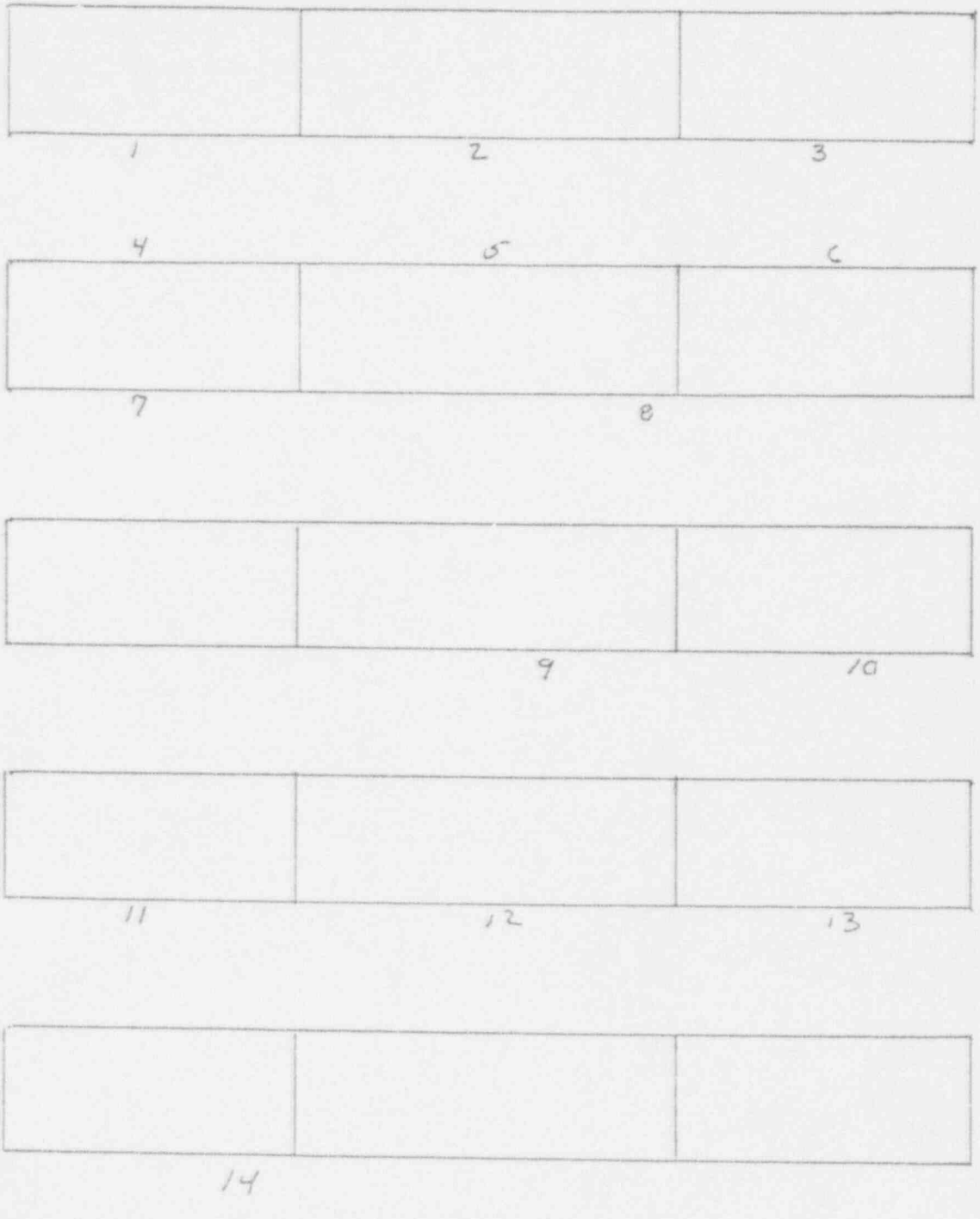
Control Room Unit #2

REXX - DC magnetic field Emissions

GENERAL AREA

East wall ↑

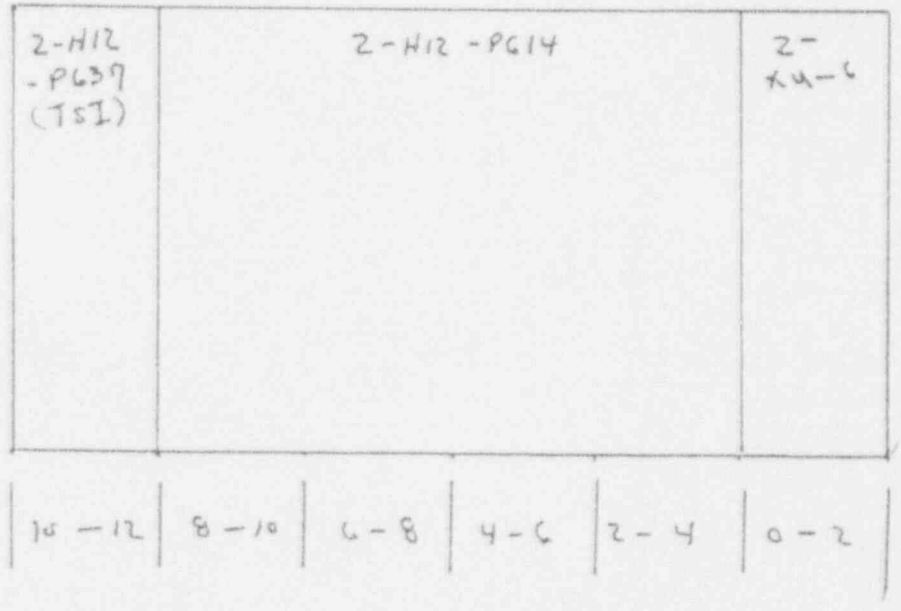
← N

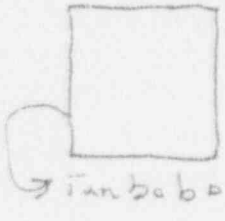


CP&L Brunswick #C0251-54N
Control Room Unit #2
REXX - DC magnetic Field Emissions

5-26-93

Front of Panel

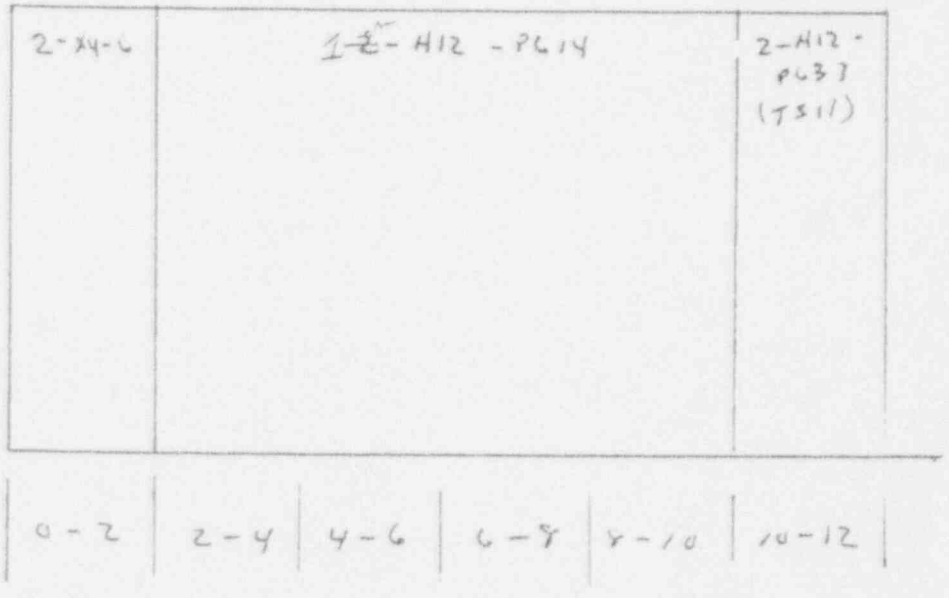




5-19-93

CP&L Brunswick "6025T-94N
Control Room unit # ~~2~~ 1
REAR magnetic FIELD Emissions

Back of Panel



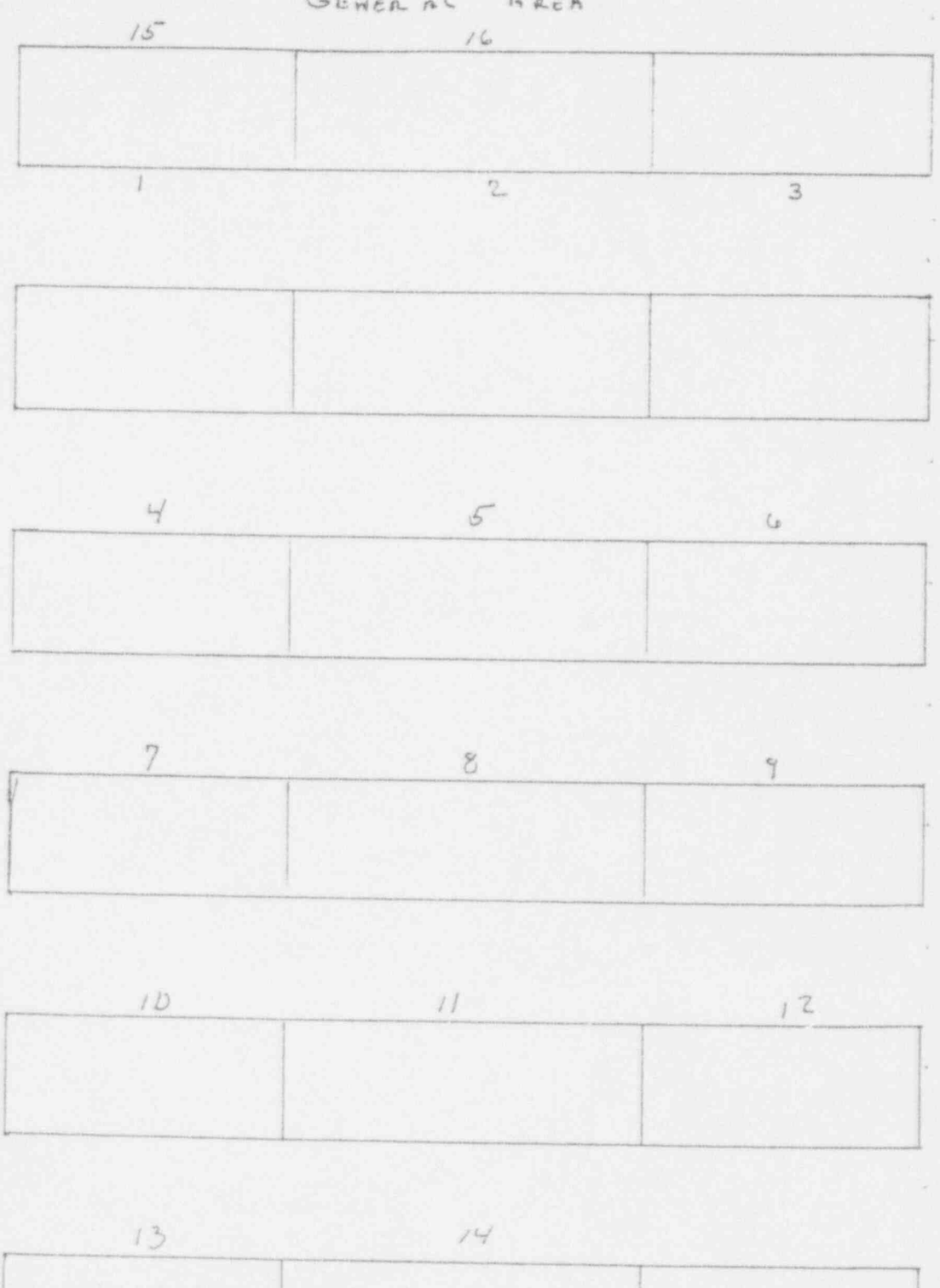
CP&L BRUNSWICK # 60251-94N 5-20-93

CONTROL Room Unit #1

REXX - DC Magnetic Field Emissions

GENERAL AREA

LAST WALL ↑ N



6.5 Radiated Emissions, Method RE01, AC Magnetic Field, 30 Hz to 50 KHz

Requirements

Radiated emissions, magnetic field, from 30 Hz to 50 KHz were measured in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method RE01 of MIL-STD-462. Reference Section 6.5, Test Setup.

Procedures

The Control Room Environment was set up and operated as specified in Section 4.0 of this report. An A. H. Systems Loop Sensor Antenna, Model SAS-200/560, was placed in the "X axis" location of its antenna fixture. The output of the loop antenna was connected to an HP Model 8566S, Automated Microwave measurement System, through a 25-foot length of RG214/U coaxial cable. The antenna orientation was then changed through multiple axes until a worst case level was detected.

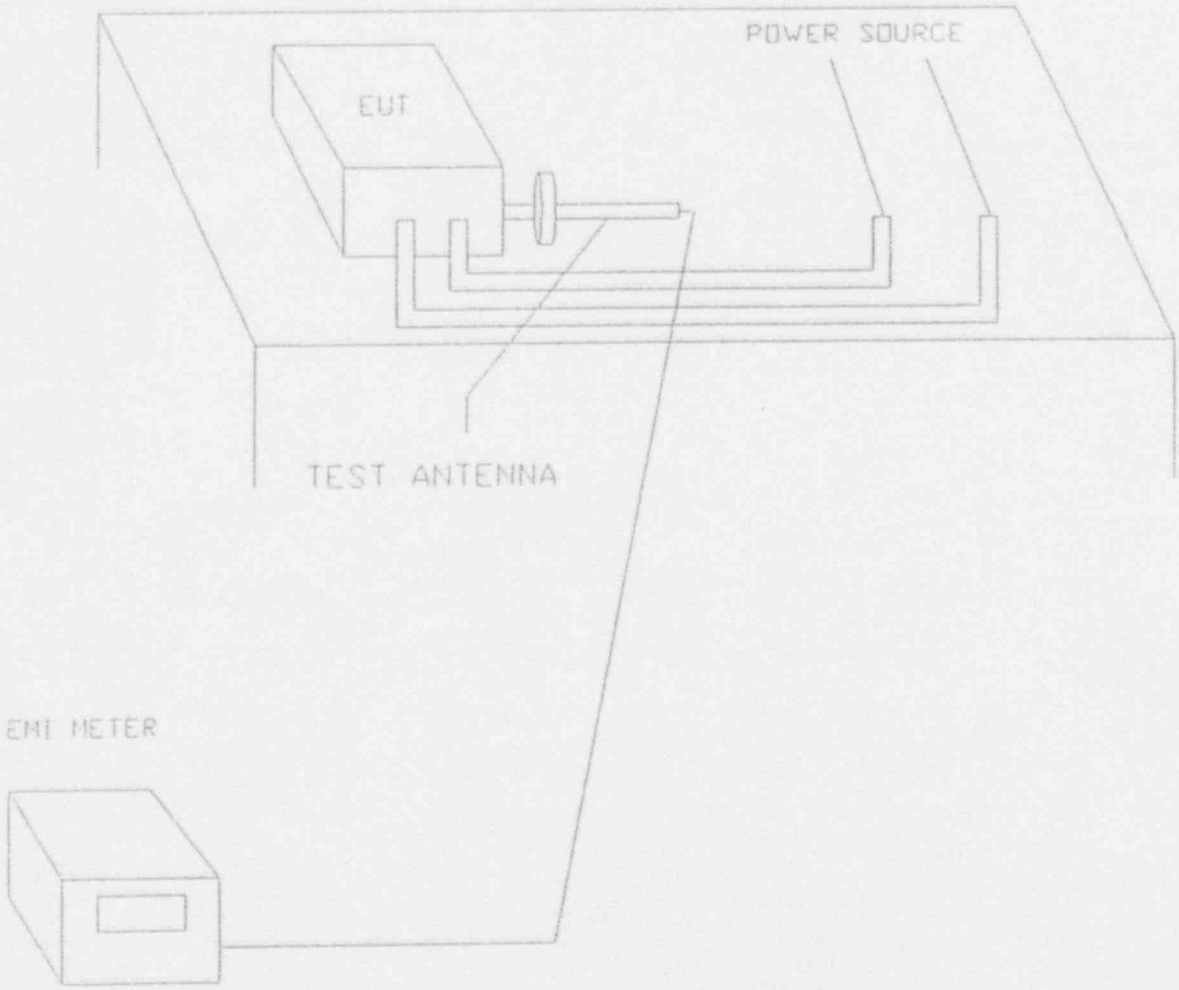
The spectrum analyzer was swept over the frequency range from 30 Hz to 50 KHz and plots were generated for the frequencies of maximum radiation. Reference Section 6.5, Data Sheets.

The remaining mapping locations were measured following the preceding procedure.

Test Results

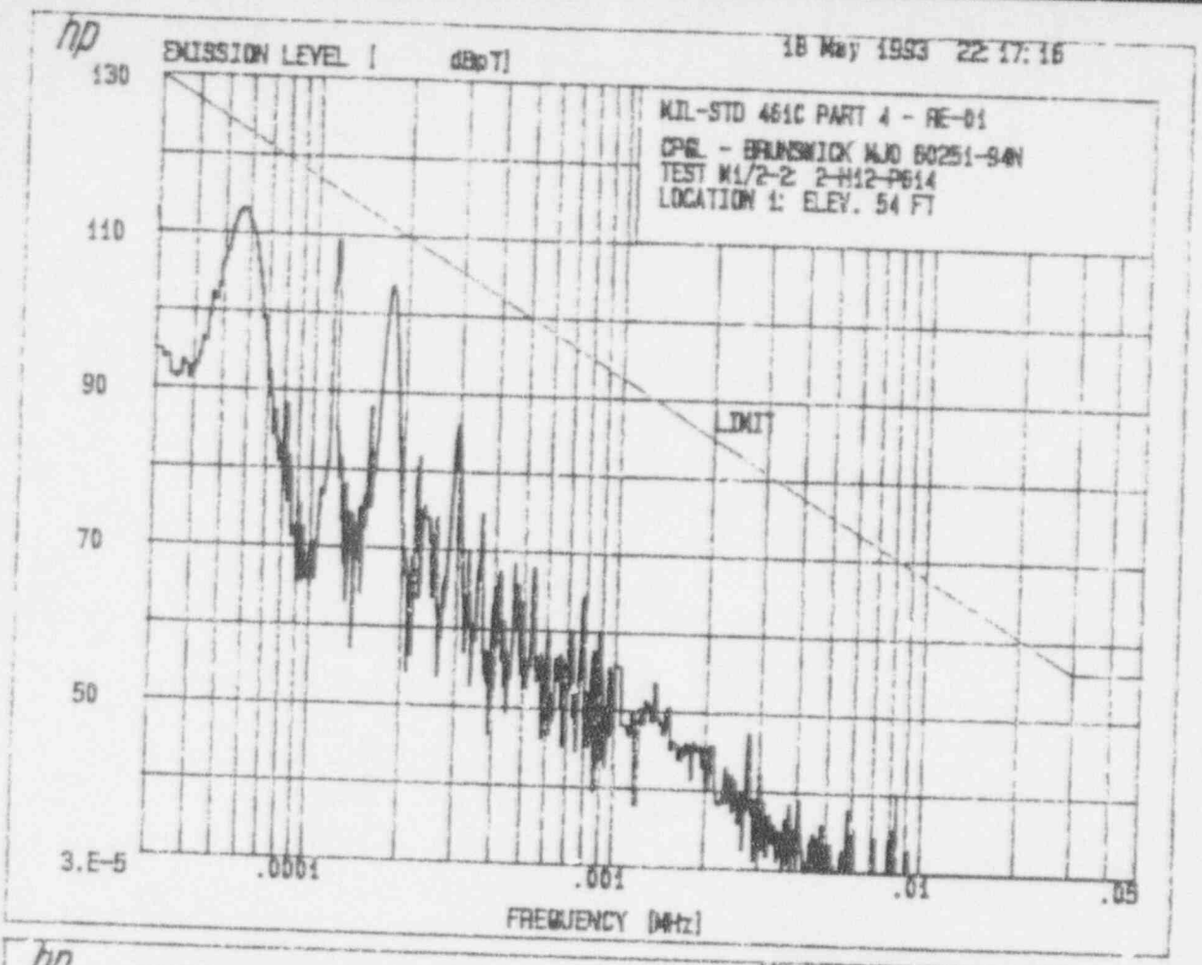
Test		Results
RE01	Radiated Emissions, AC Magnetic Field, 30 Hz - 50 KHz	TBD*

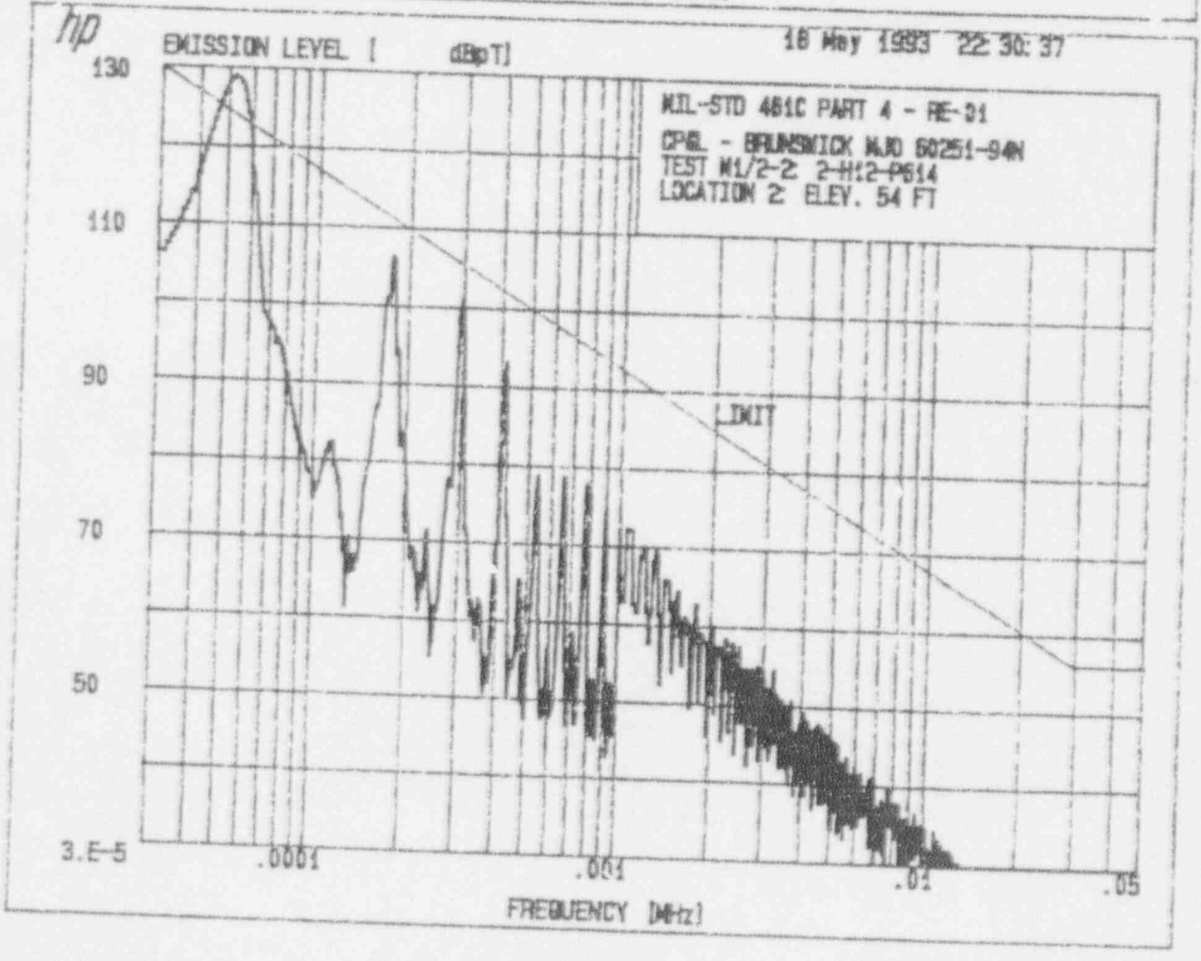
*See NTS Report 60251-94N-2.

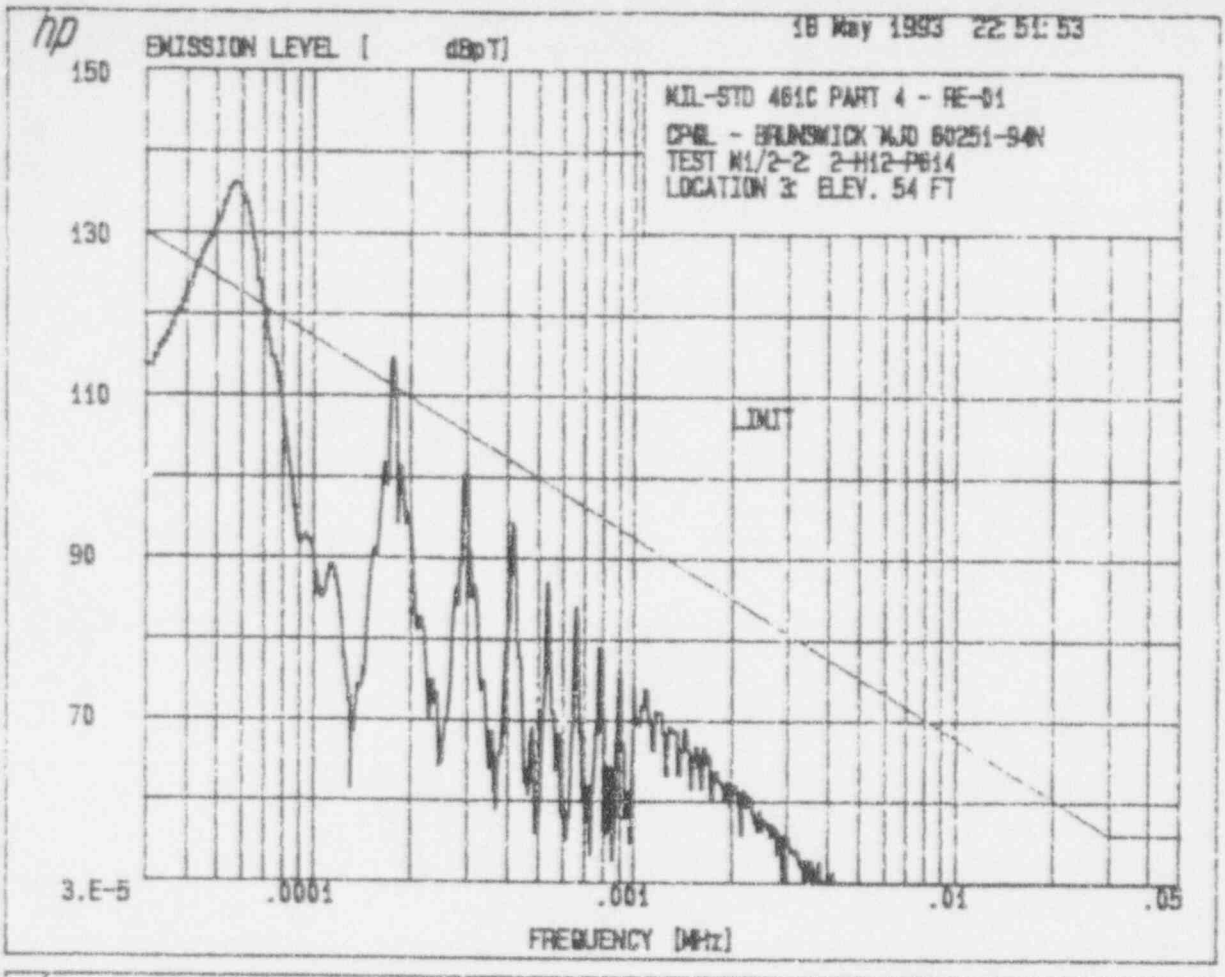


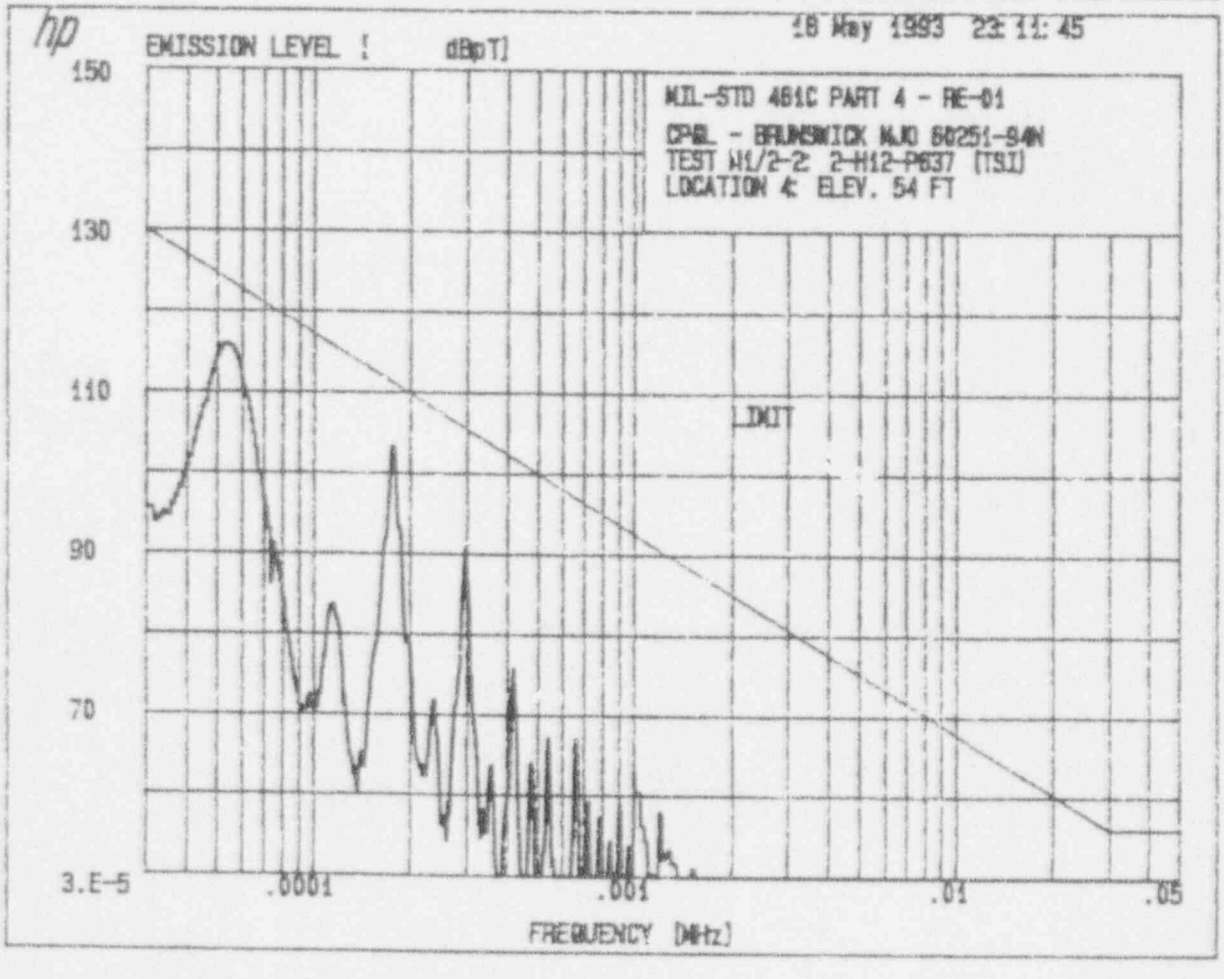
RADIATED EMISSIONS, METHOD RE01, TYPICAL TEST SETUP

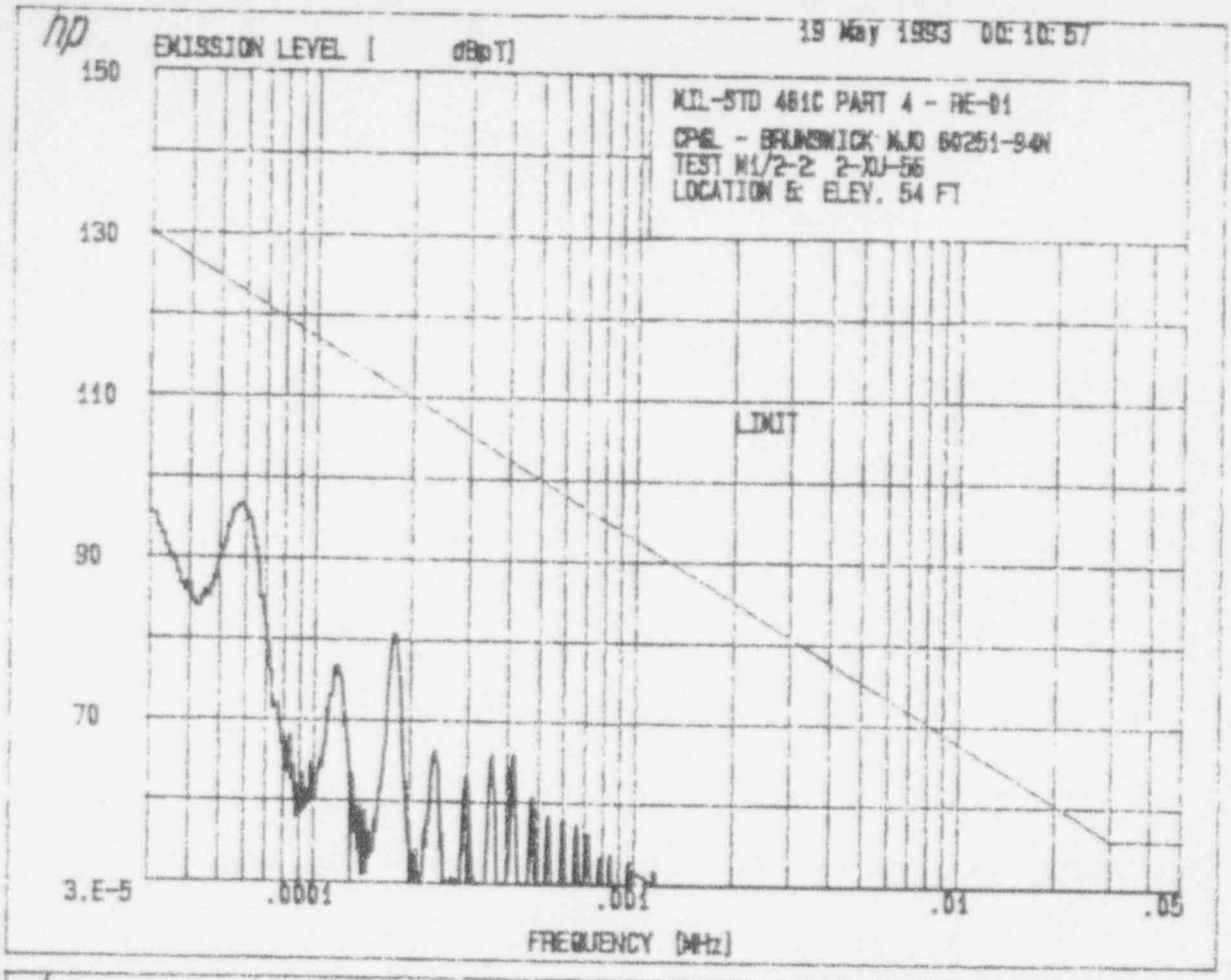
RE01 DATA SHEETS

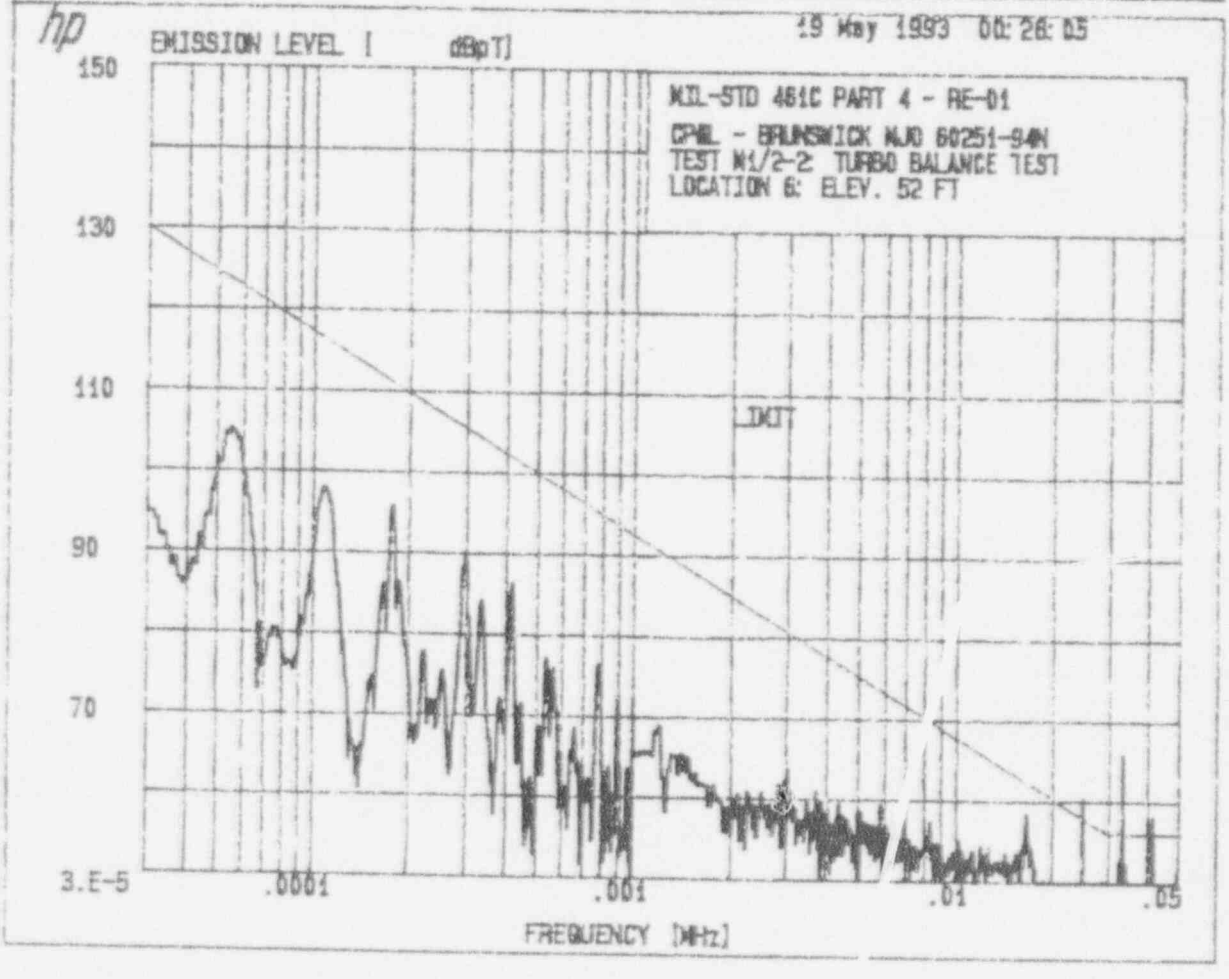

hp
EMISSION LEVEL [dBpT]
18 May 1993 22:17:16
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUO 50251-94N
TEST M1/2-2 2-H12-P614
LOCATION 1: ELEV. 54 FT
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]

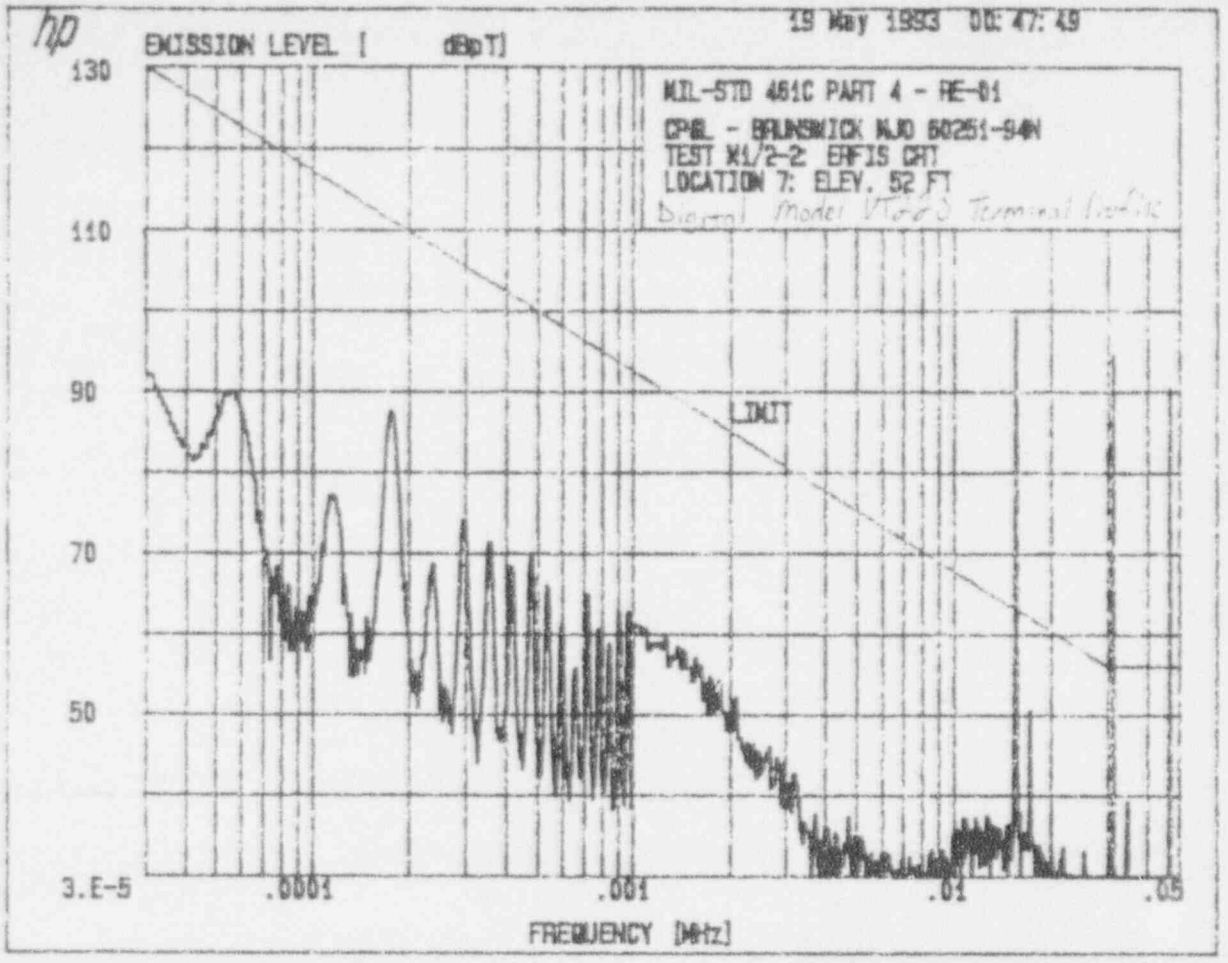

hp
EMISSION LEVEL [dBpT]
18 May 1993 22:30:37
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUO 50251-94N
TEST M1/2-2 2-H12-P614
LOCATION 2: ELEV. 54 FT
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]

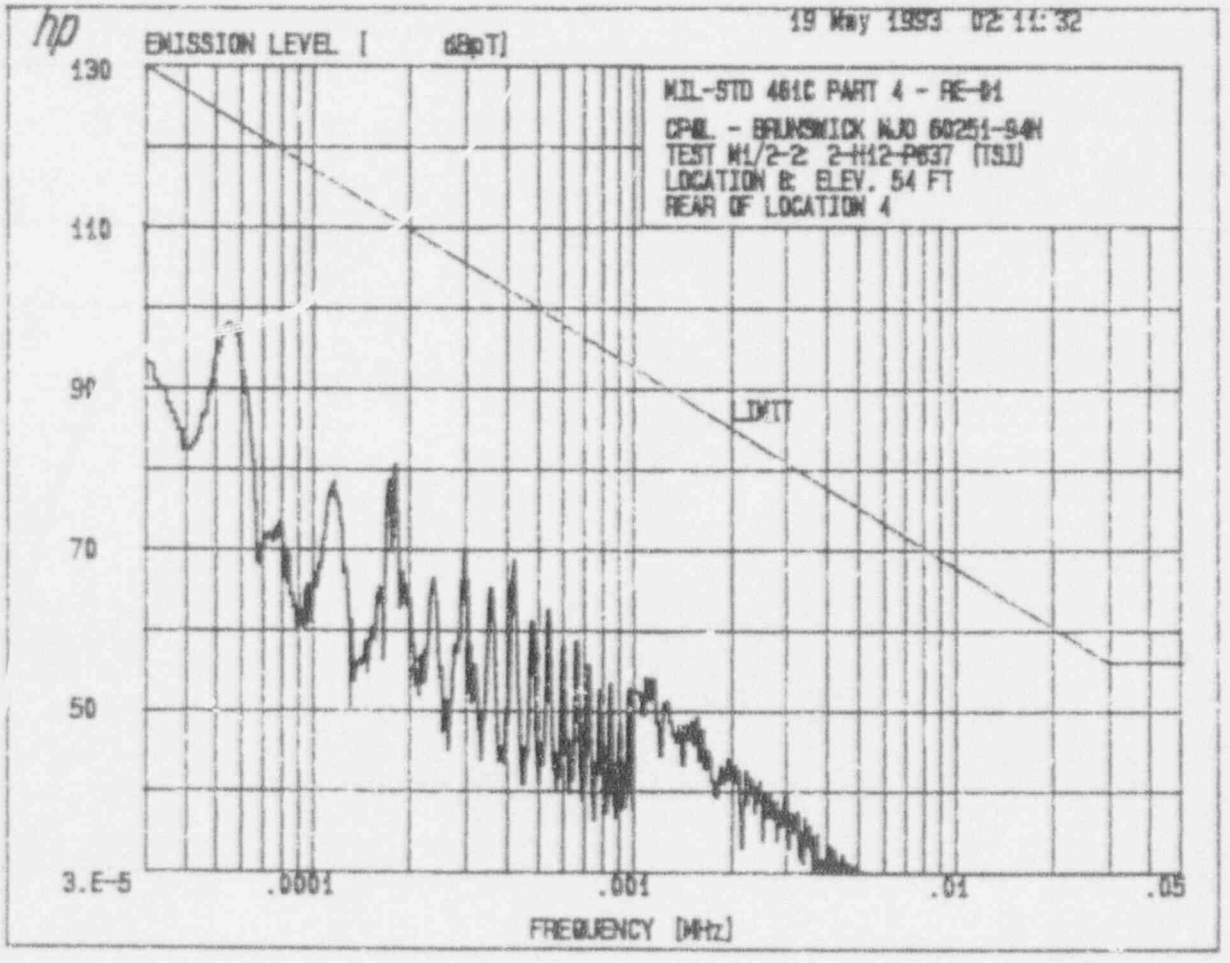

hp
EMISSION LEVEL [dBpT]
18 May 1993 22:51:53
150
130
110
90
70
3.E-5
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST N1/2-2 2-H12-P614
LOCATION 3: ELEV. 54 FT
LIMIT
.0001
.001
.01
.05
FREQUENCY [MHz]

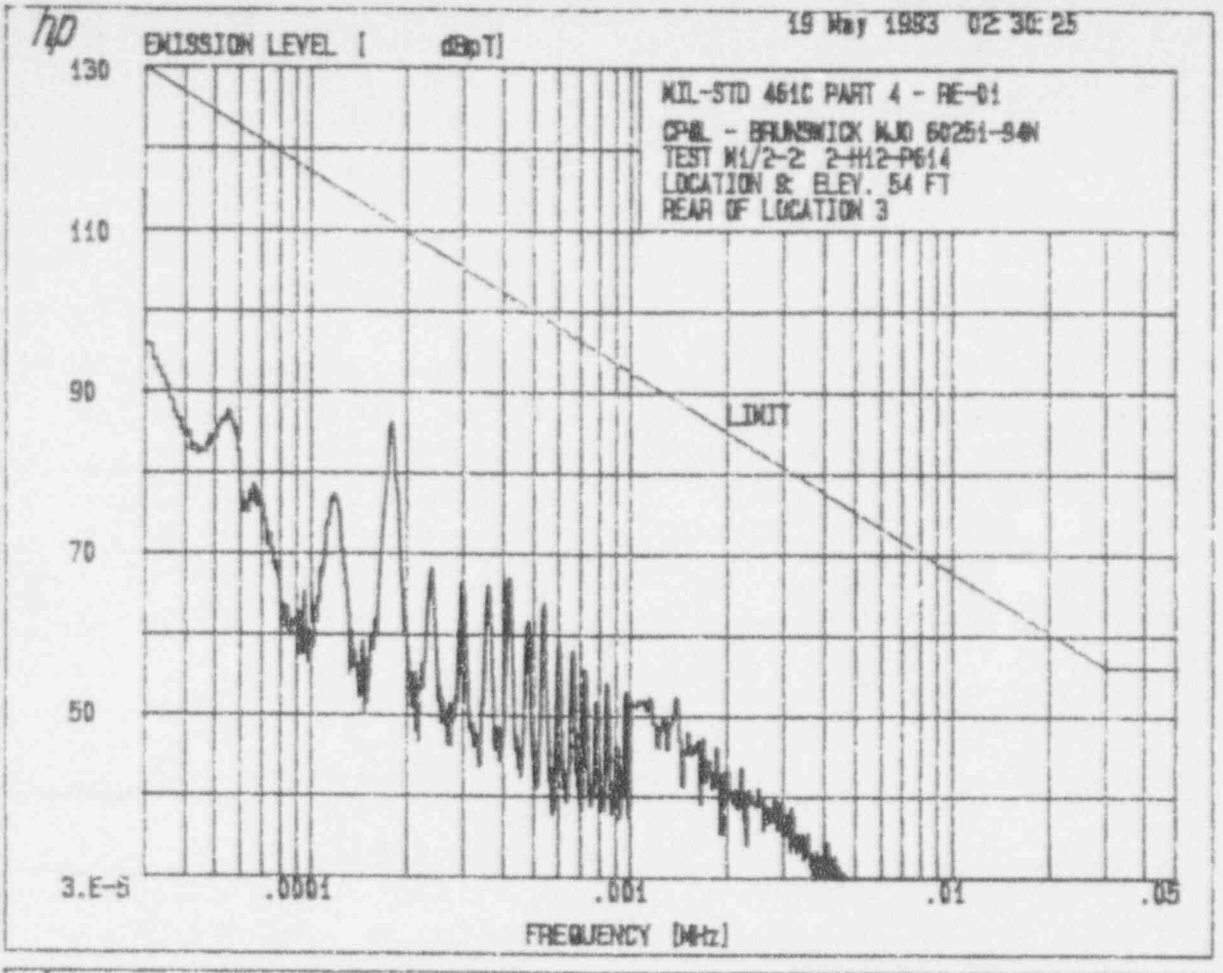

hp
EMISSION LEVEL [dBpT]
18 May 1993 23:11:45
150
130
110
90
70
3.E-5
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST N1/2-2 2-H12-P637 (TSI)
LOCATION 4: ELEV. 54 FT
LIMIT
.0001
.001
.01
.05
FREQUENCY [MHz]

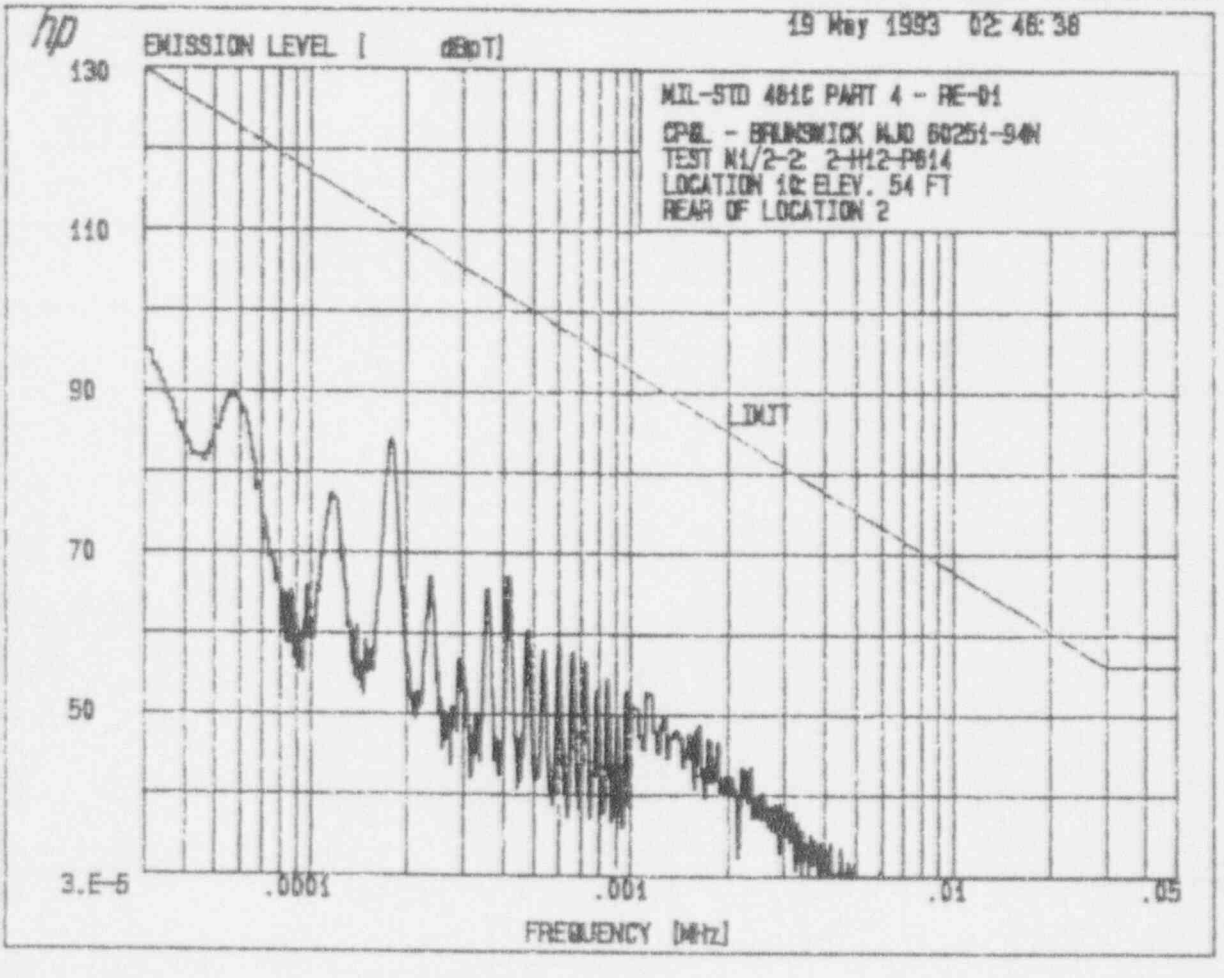

hp
EMISSION LEVEL [dBµT]
19 May 1993 00:10:57
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST M1/2-2 2-XU-56
LOCATION 6: ELEV. 54 FT
LIMIT
150
130
110
90
70
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]

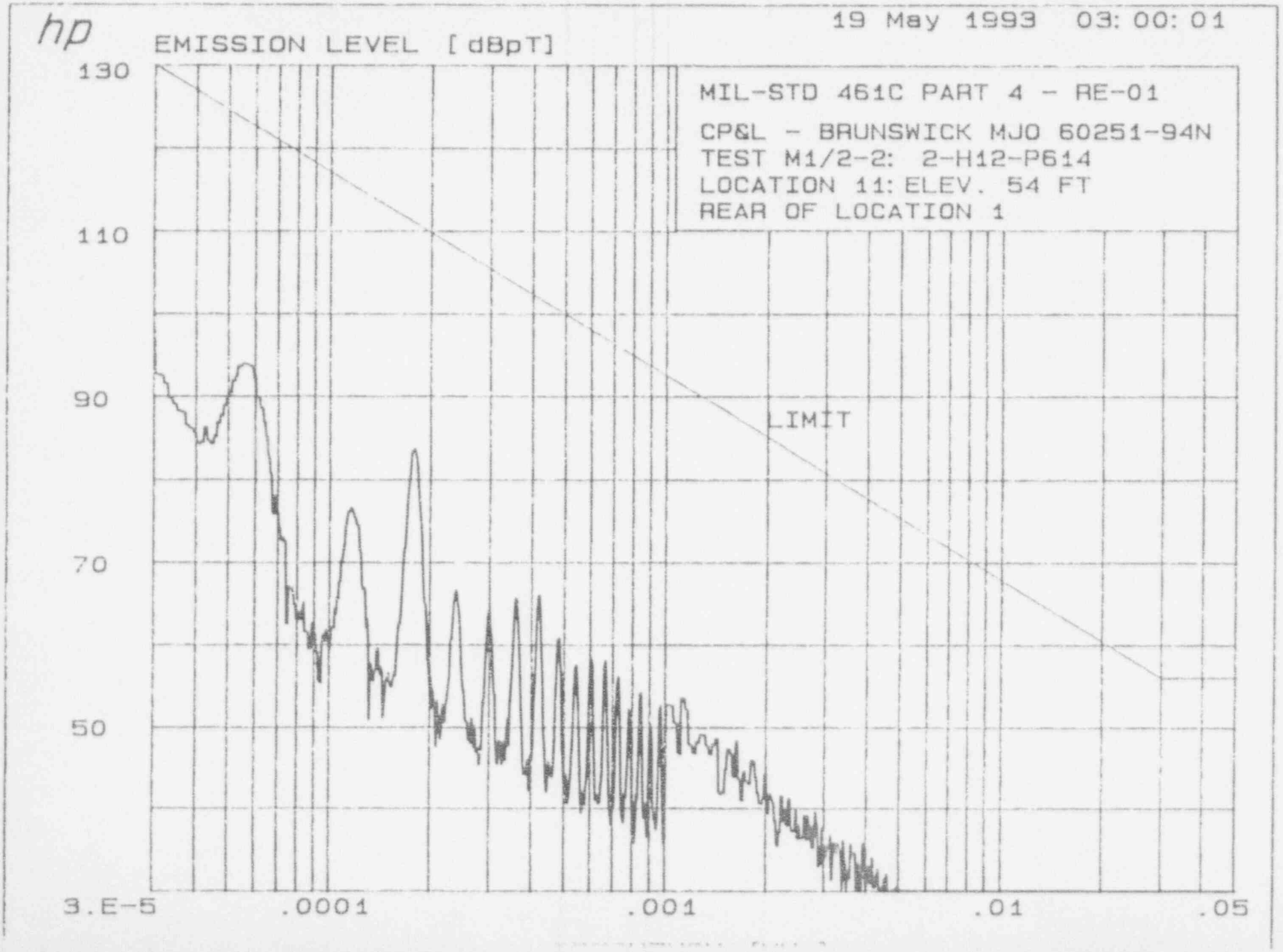

hp
EMISSION LEVEL [dBµT]
19 May 1993 00:26:05
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST M1/2-2 TURBO BALANCE TEST
LOCATION 6: ELEV. 52 FT
LIMIT
150
130
110
90
70
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]


hp
19 May 1993 00:47:49
EMISSION LEVEL [dBpT]
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST M1/2-2 EMFIS CRT
LOCATION 7: ELEV. 52 FT
Digital Model VT220 Terminal Traffic
LIMIT
FREQUENCY [MHz]


hp
19 May 1993 02:11:32
EMISSION LEVEL [dBpT]
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUD 60251-94N
TEST M1/2-2 2-H12-P637 (TSI)
LOCATION 8: ELEV. 54 FT
REAR OF LOCATION 4
LIMIT
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBµT]
19 May 1993 02:30:25
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUC 60251-94N
TEST N1/2-2 2-H12-P614
LOCATION & ELEV. 54 FT
REAR OF LOCATION 3
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBµT]
19 May 1993 02:46:38
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK NUC 60251-94N
TEST N1/2-2 2-H12-P614
LOCATION 1& ELEV. 54 FT
REAR OF LOCATION 2
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]


hp
19 May 1993 03:00:01
EMISSION LEVEL [dBpT]
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK MJO 60251-94N
TEST M1/2-2: 2-H12-P614
LOCATION 11: ELEV. 54 FT
REAR OF LOCATION 1
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05

6.6 Radiated Emissions, Method RE02, Electric Field, 14 KHz to 1 GHz

Requirements

Radiated emissions, from 14 KHz to 1 GHz, were measured in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method RE02 of MIL-STD-462. Reference Section 6.6, Test Setup.

Procedures

The Control Room Environment was set up and operated as specified in Section 4.0 of this report. The antennas used during the performance of this test were as follows:

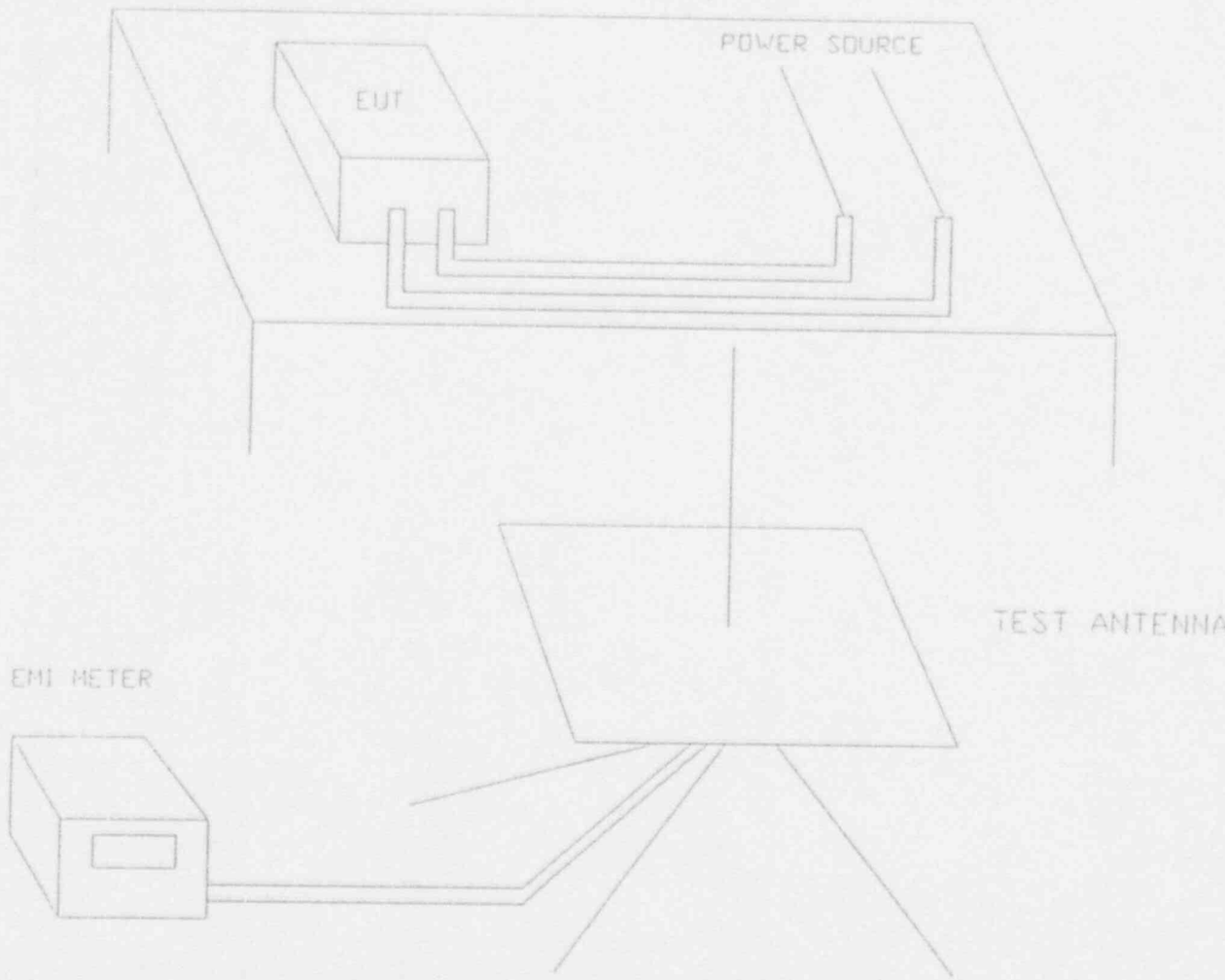
Frequency	Antenna	Coaxial Cable	Polarization
.014-30 MHz	Active Rod	25' of RG9B/U	Omni-Directional
30 - 300 MHz	Biconical	25' of RG9B/U	Vertical/Horiz.
300 - 1000 MHz	Log Periodic	25' of RG9B/U	Vertical/Horiz.

Measurements from 14 KHz to 1.0 GHz were performed using the appropriate antenna with the corresponding coaxial cable connected to a Hewlett Packard Automated Microwave Measurement System, Model 8566S. The antenna axis orientation were changed until a worst case level is detected. Plots were generated for both narrow and broad band measurements. Reference Section 6.6, Data Sheets.

The remaining mapping locations were measured following the preceding procedure.

Test Results

Test	Results
RE02 Radiated Emissions, 14KHz - 1 GHz *See NTS Report #60251-94N-2.	TBD*



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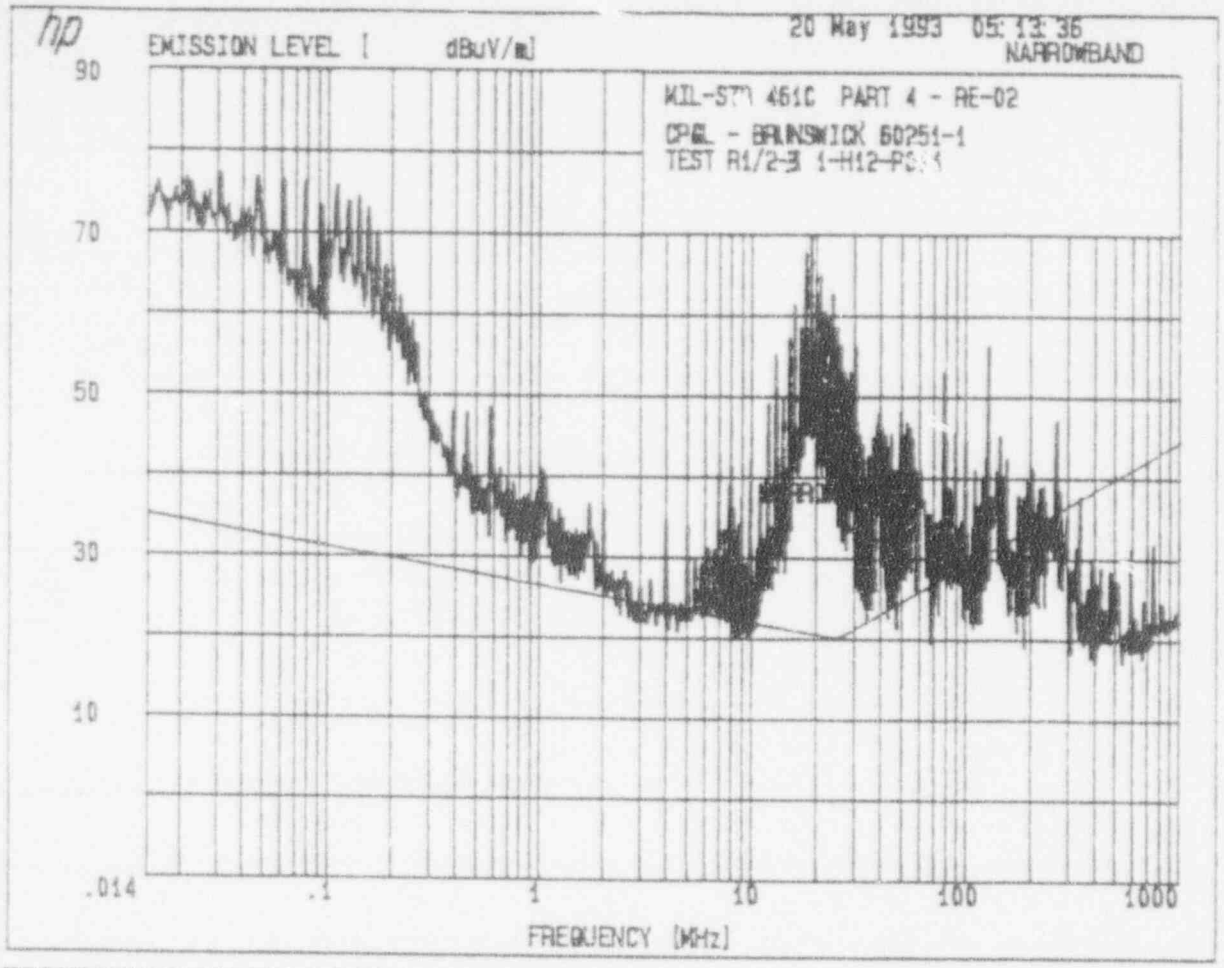
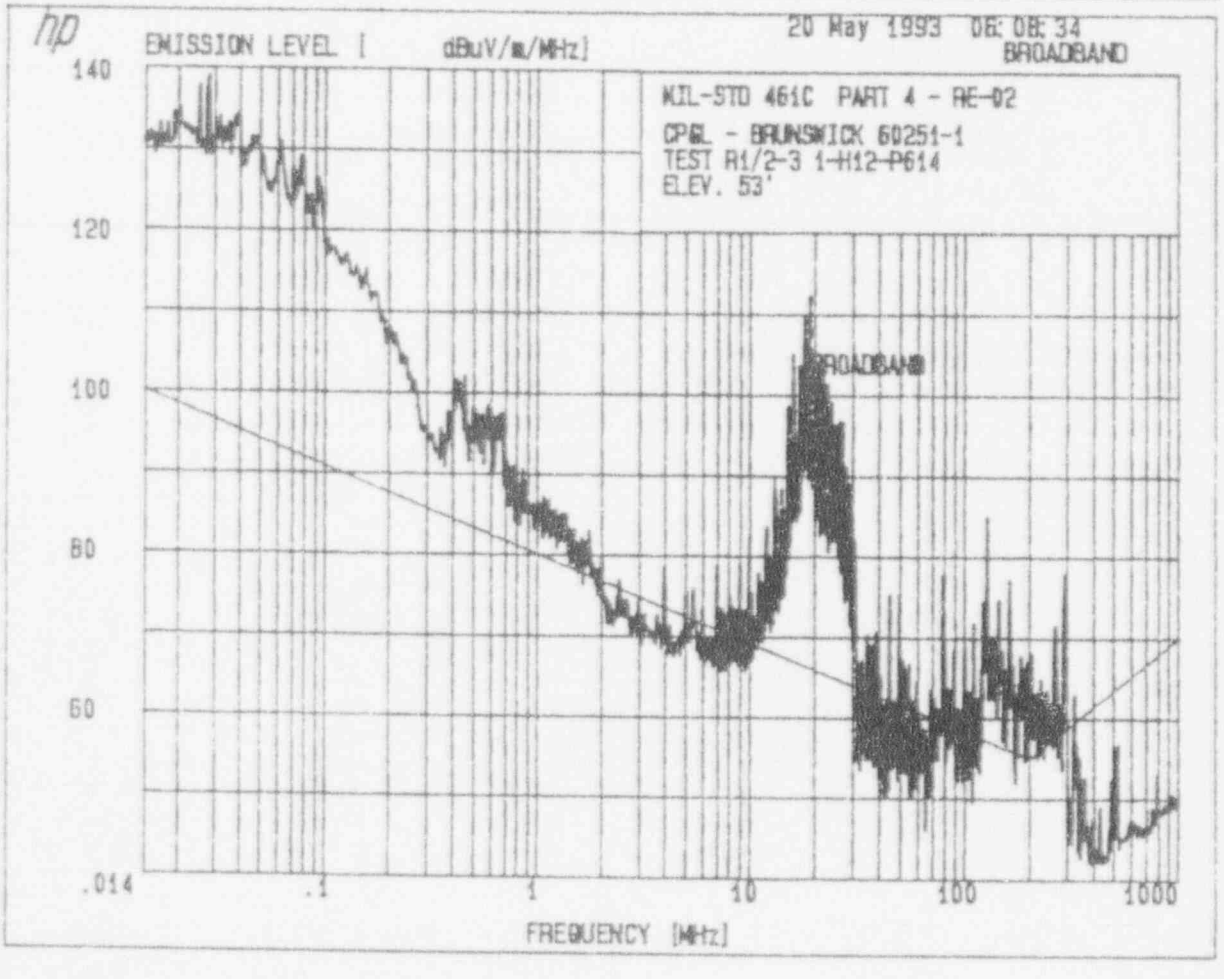
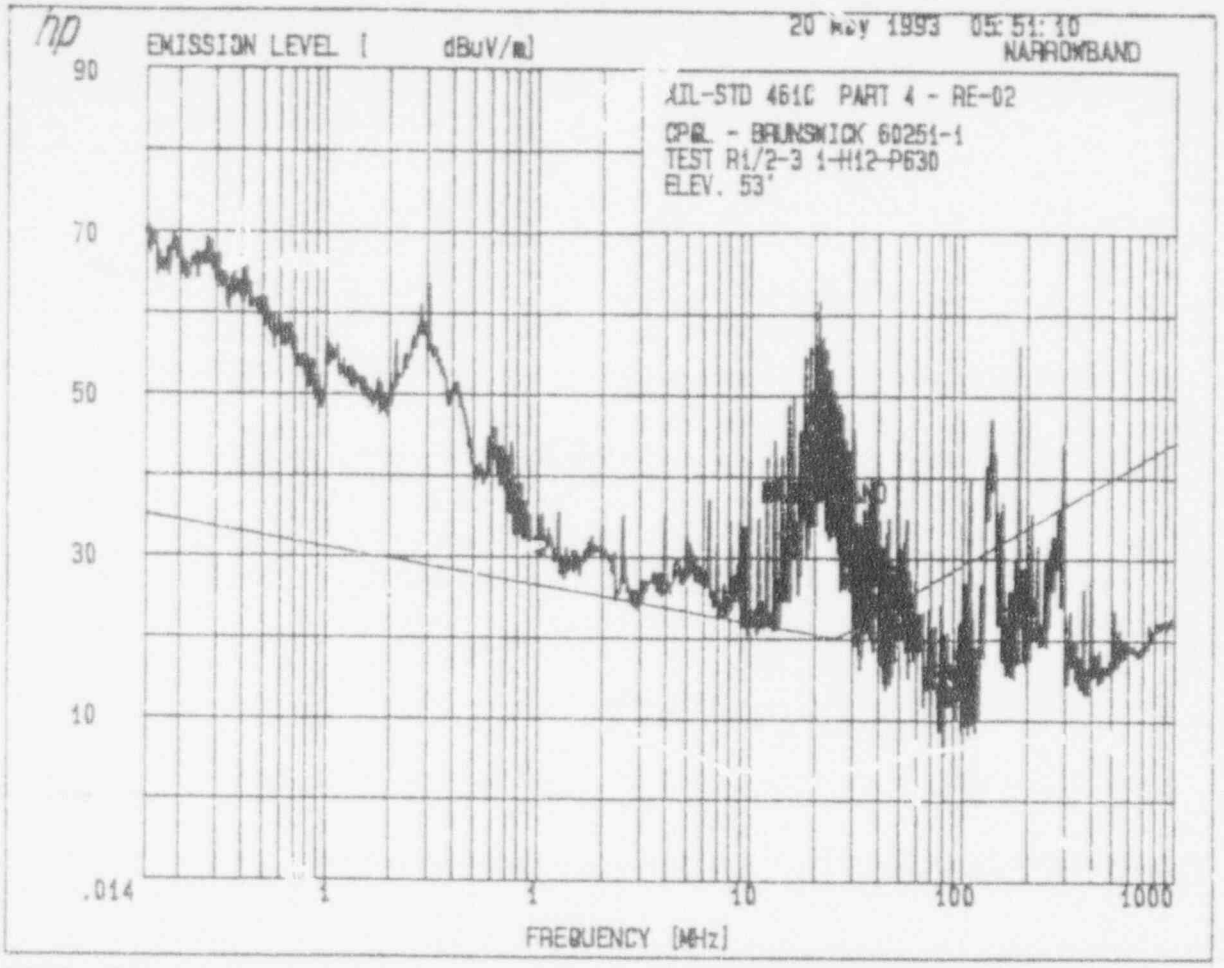
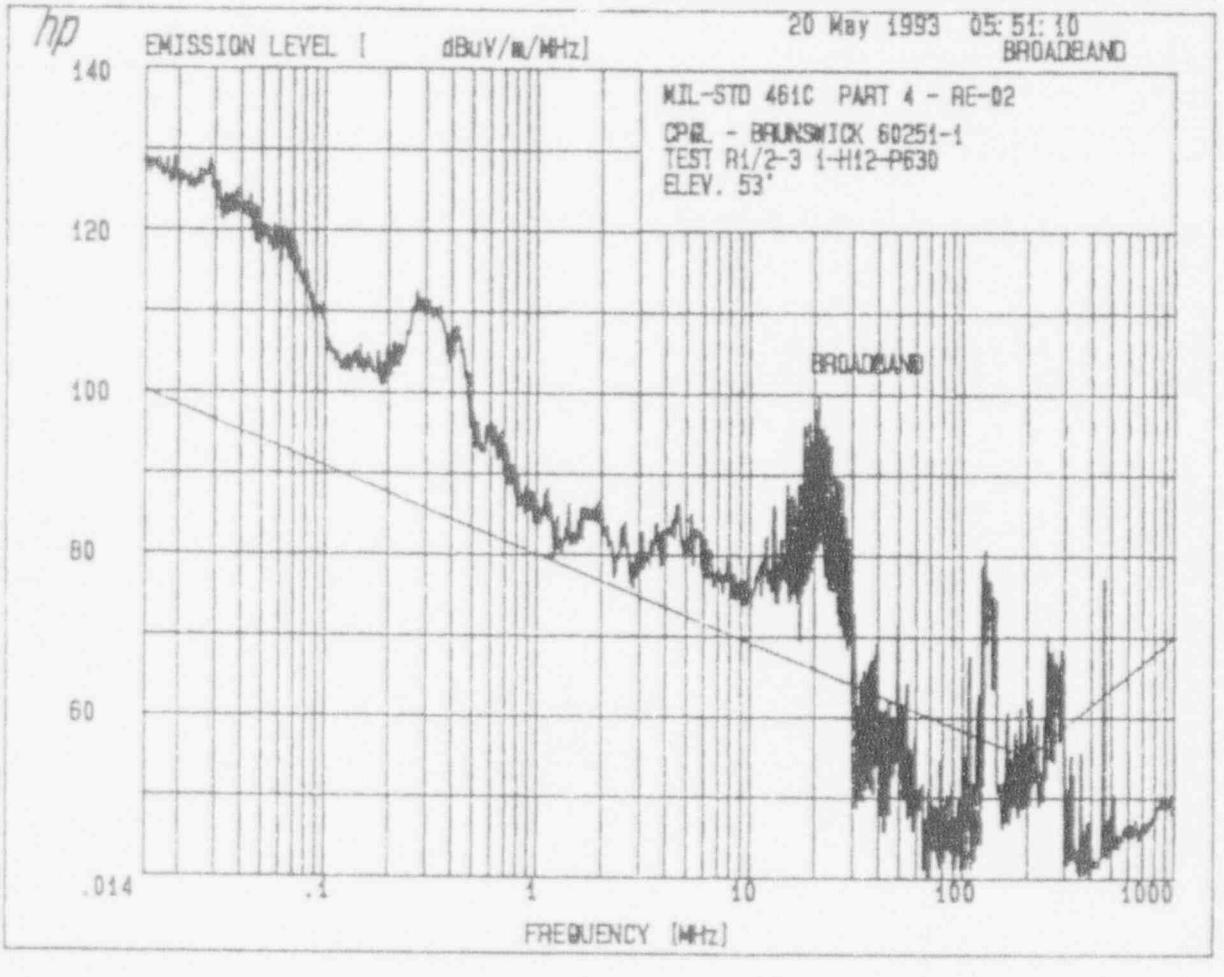
RADIATED EMISSIONS, METHOD RE02, TYPICAL TEST SETUP

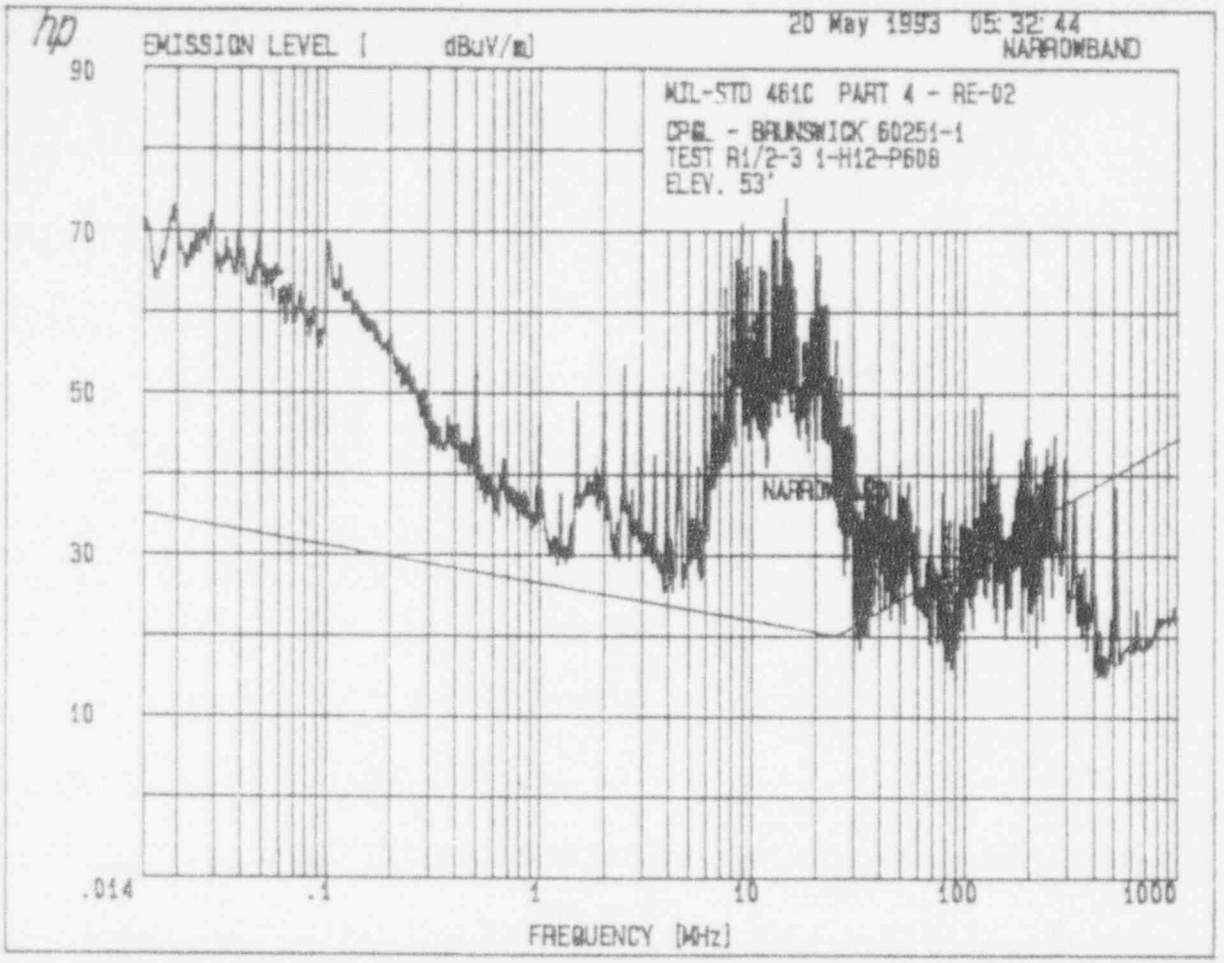
RE02 DATA SHEETS

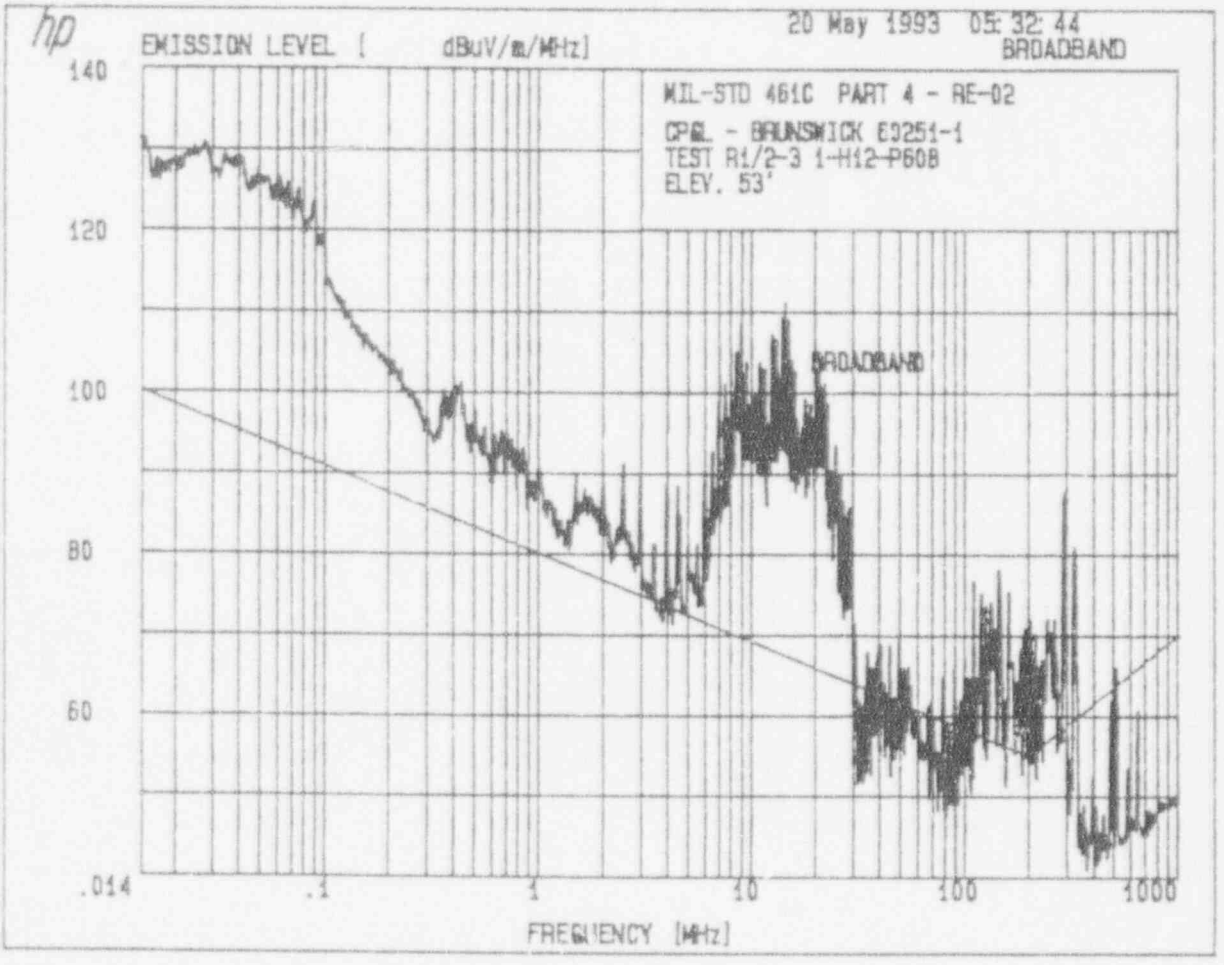

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 05:13:36
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]

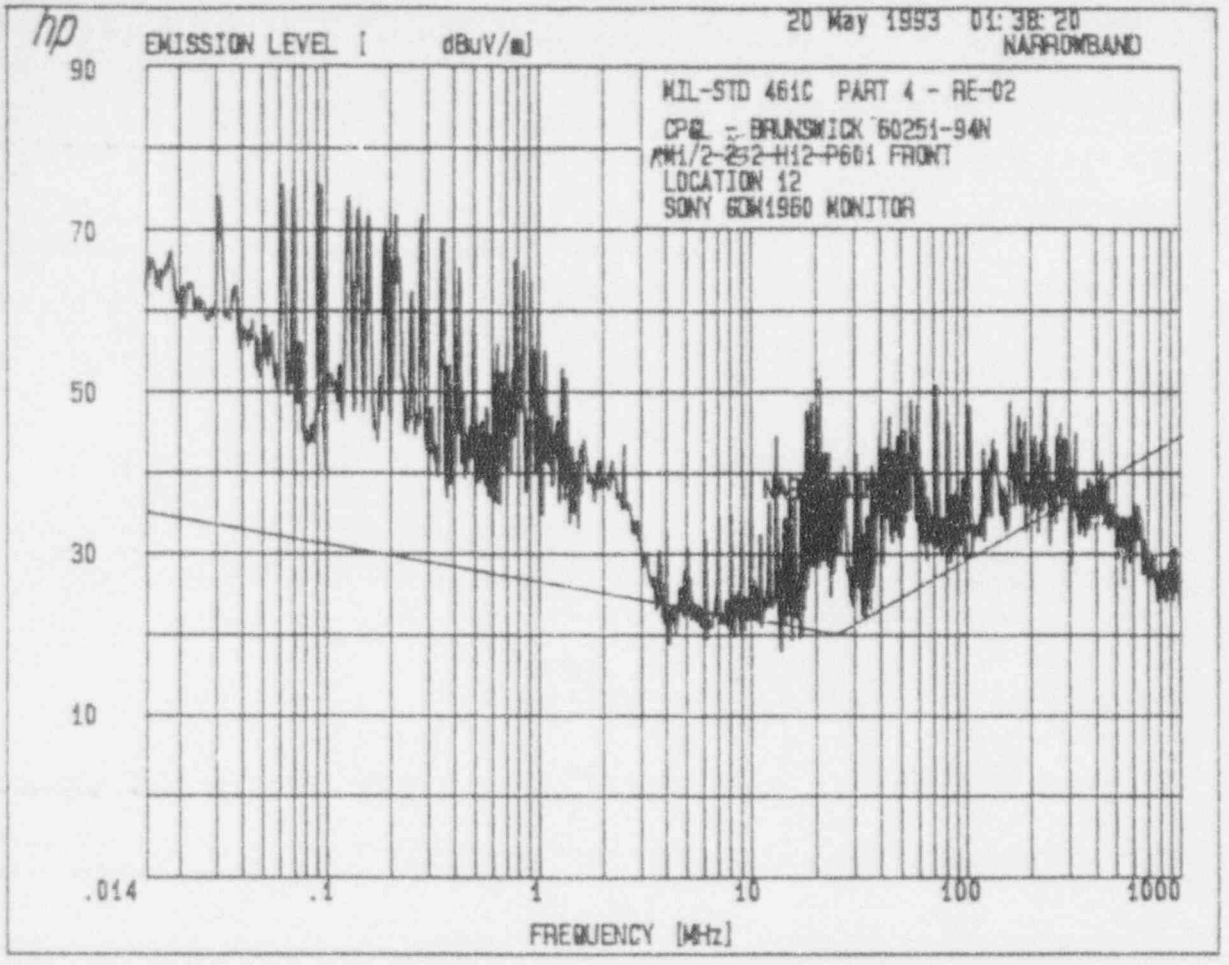

hp
EMISSION LEVEL [dBuV/m/MHz]
20 May 1993 06:08:34
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
TEST R1/2-3 1-H12-P614
ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

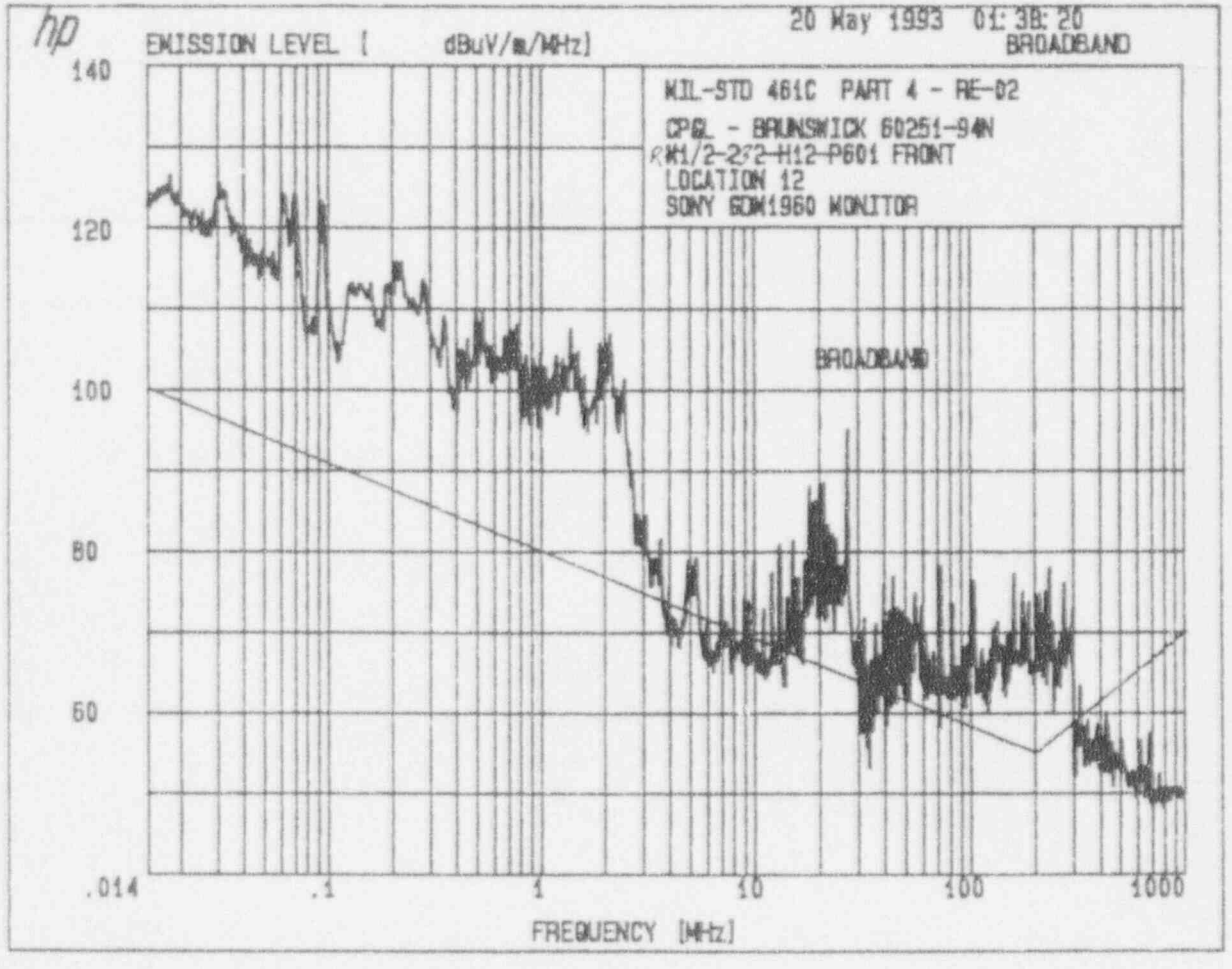

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 05:51:10
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
TEST R1/2-3 1-H12-P630
ELEV. 53'
90
70
50
30
10
.014
1
1
10
100
1000
FREQUENCY [MHz]

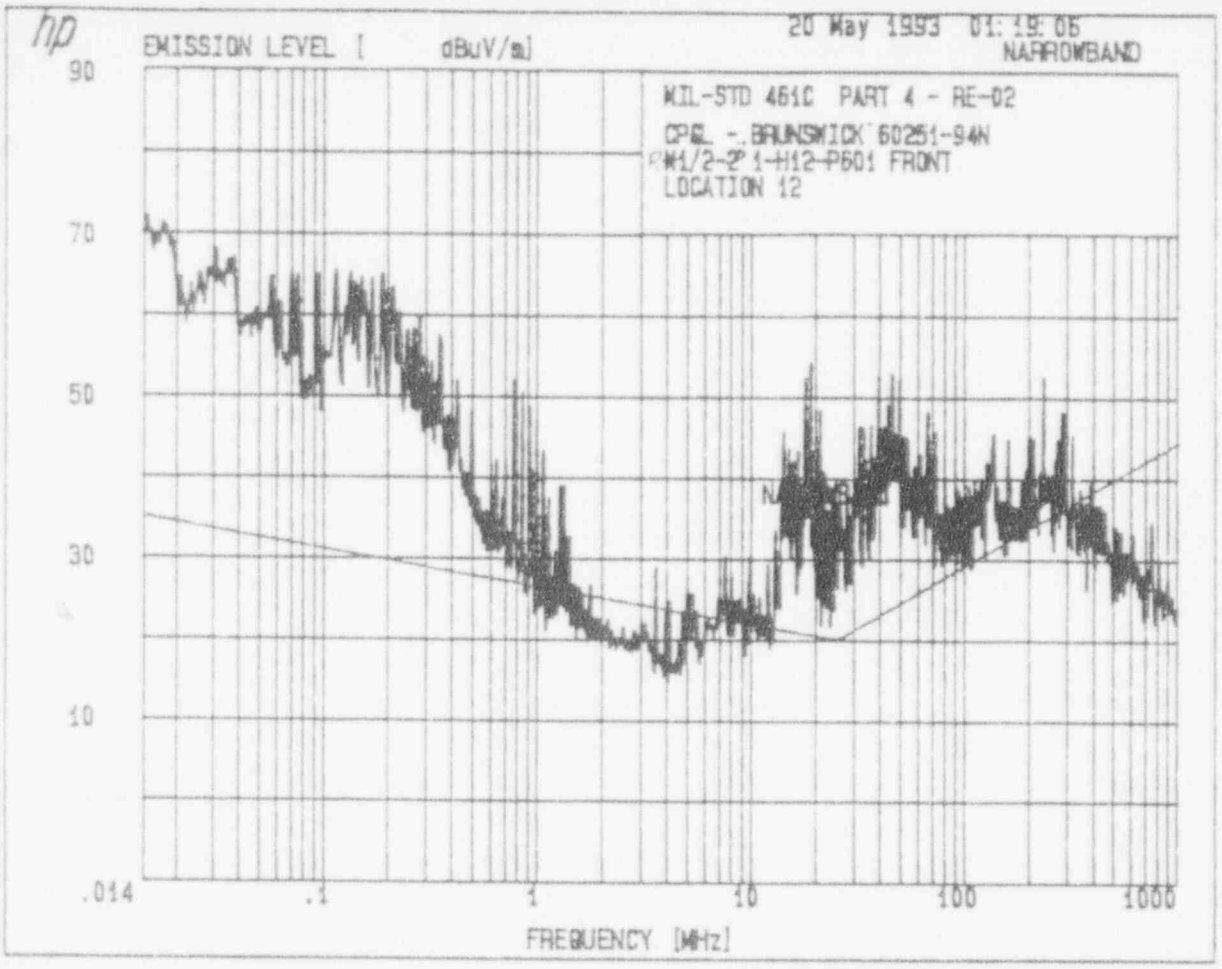

hp
EMISSION LEVEL [dBuV/m/MHz]
20 May 1993 05:51:10
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
TEST R1/2-3 1-H12-P630
ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

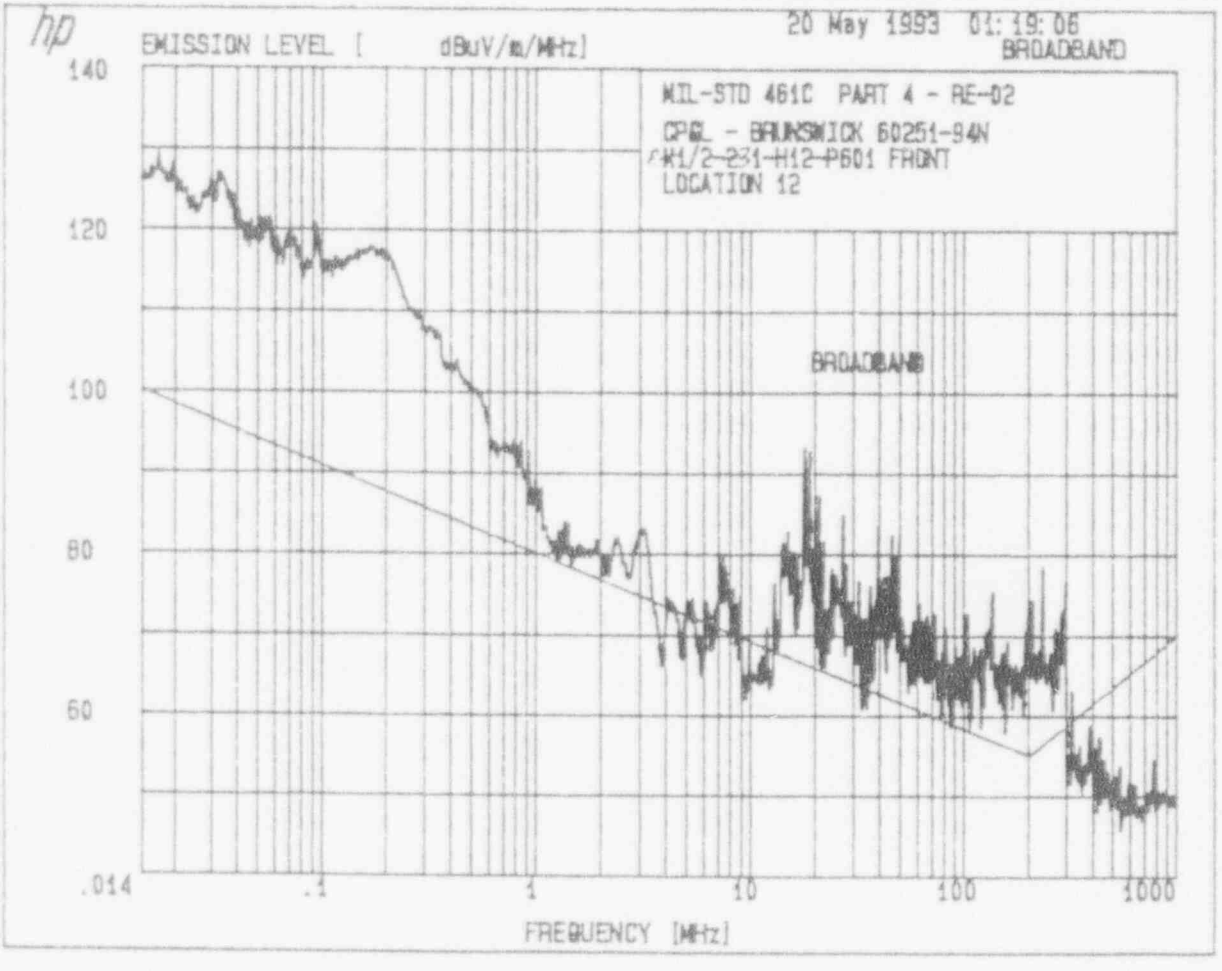

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 05:32:44
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
TEST R1/2-3 1-H12-P60B
ELEV. 53'
NARROWBAND
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]

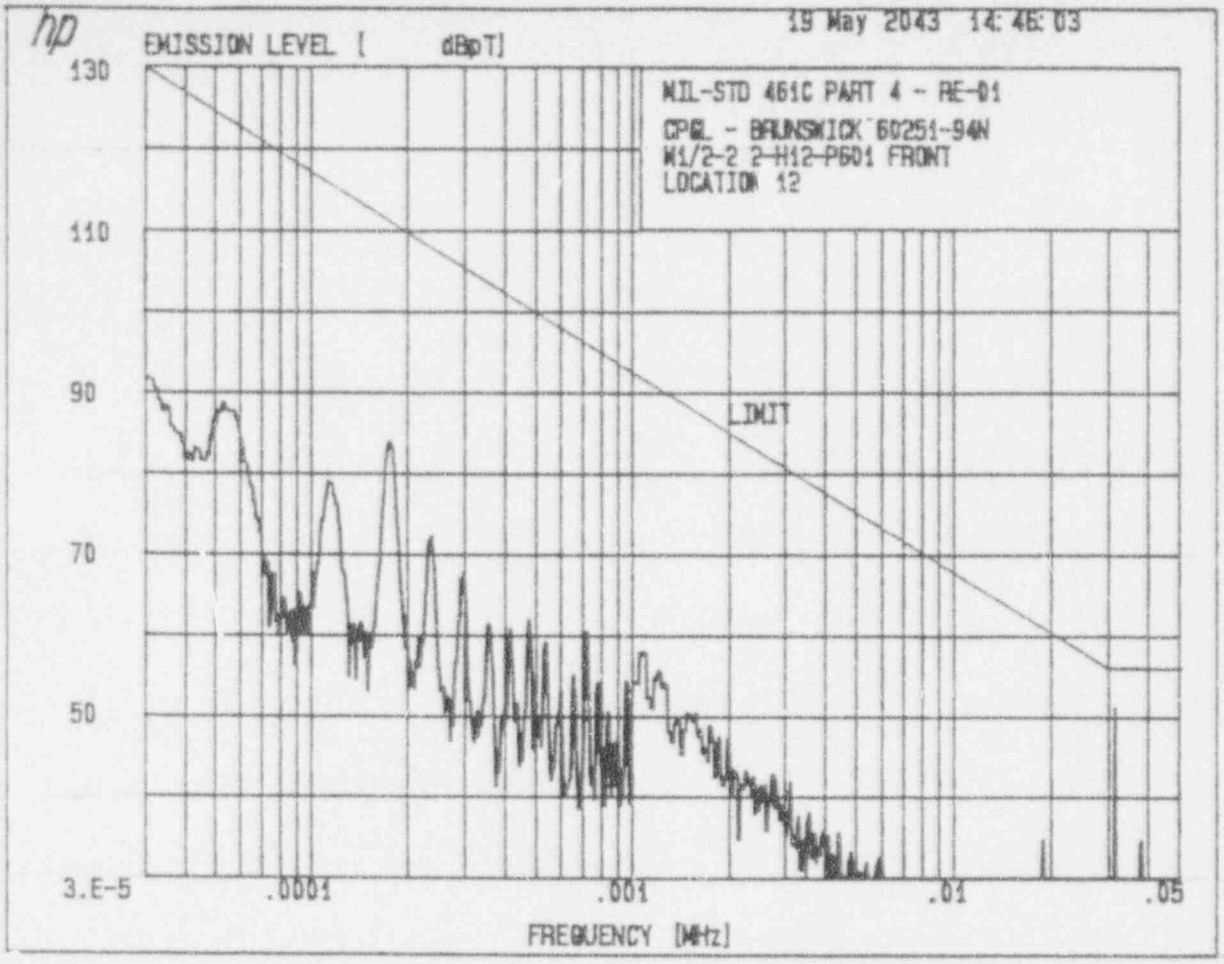

hp
EMISSION LEVEL [dBuV/m/MHz]
20 May 1993 05:32:44
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-1
TEST R1/2-3 1-H12-P60B
ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

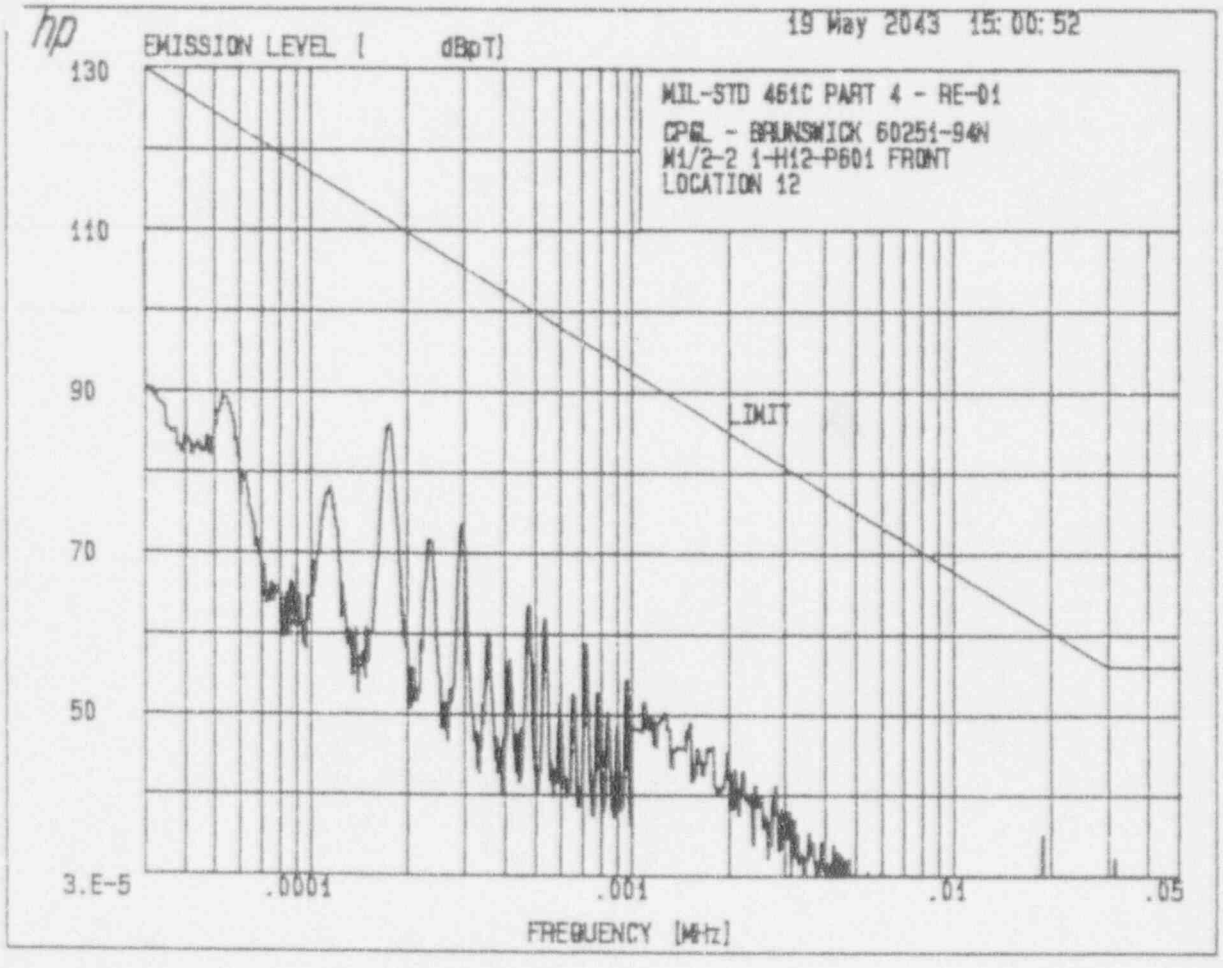

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 01:38:20
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
RM1/2-252-H12-P601 FRONT
LOCATION 12
SONY GDM1960 MONITOR
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]

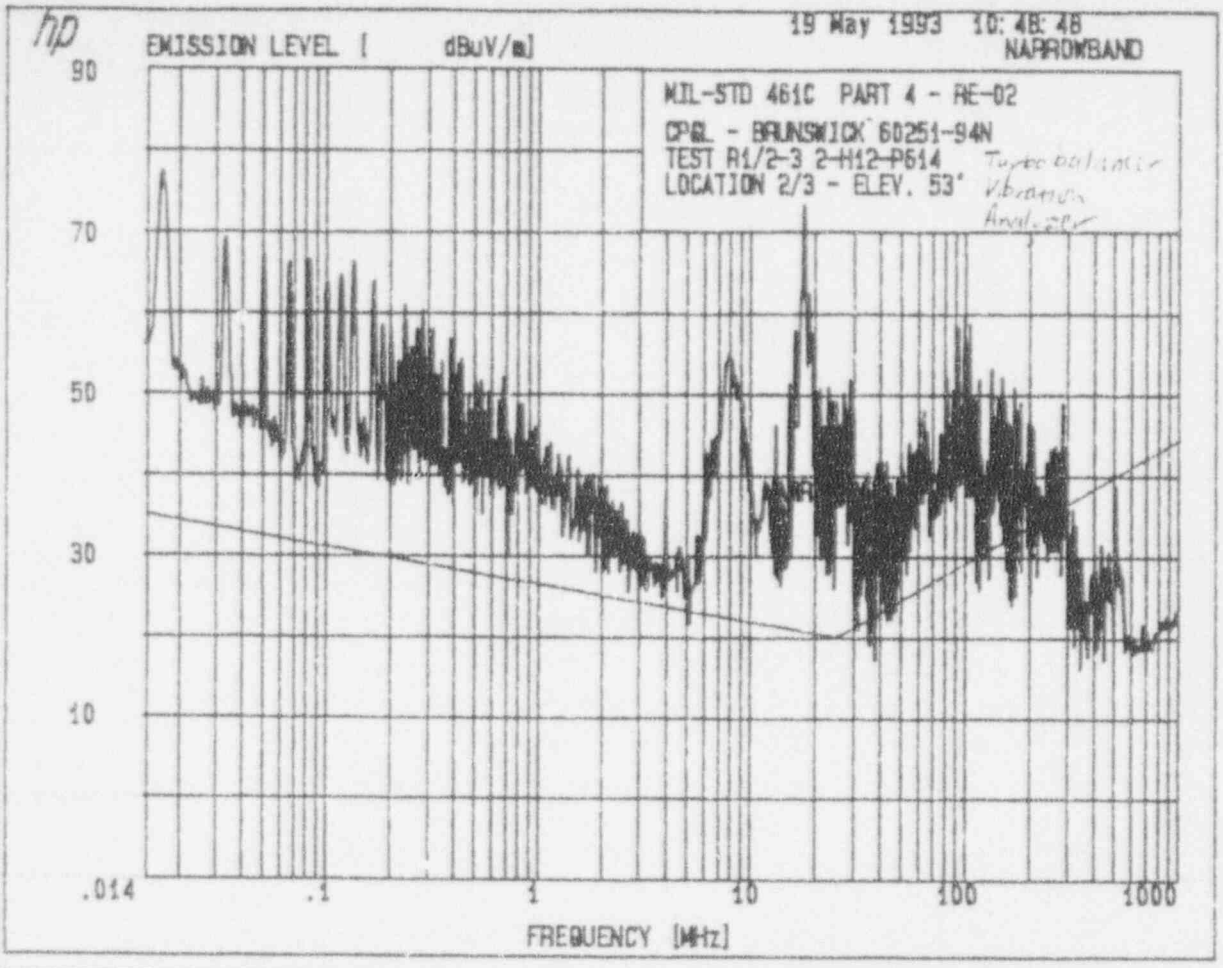

hp
EMISSION LEVEL [dBuV/m/MHz]
20 May 1993 01:38:20
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
RM1/2-252-H12-P601 FRONT
LOCATION 12
SONY GDM1960 MONITOR
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

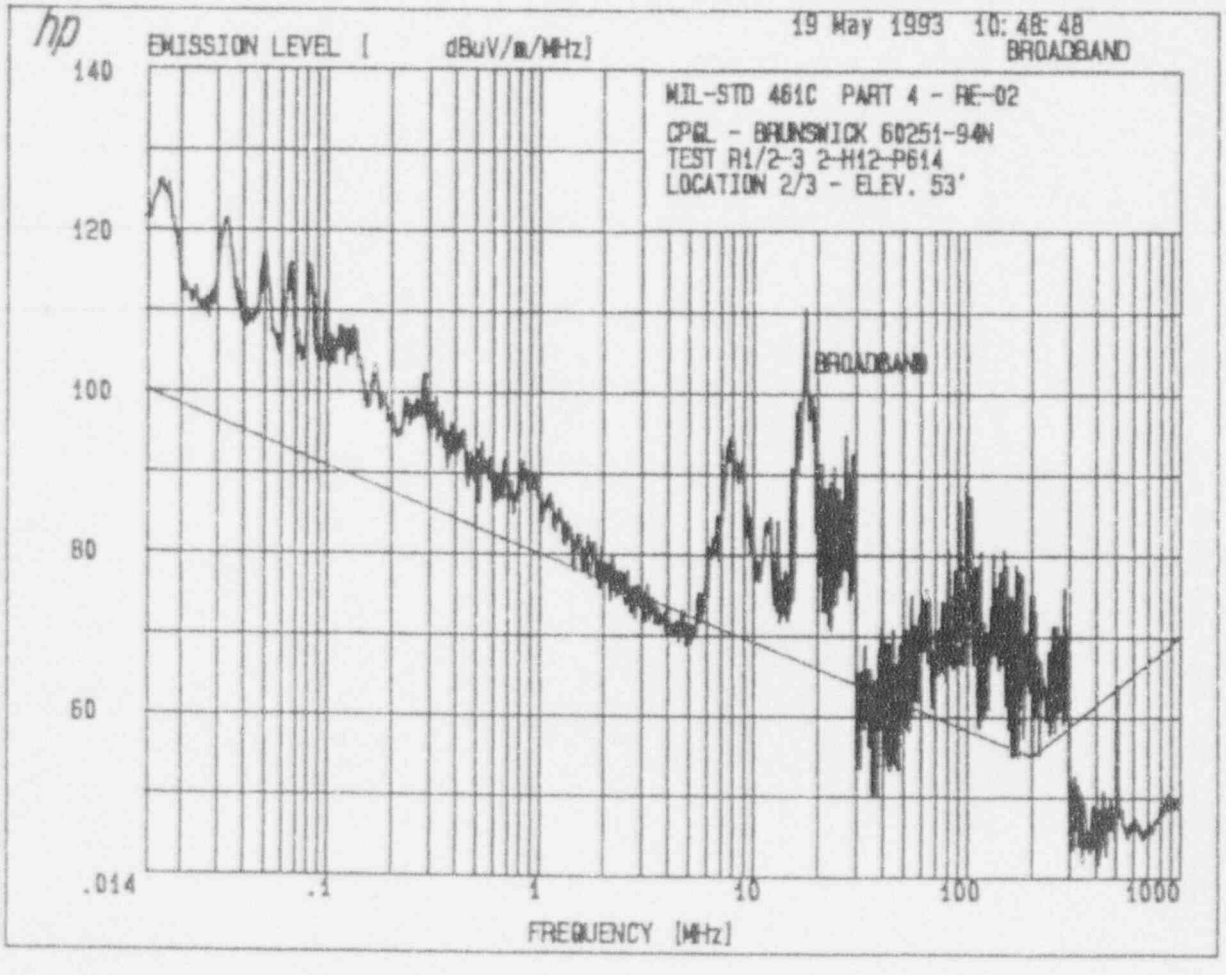

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 01:19:06
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
AM1/2-231-H12-P601 FRONT
LOCATION 12
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]

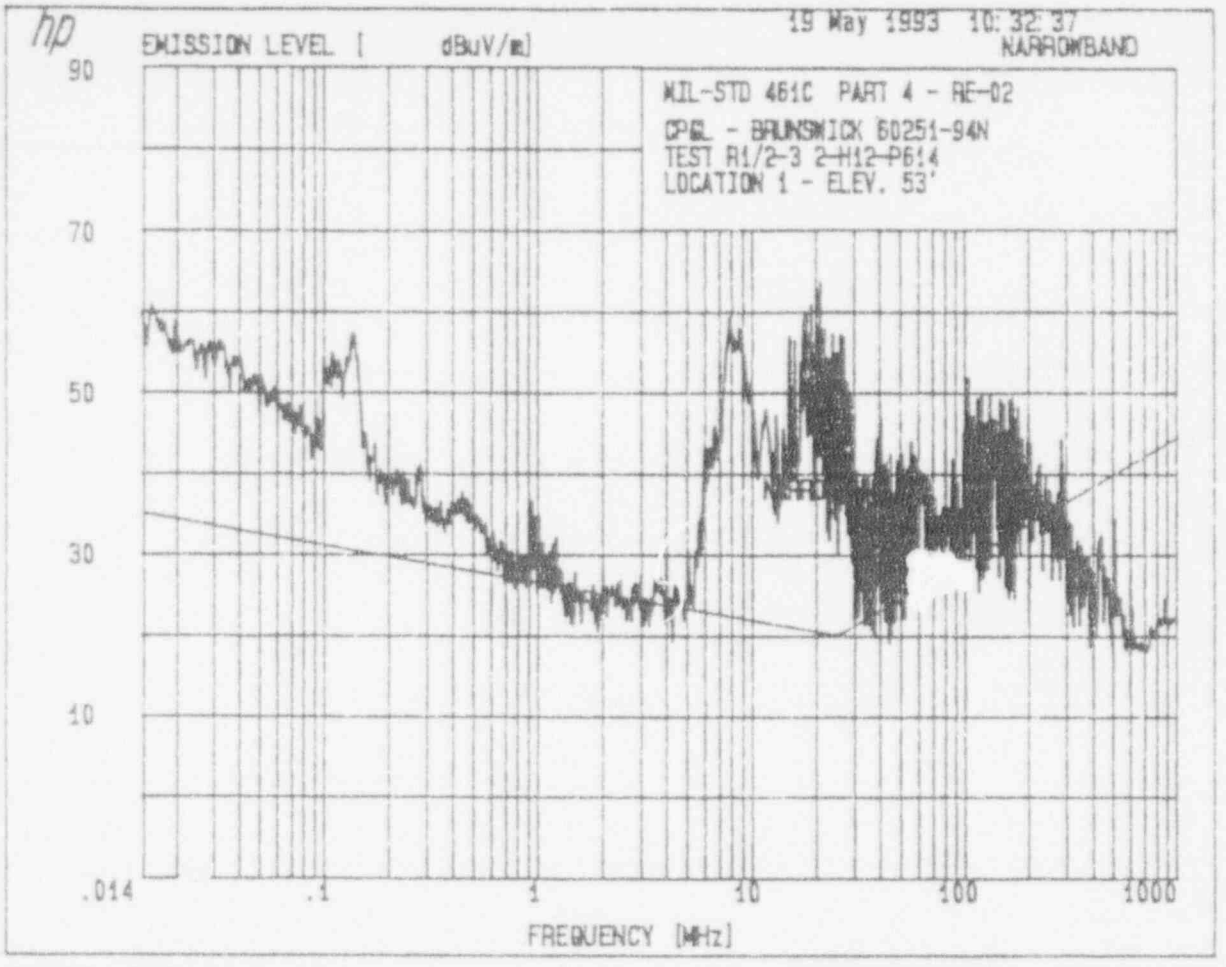

hp
EMISSION LEVEL [dBuV/m/MHz]
20 May 1993 01:19:06
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
AM1/2-231-H12-P601 FRONT
LOCATION 12
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

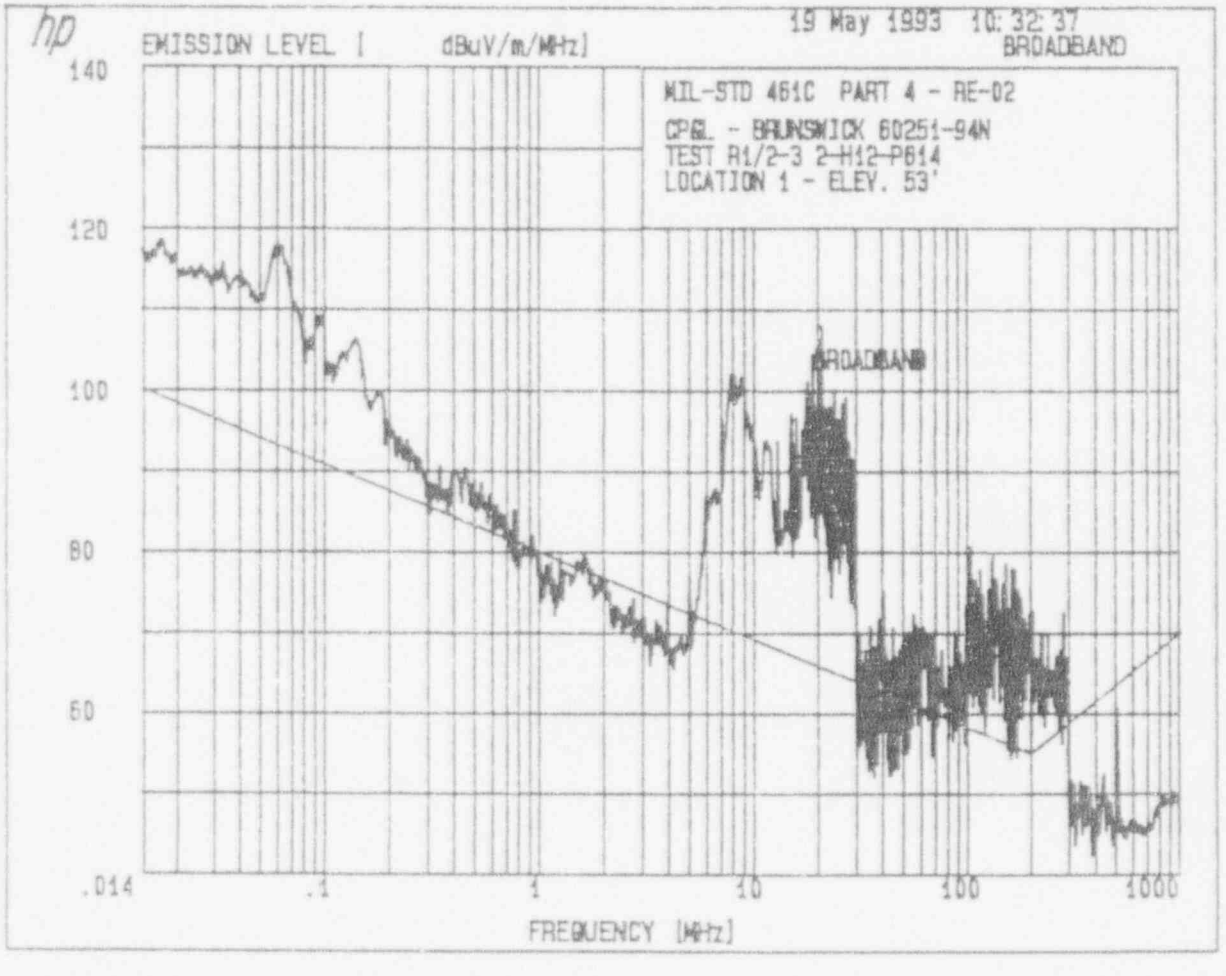

hp
19 May 2043 14:46:03
EMISSION LEVEL [dBpT]
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK 60251-94N
M1/2-2 2-H12-P601 FRONT
LOCATION 12
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]

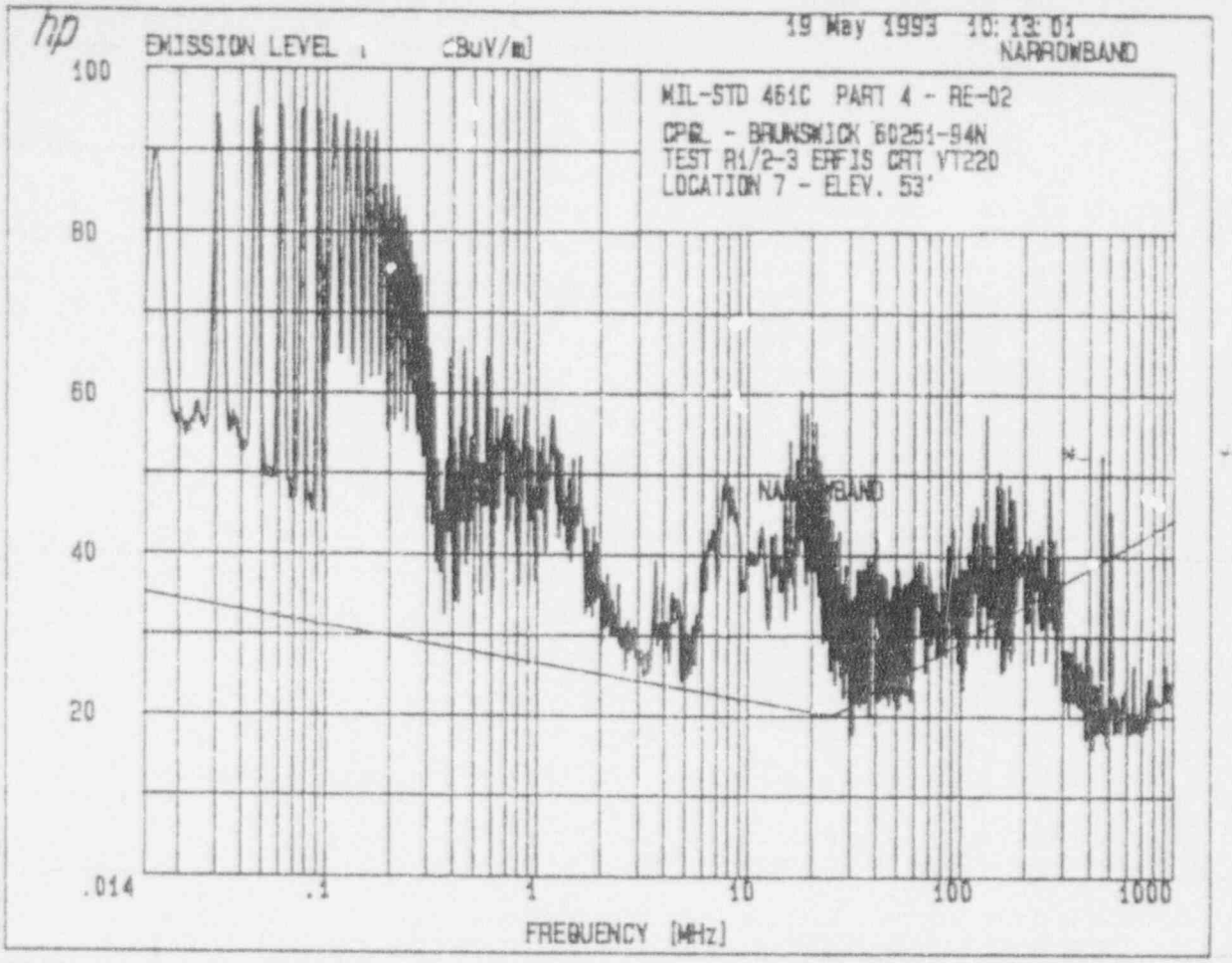

hp
19 May 2043 15:00:52
EMISSION LEVEL [dBpT]
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK 60251-94N
M1/2-2 1-H12-P601 FRONT
LOCATION 12
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m]
19 May 1993 10:48:48
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 2/3 - ELEV. 53'
Typed on Hewlett-Packard Vibration Analyzer
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]

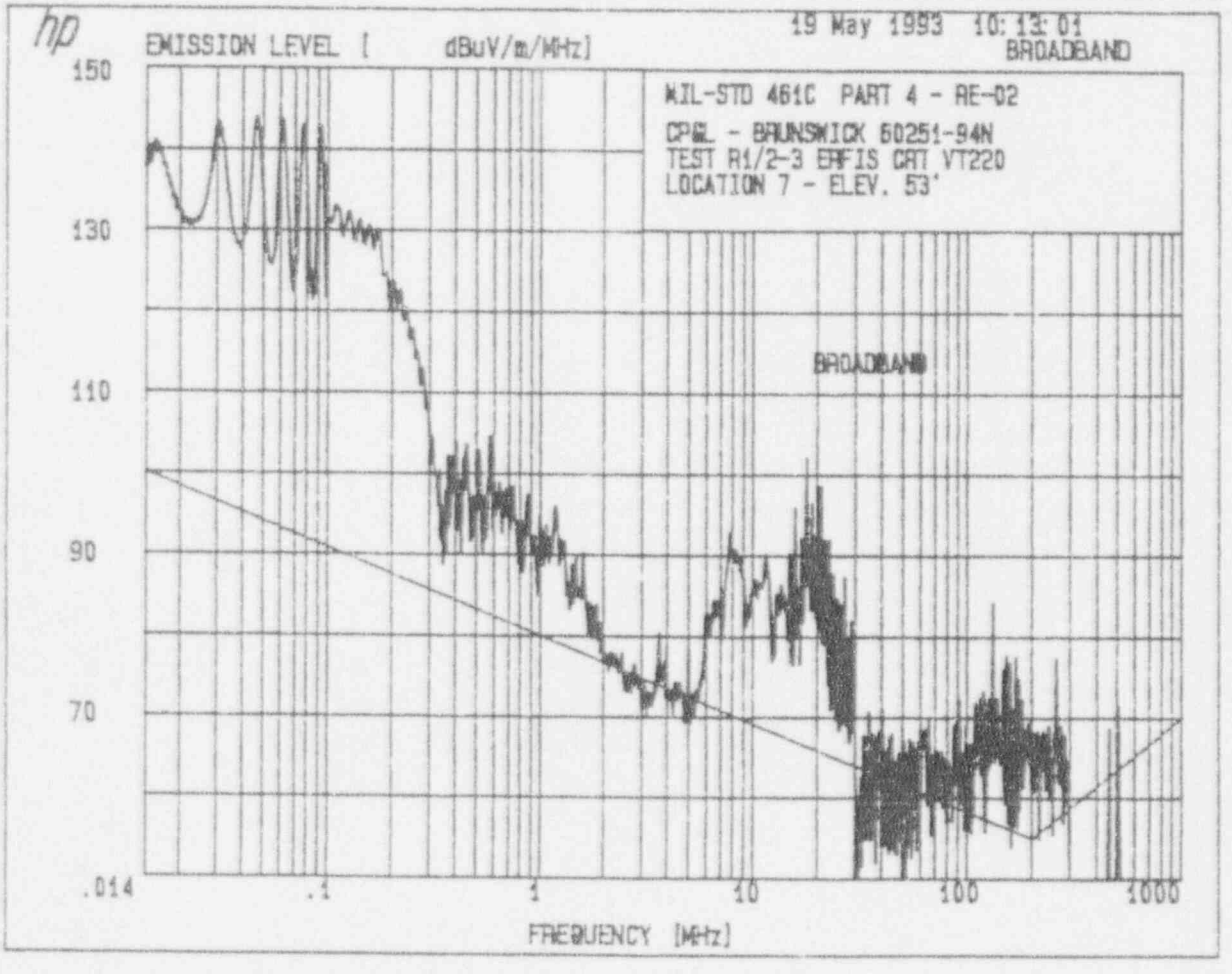

hp
EMISSION LEVEL [dBuV/m/MHz]
19 May 1993 10:48:48
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 2/3 - ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

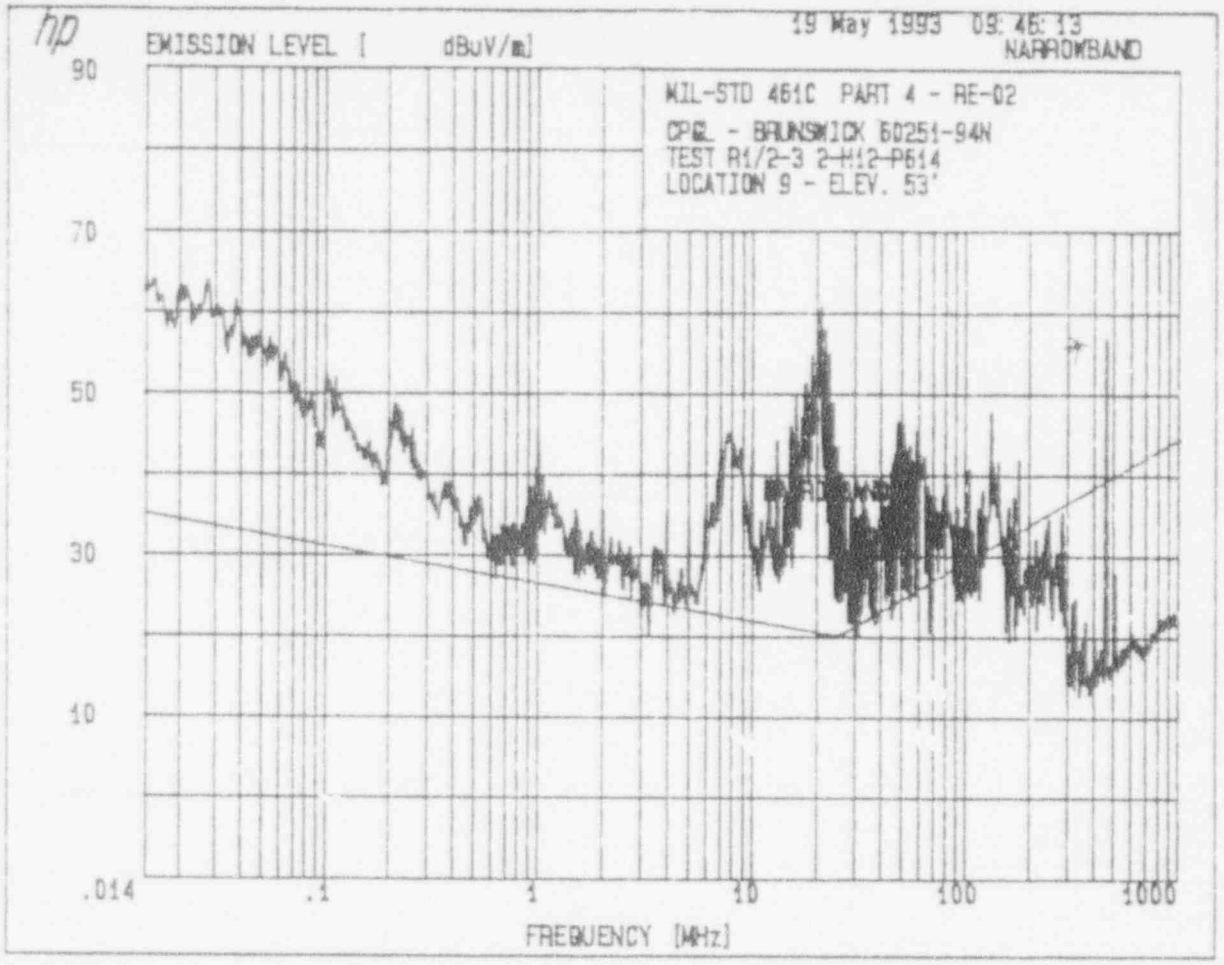

hp
EMISSION LEVEL [dBuV/m]
19 May 1993 10:32:37
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 1 - ELEV. 53'
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m/MHz]
19 May 1993 10:32:37
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 1 - ELEV. 53'
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

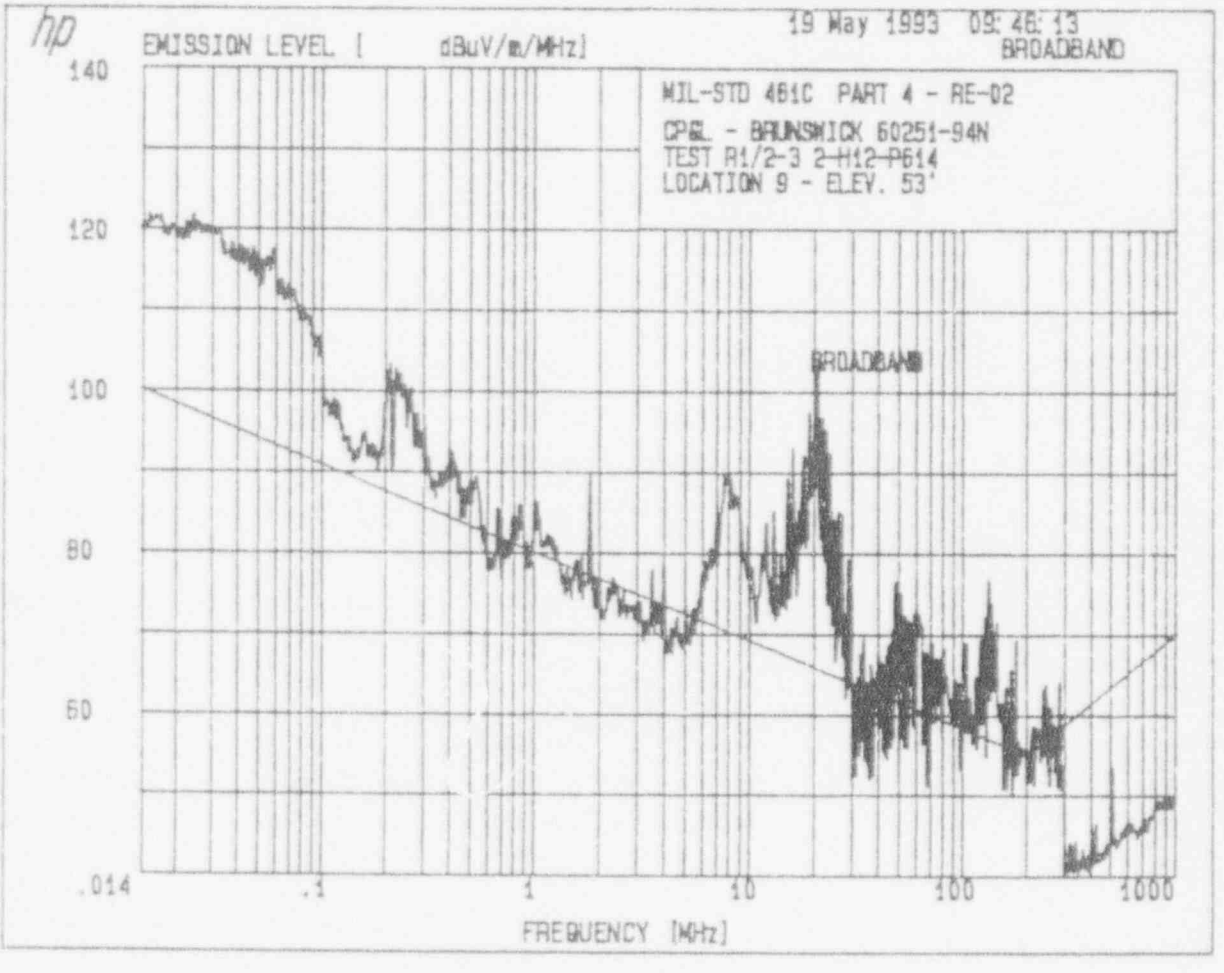


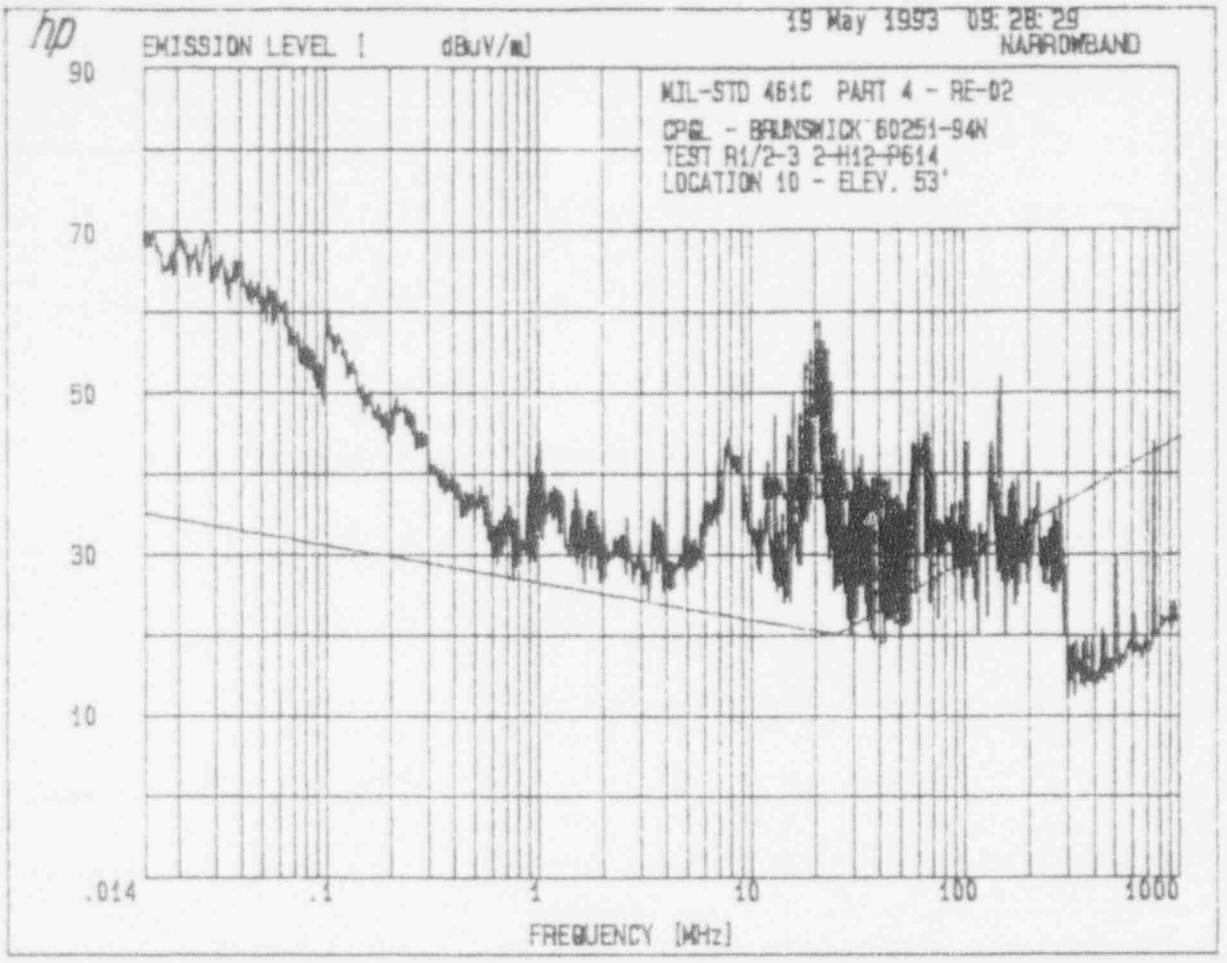
+- standard mil radio

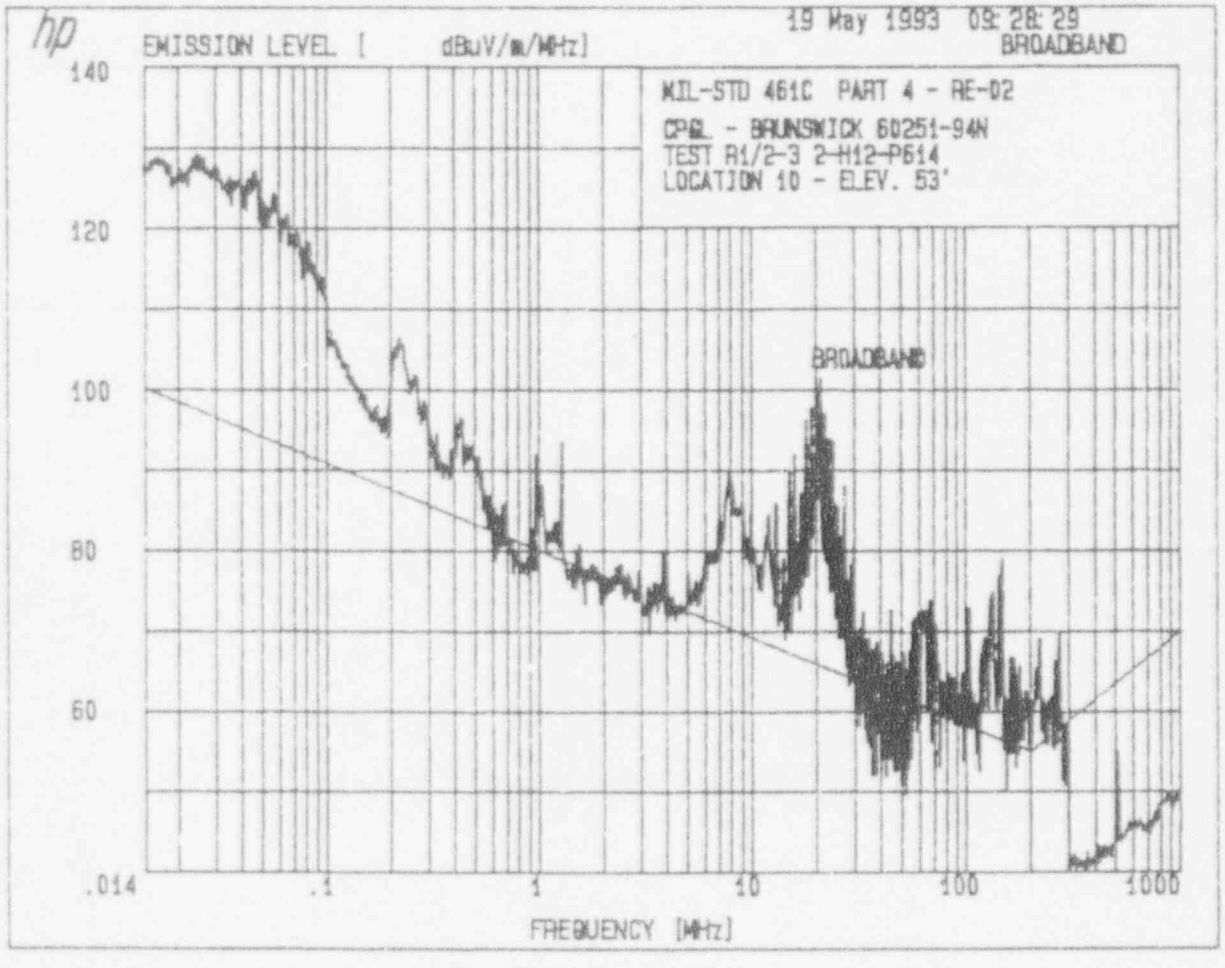


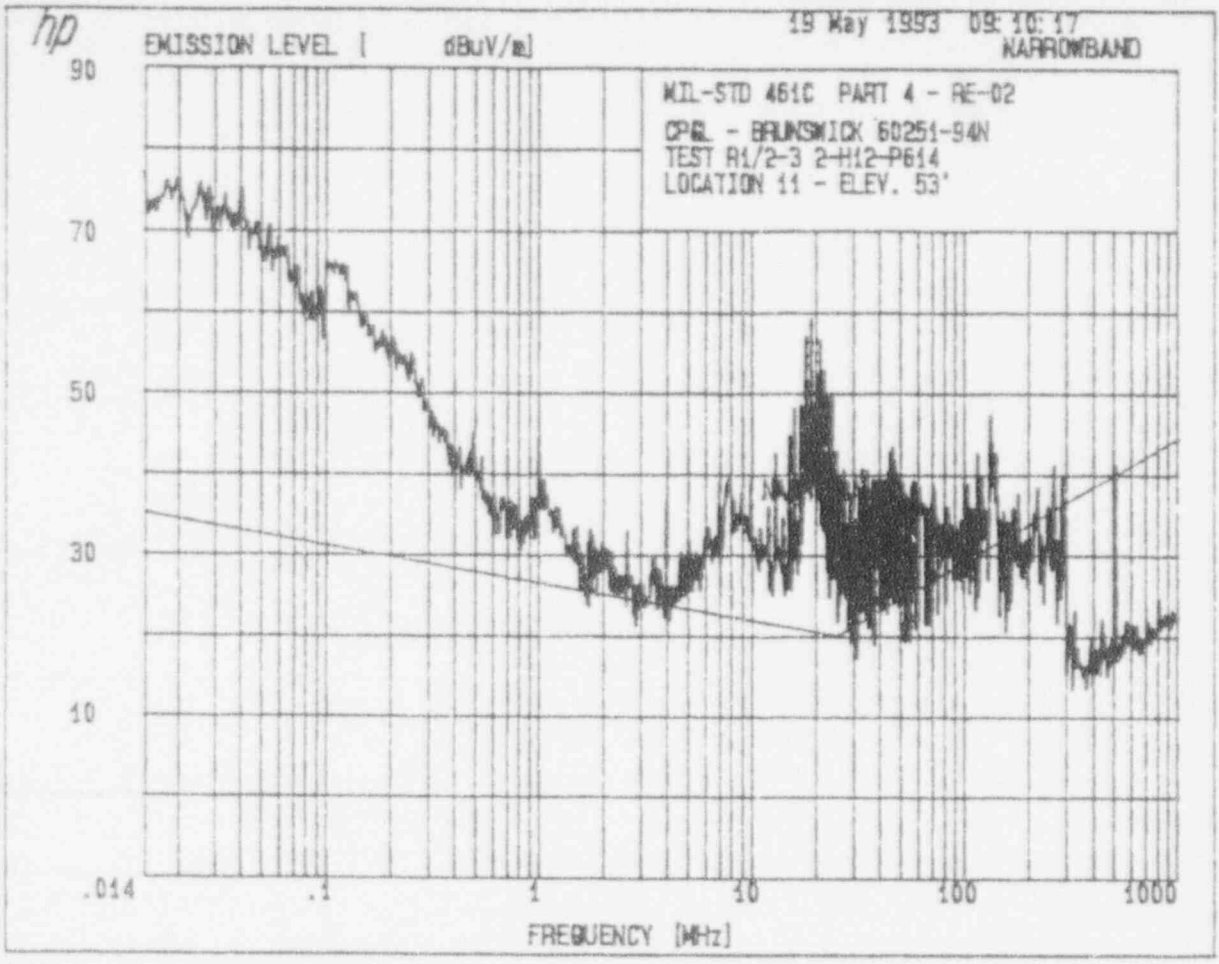


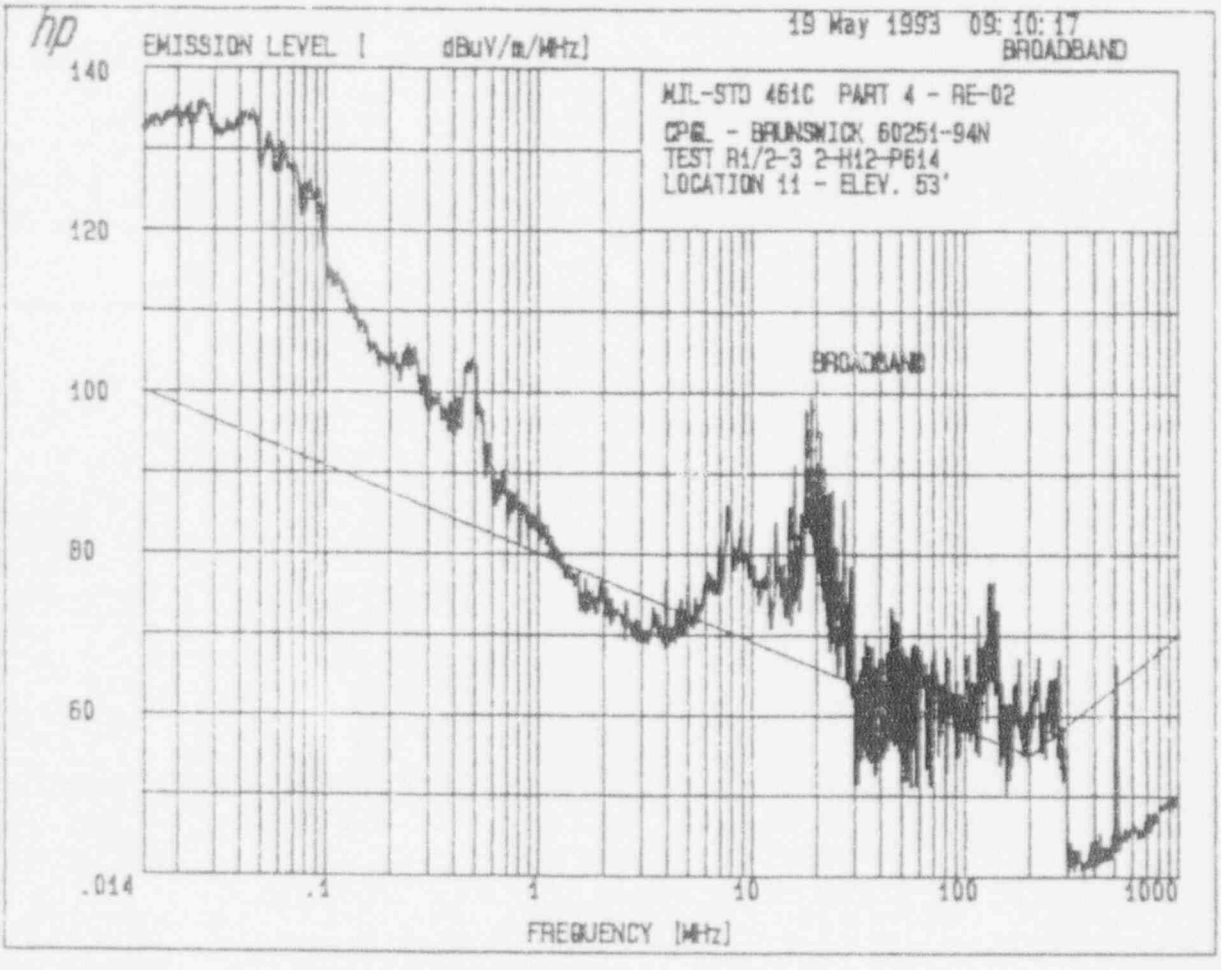
← Hand-held radio

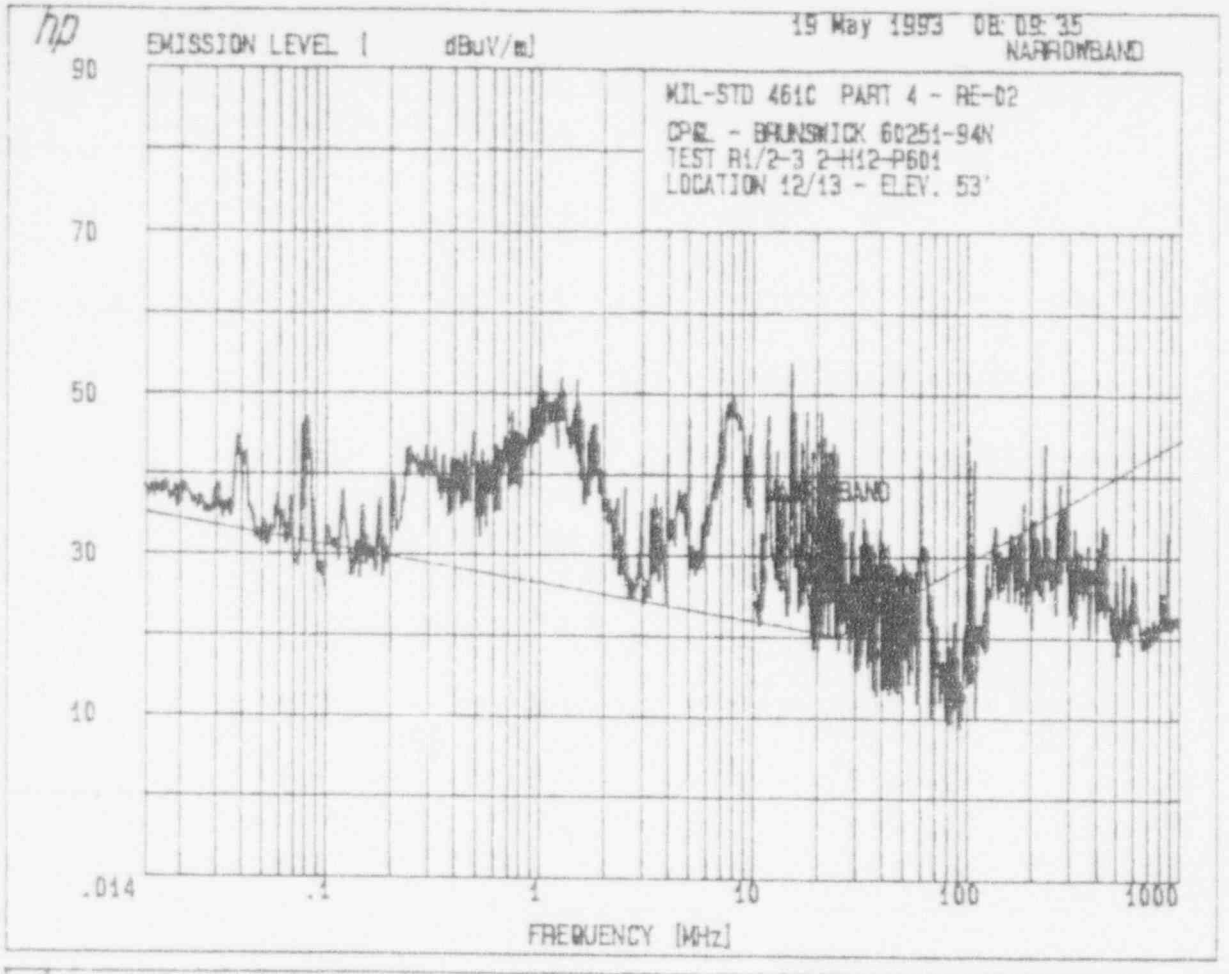


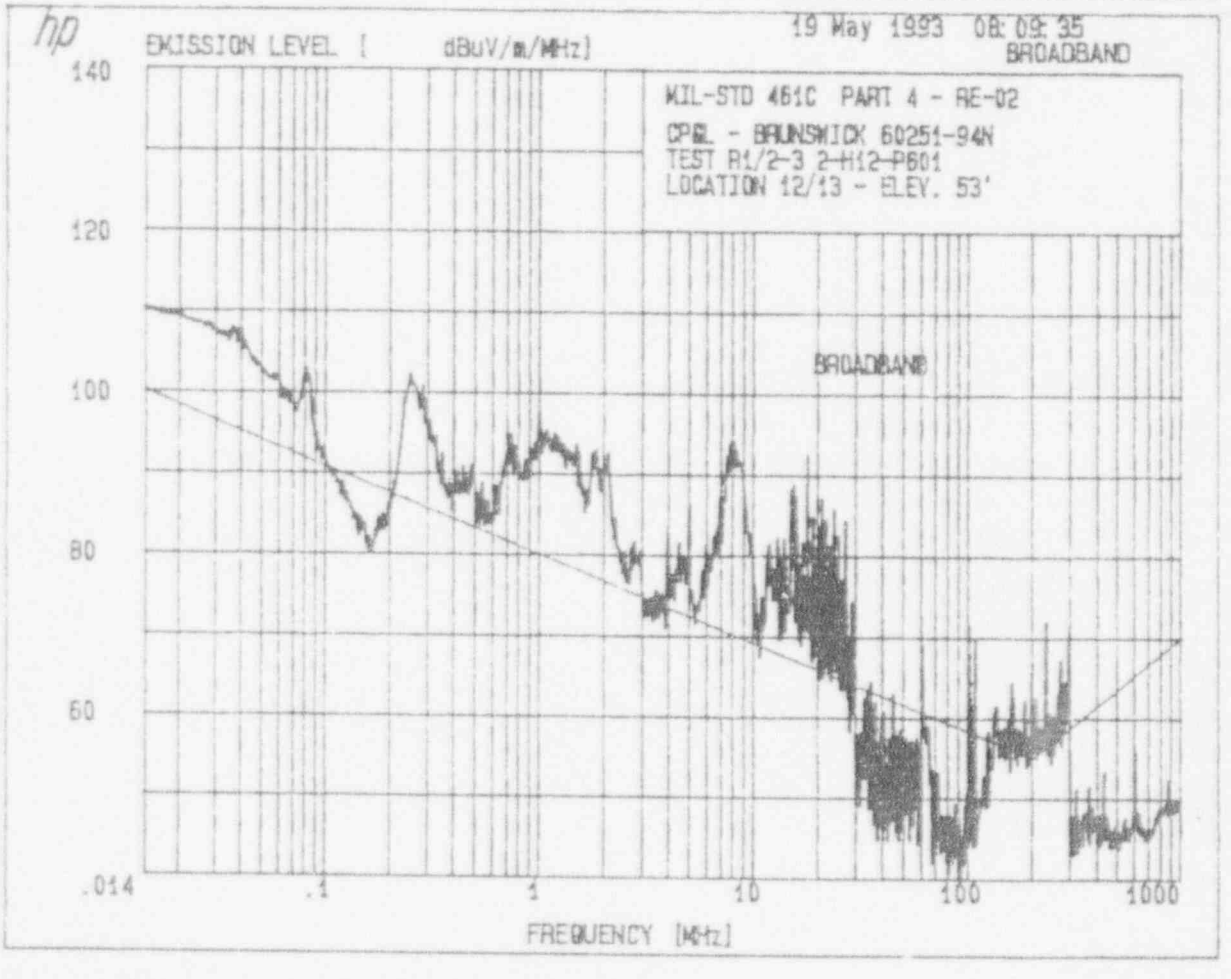

hp
EMISSION LEVEL [dBuV/m]
19 May 1993 09:28:29
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 10 - ELEV. 53'
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m/MHz]
19 May 1993 09:28:29
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P614
LOCATION 10 - ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m]
19 May 1993 09:10:17
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 50251-94N
TEST R1/2-3 2-H12-P614
LOCATION 11 - ELEV. 53'
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m/MHz]
19 May 1993 09:10:17
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 50251-94N
TEST R1/2-3 2-H12-P614
LOCATION 11 - ELEV. 53'
BROADBAND
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m]
19 May 1993 08:09:35
NARROWBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P601
LOCATION 12/13 - ELEV. 53'
90
70
50
30
10
.014
.1
1
10
100
1000
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m/MHz]
19 May 1993 08:09:35
BROADBAND
MIL-STD 461C PART 4 - RE-02
CP&L - BRUNSWICK 60251-94N
TEST R1/2-3 2-H12-P601
LOCATION 12/13 - ELEV. 53'
140
120
100
80
60
.014
.1
1
10
100
1000
FREQUENCY [MHz]

6.7 Radiated Emissions, Method RE02.1, Electric Field, Hand-held Radio Profile

Requirements

Radiated emissions, hand-held radios, were measured in accordance with NTS TP #60251-94N-1 and with the applicable portions of Test Method RE02 of MIL-STD-462. Reference Section 6.7, Test Setup.

Procedures

The Control Room Environment was set up and operated as specified in Section 4.0 of this report. The radios were tested, at each of their operating frequencies, in a continuous communication and keying communication mode of operation. The antenna used during the performance of this test were as follows:

Frequency	Antenna	Coaxial Cable
30 - 300 MHz	Biconical	25' of RG9B/U
300 - 1000 MHz	Log Periodic	25' of RG9B/U

Measurements were performed using the appropriate antenna with the corresponding coaxial cable connected to a Hewlett Packard Automated Microwave Measurement System, Model 8566S. The transmitting antenna axis orientation (hand-held radio) was changed through multiple axes with the radio inside the control room until a worst case level was detected. Other site specific radios and known sources of noise were "keyed" or activated as much as feasible. Plots were generated for narrow band measurements. Reference Section 6.7, Data Sheets.

6.7 Radiated Emissions, Method RE02.1, Electric Field, Hand-held Radio Profile

Requirements (continued)

*Note: In past years, actuations of engineered safety features or loss of offsite power events have been caused by Electromagnetic Interference (EMI) from hand-held communications radios (walkie-talkies). Electromagnetic Interference can cause induced voltage/current signals in electronic circuitry.

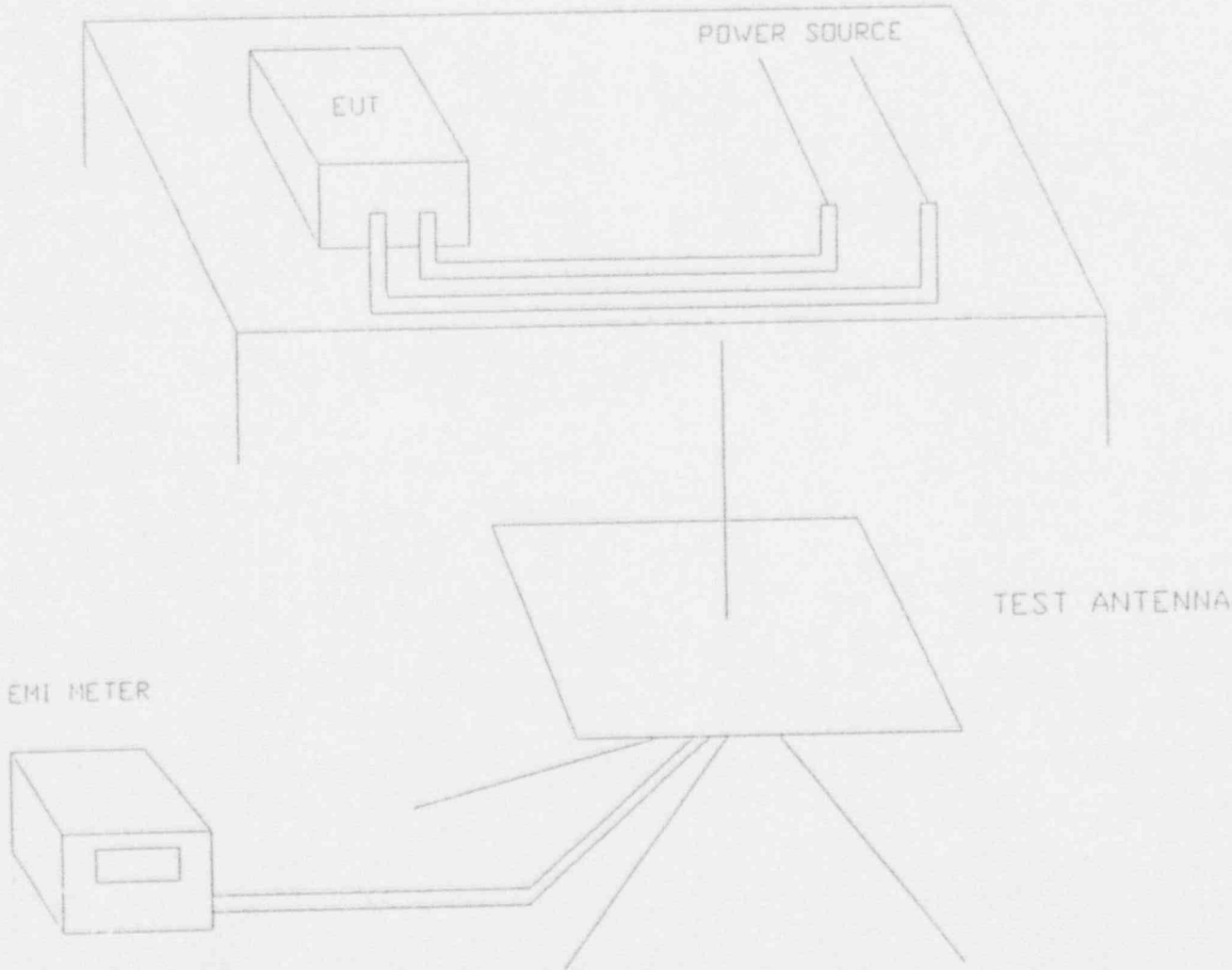
These events are significant because the actuations that occurred resulted in plant transients that challenged plant operators and safety systems. Due to the fact that this EMI was spurious in nature, event cause was difficult to determine.

The use of portable radios was later addressed in IE Information Notice No. 83-83: Use of Portable Radio Transmitters Inside Nuclear Power Plants.

Test Results

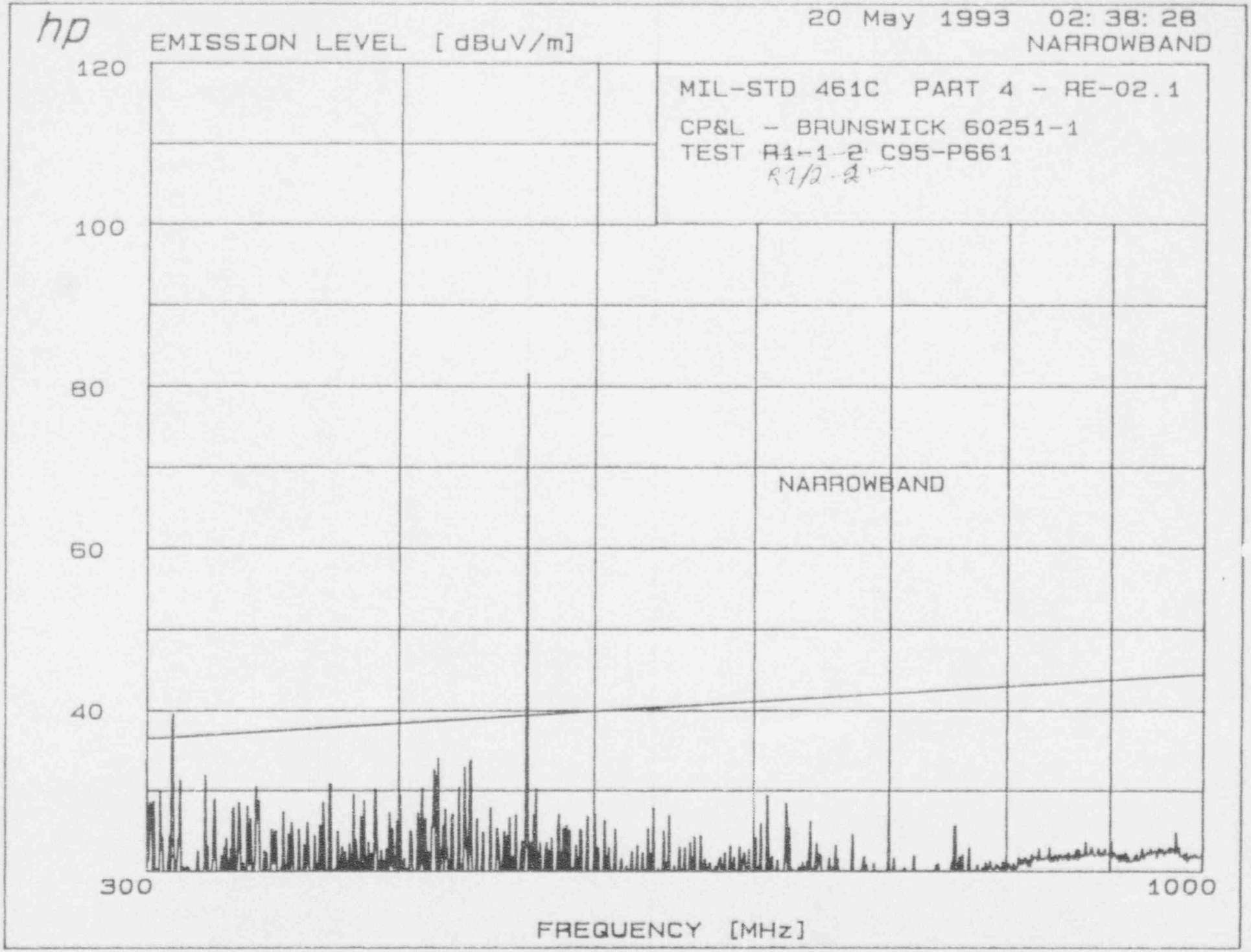
Test		Results
RE02.1	Radiated Emissions, Hand-Held Radio Profile	TBD*

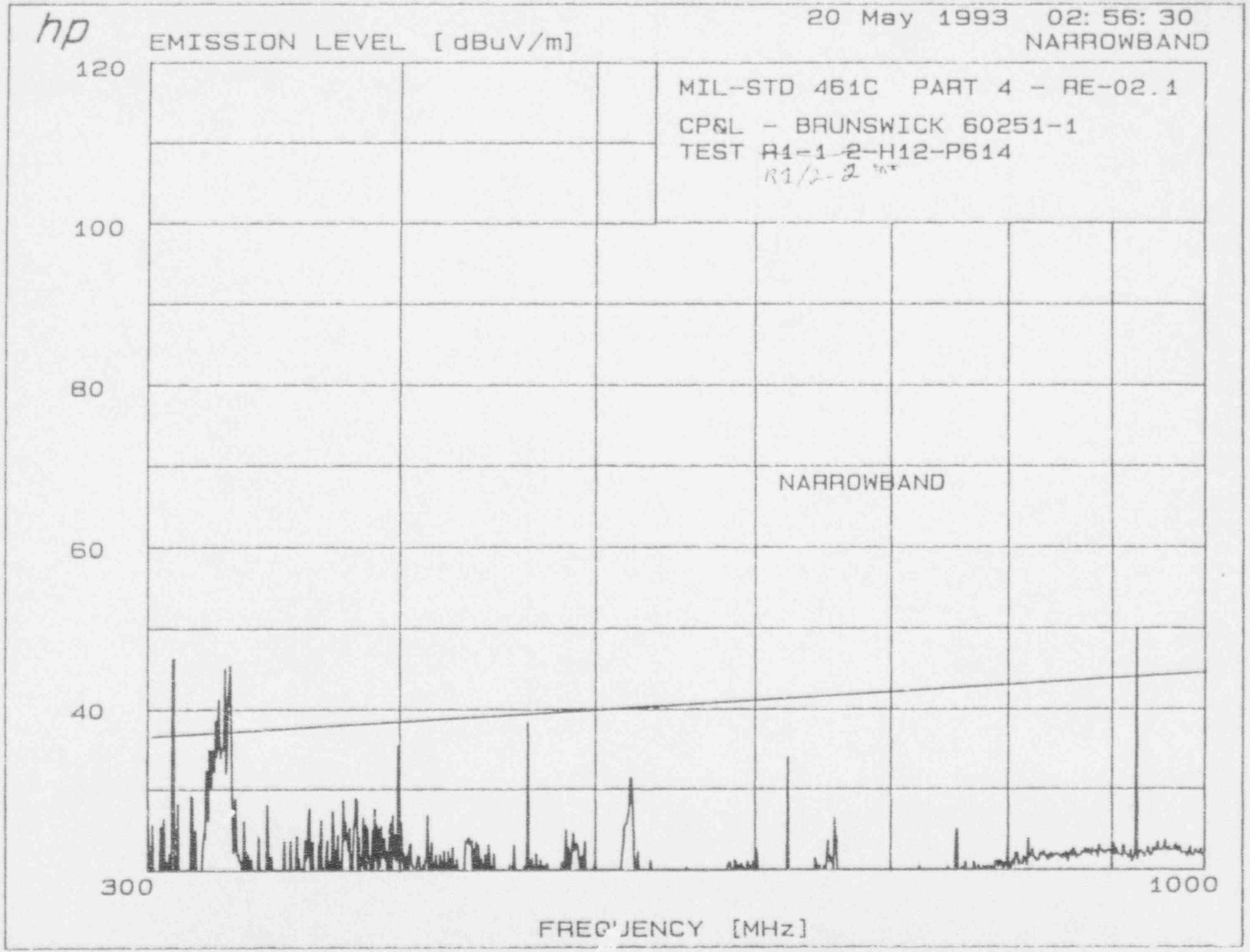
*See NTS Report #60251-94N-2.

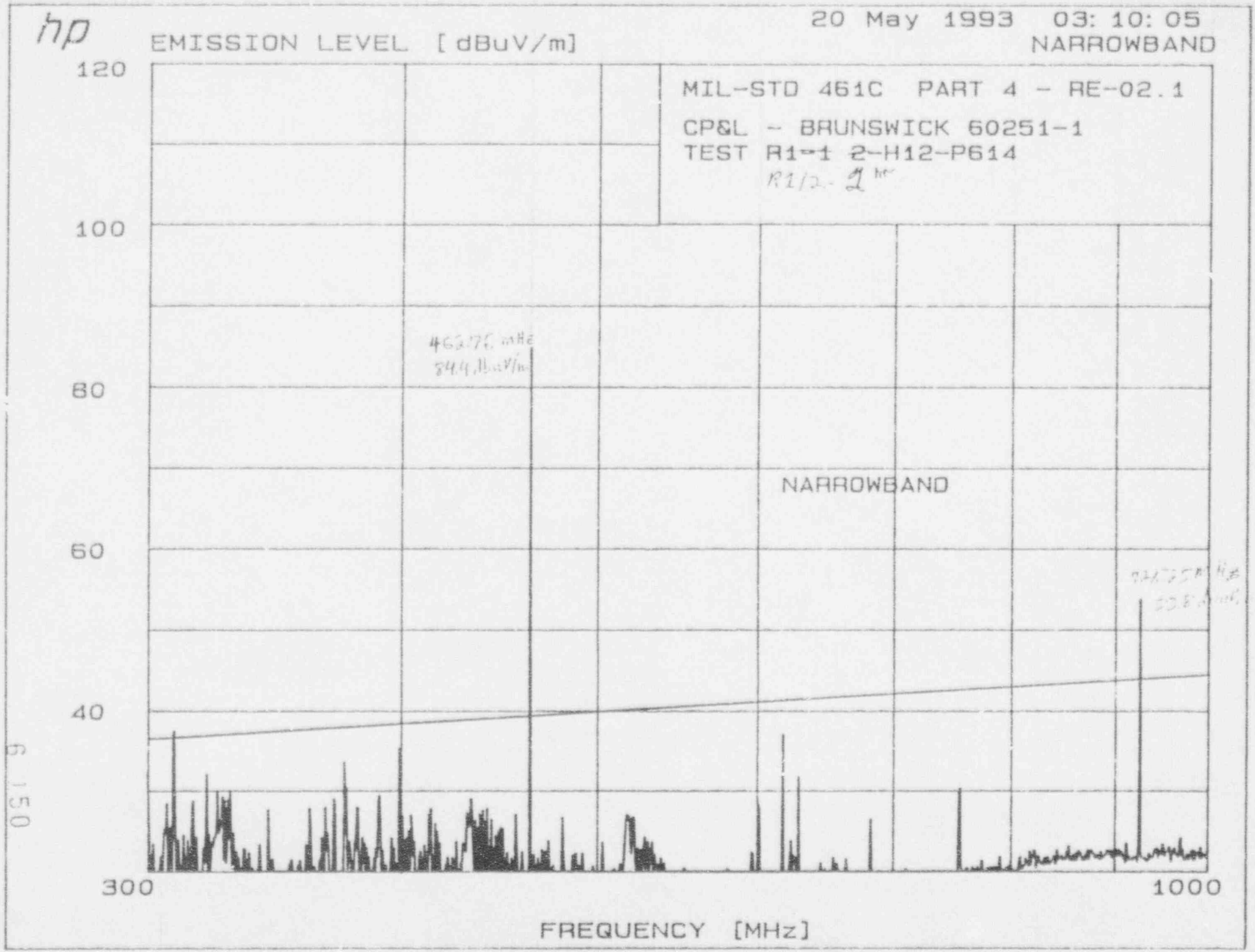


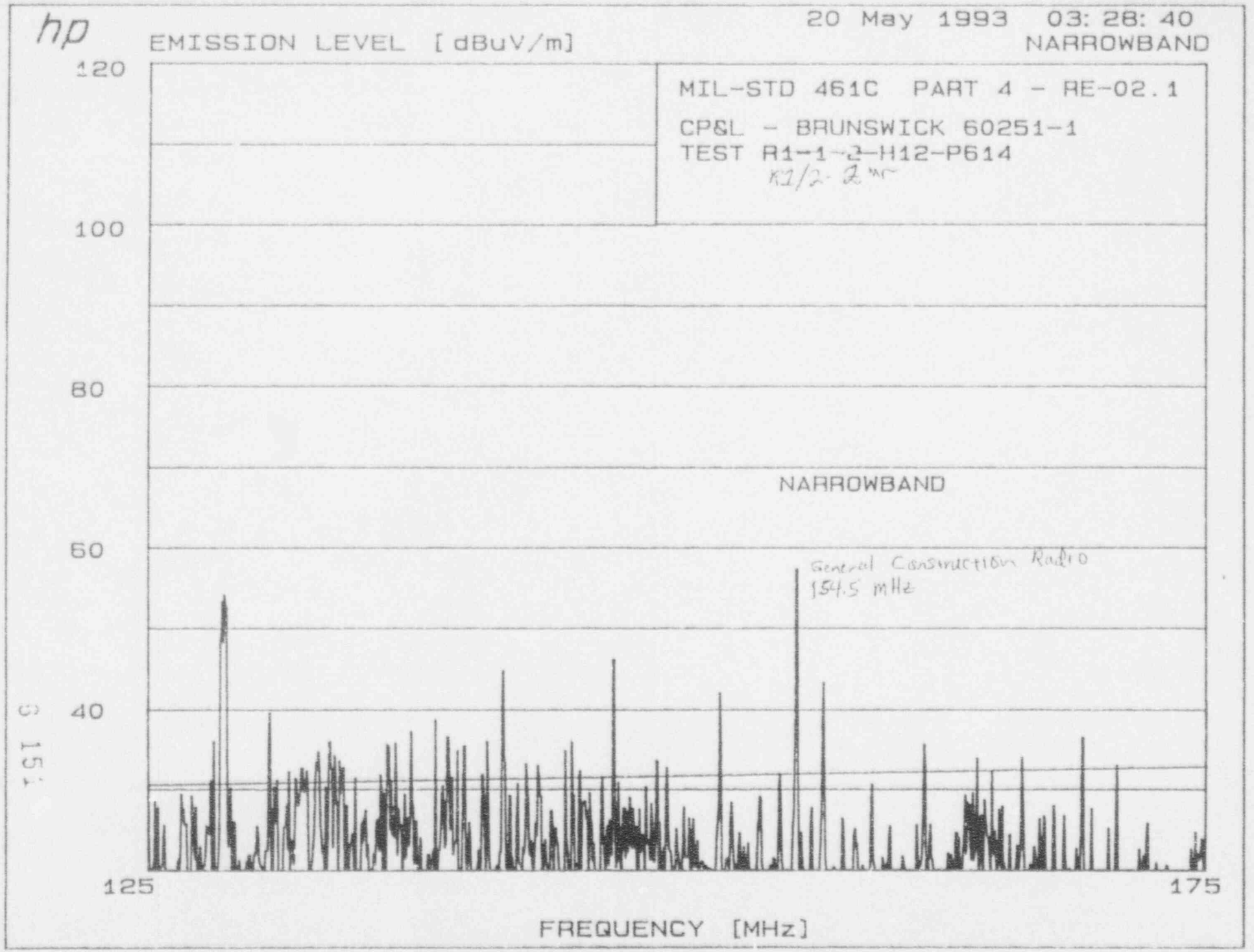
RADIATED EMISSIONS, METHOD RE02.1, TYPICAL TEST SETUP

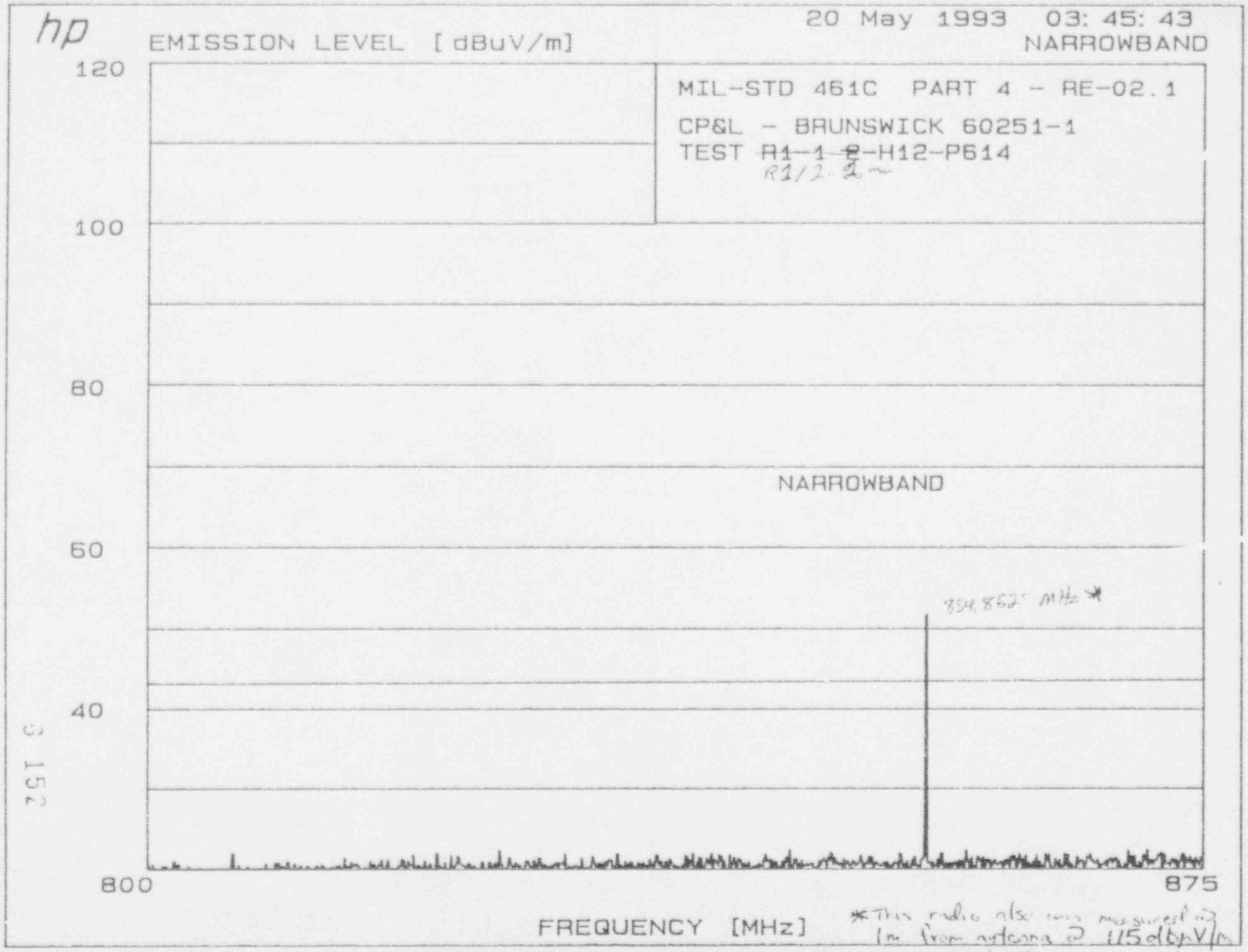
RE02.1 DATA SHEETS

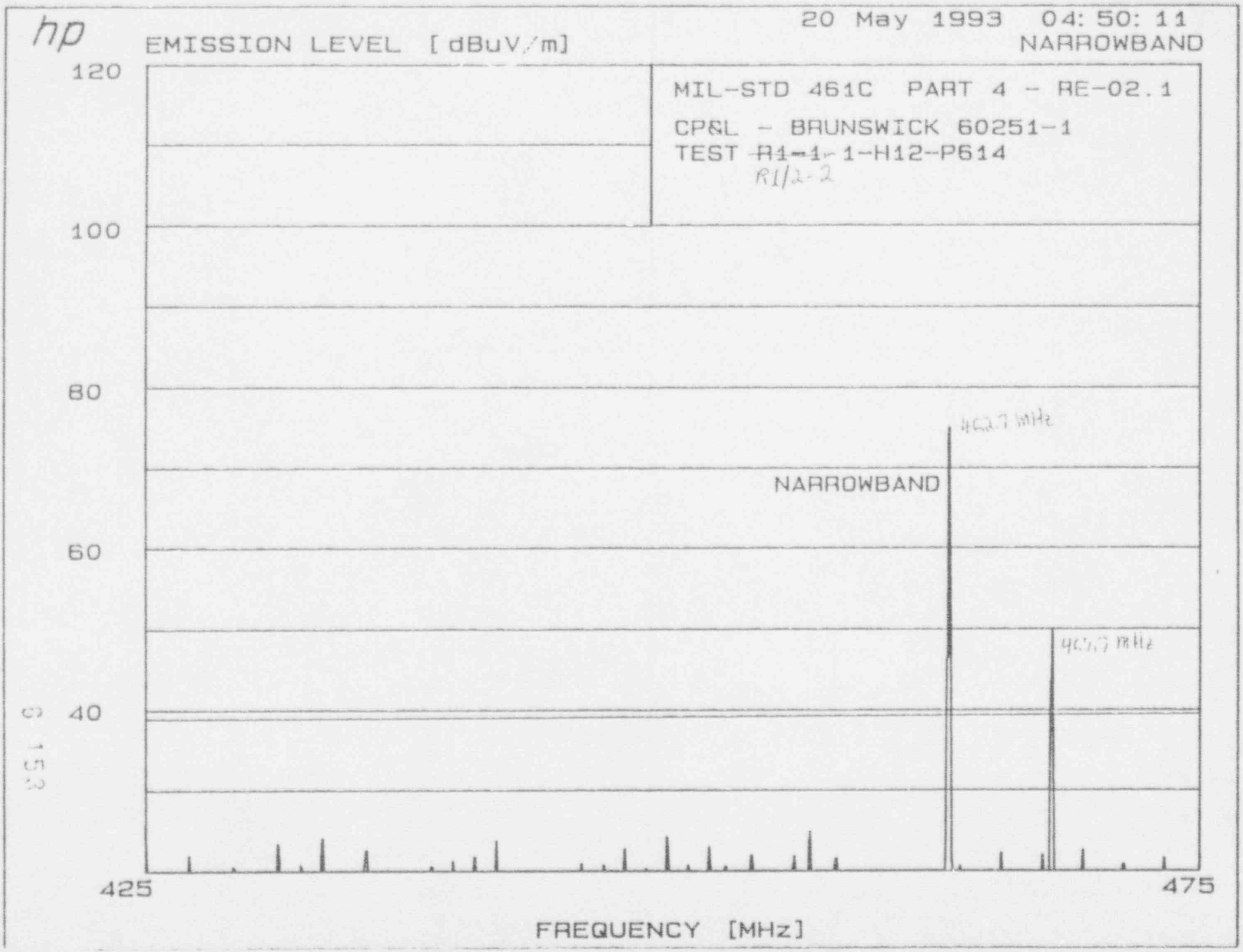

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 02:38:28
NARROWBAND
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1-2 C95-P661
R1/2-2
120
100
80
60
40
NARROWBAND
300
1000
FREQUENCY [MHz]

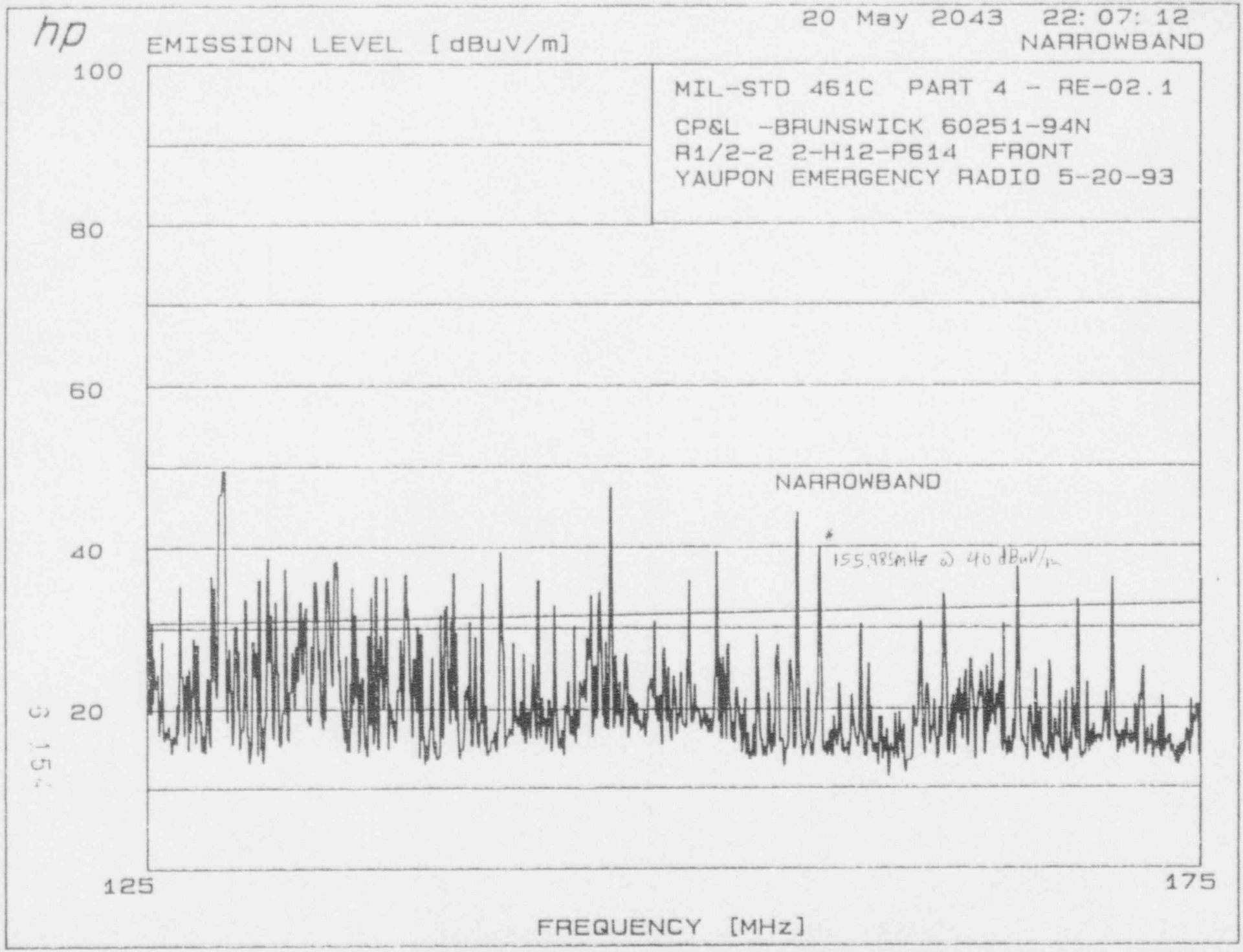

hp
EMISSION LEVEL [dBuV/m]
20 May 1993 02:56:30
NARROWBAND
120
100
80
60
40
300
1000
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1 2-H12-P614
R1/2-2 HT
NARROWBAND
FREQUENCY [MHz]

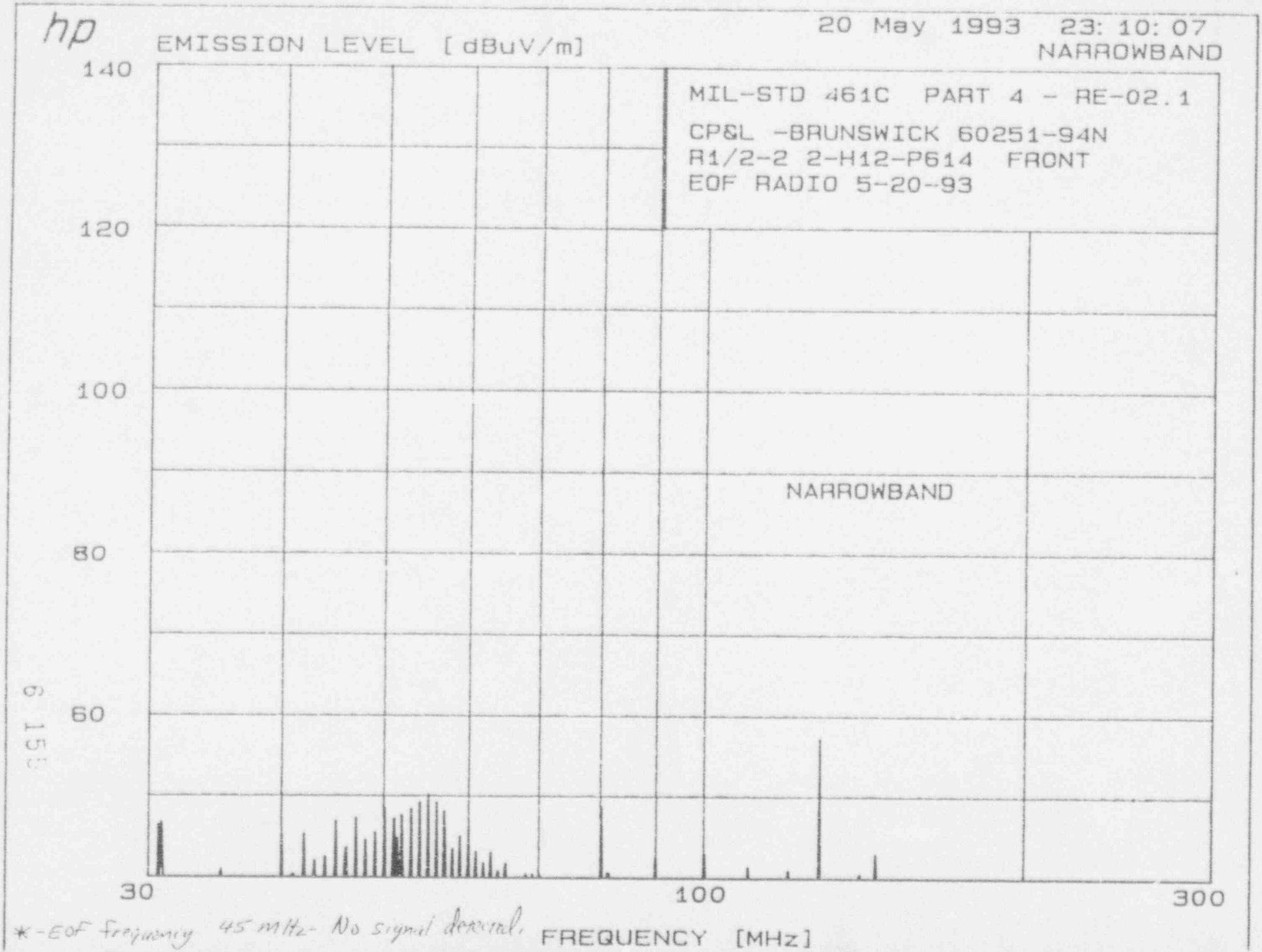

hp
20 May 1993 03: 10: 05
EMISSION LEVEL [dBuV/m]
NARROWBAND
120
100
80
60
40
300
1000
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1 2-H12-P614
R1/2 - 2 m
463.75 mHz
84.4 dBuV/m
NARROWBAND
FREQUENCY [MHz]
6.150


hp
20 May 1993 03: 28: 40
NARROWBAND
EMISSION LEVEL [dBuV/m]
120
100
80
60
40
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1-2-H12-P614
K1/2-2 mc
NARROWBAND
General Construction Radio
154.5 mHz
125
175
FREQUENCY [MHz]


hp
20 May 1993 03: 45: 43
EMISSION LEVEL [dBuV/m]
NARROWBAND
120
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1 R-H12-P614
R1/2.2m
100
80
NARROWBAND
60
354.862 MHz *
40
800
875
FREQUENCY [MHz]
* This radio also was measured @ 1m from antenna @ 115 dbuV/m


hp
20 May 1993 04:50:11
EMISSION LEVEL [dBuV/m]
NARROWBAND
120
100
80
60
40
MIL-STD 461C PART 4 - RE-02.1
CP&L - BRUNSWICK 60251-1
TEST R1-1-1-H12-P614
R1/2-2
462.7 MHz
NARROWBAND
467.7 MHz
425
475
FREQUENCY [MHz]


hp
20 May 2043 22:07:12
EMISSION LEVEL [dBuV/m]
NARROWBAND
100
80
60
40
20
MIL-STD 461C PART 4 - RE-02.1
CP&L -BRUNSWICK 60251-94N
R1/2-2 2-H12-P614 FRONT
YAUPON EMERGENCY RADIO 5-20-93
NARROWBAND
155.985MHz @ 40 dBuV/m
125
175
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBuV/m]
20 May 1993 23:10:07
NARROWBAND
MIL-STD 461C PART 4 - RE-02.1
CP&L -BRUNSWICK 60251-94N
R1/2-2 2-H12-P614 FRONT
EOF RADIO 5-20-93
140
120
100
80
60
NARROWBAND
30
100
300
FREQUENCY [MHz]
* - EOF frequency 45 MHz - No signal detected.

7.0 TEST EQUIPMENT LIST

The test equipment listed in Section 7.0 of this test report is the actual test equipment used during this test program. All test equipment was checked prior to testing to assure that it is within calibration, and it was allowed sufficient warm-up time to guarantee measurement accuracy.

Calibration is performed and checked on a routine basis in accordance with NTS TP #60251-94N-1 and with MIL-STD-45662A, using standards traceable to the National Institute of Standards and Technology (NIST).

LIST GENERATED ON : 06/10/93

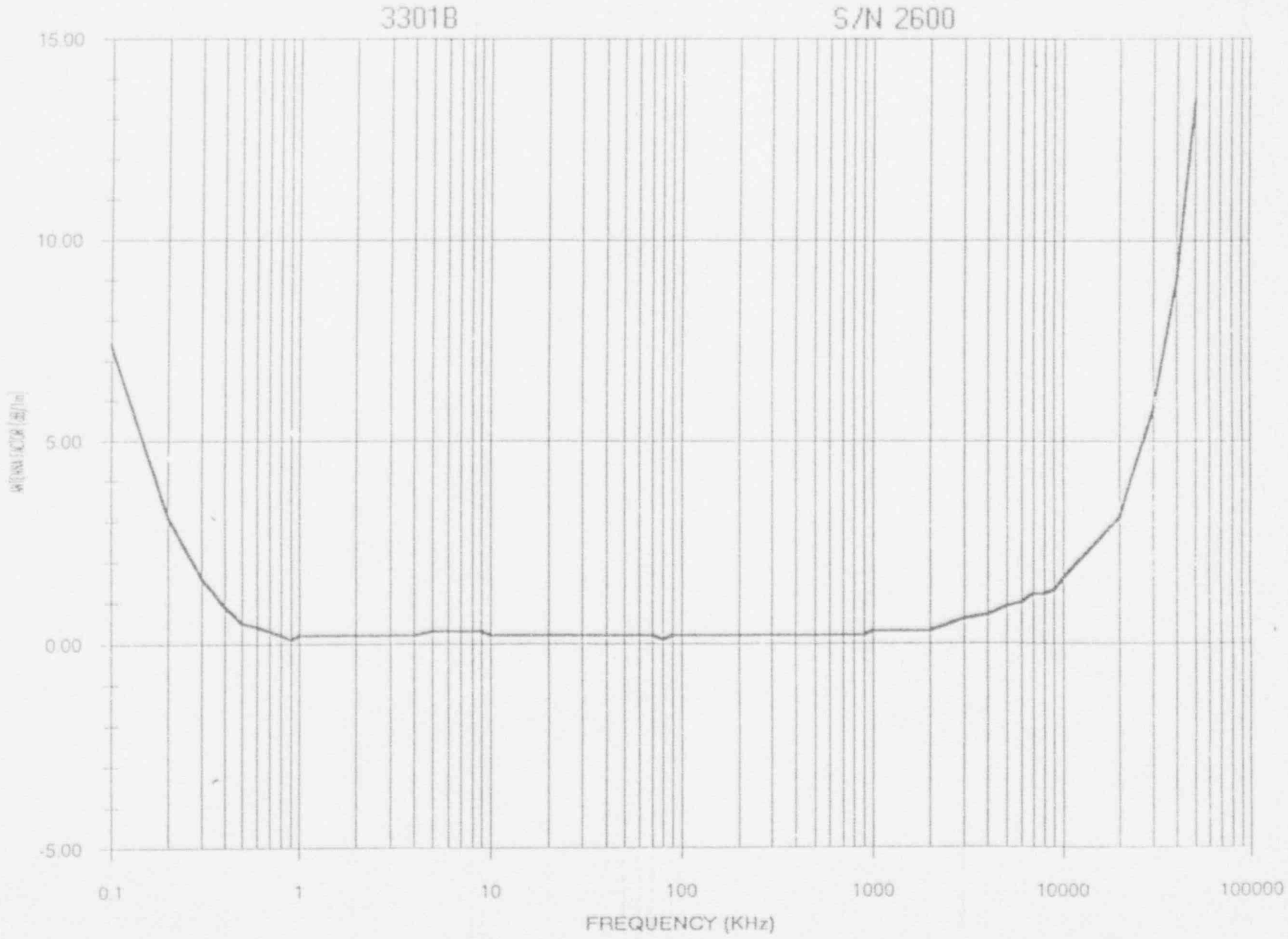
NTS Equipment List
FOR MJO # 60251-1 -94N

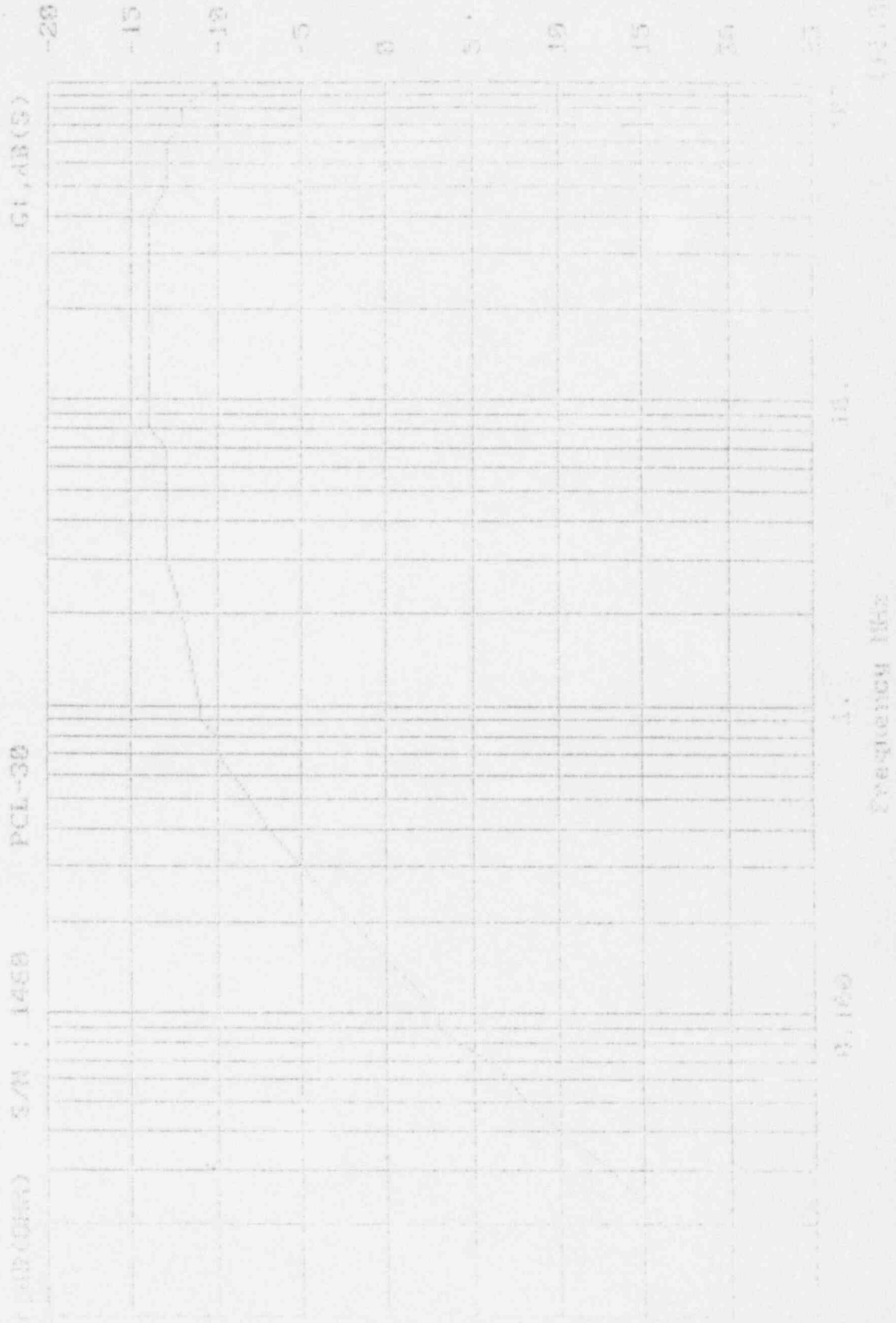
INV #	DESCRIPTION	MANUFACTURER	MODEL #	SERIAL #	RANGE	ACCURACY	CAL FREQ (months)	CAL DUE DATE	CAL STATUS
ML353	DIGITAL MULTIMETER	FLUKE	8050A	2244408	10 U -1000 VDC	DCV:+/-(.03%RDG	6	10/09/93	CAL
ML390	GAUSSMETER	MAGNETIC INST.	912	24525	10 mG TO 100 KG	DC:+/-(.4%RDG+	12	05/16/93	CAL
ML565	AC-DC CURRENT PROBE	FLUKE	Y8100	4165116	0-200 AMP DC TO 1 KHZ	0-200HZ:+/-2%FS	12	09/24/93	CAL
MW312	ATTENUATOR SET	WEINSHEL	AS-5A	1239	3dB-6dB-10dB-20dB	+/-.01dB	6	05/25/93	CAL
MW392	ATTENUATOR	KAY	432D	146-74	1-101dB, 50 OHMS	+/-.6 TO	6	11/13/93	CAL
MW399	ATTENUATOR	WEINSCHEL	47-10-34	AR8807	DC TO 18 GHZ,10 dB,	+/- .5dB	6	06/10/93	CAL
WA419J	PLOTTER	HEWLETT PACKARD	7475A	2641V10784	N/A	N/A			NCR
	RENTAL CURRENT PROBE	A.H. SYSTEMS	BCP-200/510	508	20 Hz TO 1 MHz	N/A	12	11/06/93	CAL
	RENTAL CURRENT PROBE	A.H. SYSTEMS	BCP-200/511	526	1 KHz TO 100 MHz	N/A	12	11/06/93	CAL
	RENTAL SPECTRUM ANALYZER	HEWLETT PACK.	190849F	8566B				10/17/93	CAL
	RENTAL DISPLAY	HEWLETT PACK.	145513B					N/A	
	RENTAL DISK DRIVE	HEWLETT PACK.	172057A	9153C				N/A	
	RENTAL CPU	HEWLETT PACK.	1455BA	300				N/A	
	RENTAL COMPUTER	TOSHIBA	T3200					05/08/93	CAL
	RENTAL SCOPE	TEK	TDS520					10/14/93	CAL

CALIBRATION ABBREVIATIONS

UWCE - USE WITH CALIBRATED EQUIPMENT
CBU - CALIBRATE BEFORE USE
NQM - NOT USED FOR QUANTITATIVE MEASUREMENTS
CAL - CALIBRATED

8.0 ANTENNA/PROBE CORRECTION FACTORS


3301B
S/N 2600
15.00
10.00
5.00
0.00
-5.00
0.1
1
10
100
1000
10000
100000
FREQUENCY (KHz)



INSTRUCTIONS: Add the transfer conductance in dB(S) shown above to convert the two-terminal detection system voltage i
conducted current. For example; if the factor at 20 kHz is +8 dB(S) and the two-terminal voltage is 60 dB(µV), th
conducted current is 68 dB (µA). (Or in linear terms: 1000 µV x 2.5 S = 2500 µA.)

A.H. SYSTEMS INC.
9710 COZYCROFT AVE.
CHATSWORTH, CA 91311
(818)998-0223

MODEL: BCP-200/511
BROADBAND CURRENT PROBE
DATE: 06-NOV-92
SN: 526

BROADBAND CURRENT PROBE CALIBRATION

Frequency	Transfer Impedance Factor (dB ohms)
1 KHz	-35.0
2 KHz	-29.0
5 KHz	-21.1
10 KHz	-15.0
20 KHz	- 9.9
50 KHz	- 4.2
100 KHz	- 1.2
200 KHz	0.5
500 KHz	1.0
1 MHz	1.0
2 MHz	1.0
5 MHz	1.0
10 MHz	1.0
20 MHz	1.0
50 MHz	1.0
100 MHz	0.6

CONVERSION FORMULA: dBuA = dBuV - dB ohms

A.H. SYSTEMS INC.
9710 COZYCROFT AVE.
CHATSWORTH, CA 91311
(818) 998-0223

MODEL: SAS-200/560
DATE: 06-NOV-92
SN: 588

LOOP ANTENNA MODEL SAS-200/560 CALIBRATION

Frequency	Antenna Factor 50 Ohm Load (dBpT/uV)	Antenna Factor 1M Ohm Load (dBpT/uV)
20 Hz	78.9	80.0
50 Hz	72.1	71.9
100 Hz	66.9	67.4
200 Hz	62.2	60.9
500 Hz	54.3	53.5
1 kHz	49.5	48.0
2 kHz	44.1	42.8
5 kHz	36.7	35.5
10 kHz	31.5	29.5
20 kHz	26.7	23.0
50 kHz	23.6	15.3
100 kHz	22.8	9.0
200 kHz	22.4	1.3
300 kHz	22.1	- 5.7
400 kHz	22.0	-17.5
420 kHz	22.1	-24.6
440 kHz	22.1	-34.6
460 kHz	22.0	-22.0
480 kHz	21.9	-17.1
500 kHz	21.7	-14.5
1 MHz	21.7	2.6
2 MHz	21.4	9.0

NVERSION FORMULAS: dBpT = dBuV + dBpT/uV
dBuV/m = dBpT + 49.5 dB

A.H. SYSTEMS INC.
9710 COZYCROFT AVE.
CHATSWORTH, CA 91311
(818)998-0223

MODEL: SAS-200/550-1
ACTIVE MONOPOLE ANTENNA
DATE: 06-NOV-92
SN: 611

ACTIVE MONOPOLE ANTENNA CALIBRATION

Frequency	Antenna Factor (dB)
10 KHz	- 4.6
20 KHz	- 4.6
50 KHz	- 4.5
100 KHz	- 4.6
200 KHz	- 4.6
500 KHz	- 4.6
1 MHz	- 4.5
2 MHz	- 4.6
5 MHz	- 4.6
10 MHz	- 4.6
20 MHz	- 4.5
30 MHz	- 4.2
40 MHz	- 3.7
50 MHz	- 2.8
60 MHz	- 1.8

ADD ANTENNA FACTOR PLUS CABLE LOSS TO RECEIVER READING
IN dBuV TO CONVERT TO FIELD INTENSITY IN dBuV/METER

A.H. SYSTEMS INC.
9710 COZYCROFT AVE.
CHATSWORTH, CA 91311
(818) 998-0223

1 METER CALIBRATION
GAIN AND ANTENNA FACTORS FOR BICONICAL ANTENNA

MODEL NUMBER: SAS-200/542
S/N : 464
DATE : 06-NOV-92

FREQUENCY (MHz)	ANTENNA FACTOR (dB)	GAIN dBi	GAIN NUMERIC
20	13.8	-17.5	.017
25	13.7	-15.4	.028
30	13.7	-13.9	.040
35	14.0	-12.8	.051
40	13.7	-11.4	.072
45	13.5	-10.1	.095
50	12.6	-8.37	.145
60	10.6	-4.79	.331
70	10.1	-2.95	.506
80	9.90	-1.59	.693
90	10.1	-.768	.837
100	10.5	-.253	.943
110	10.7	.374	1.09
120	11.2	.630	1.15
130	11.7	.825	1.20
140	12.2	.969	1.25
150	12.3	1.46	1.40
160	13.2	1.12	1.29
170	13.6	1.25	1.33
180	14.4	.952	1.24
190	15.2	.821	1.15
200	16.2	.067	1.01
210	17.0	-.308	.931
220	17.6	-.504	.890
230	18.5	-1.01	.790
240	19.0	-1.14	.767
250	19.6	-1.39	.725
260	19.9	-1.35	.732
270	20.0	-1.12	.771
280	20.7	-1.51	.706
290	20.5	-1.00	.793
300	21.9	-2.11	.615
310	22.5	-2.42	.571
320	23.9	-3.55	.441
330	25.1	-4.48	.356

ADD ANTENNA FACTOR PLUS CABLE LOSS TO RECEIVER READING IN dBuV TO CONVERT TO FIELD INTENSITY IN dBuV/METER. CALIBRATION PER SAE ARP-958 (1 METER) OR ANSI C63.5 (3 AND 10 METERS)

A.H. SYSTEMS INC.
9710 COZYCROFT AVE.
CHATSWORTH, CA 91311
(818) 998-0223

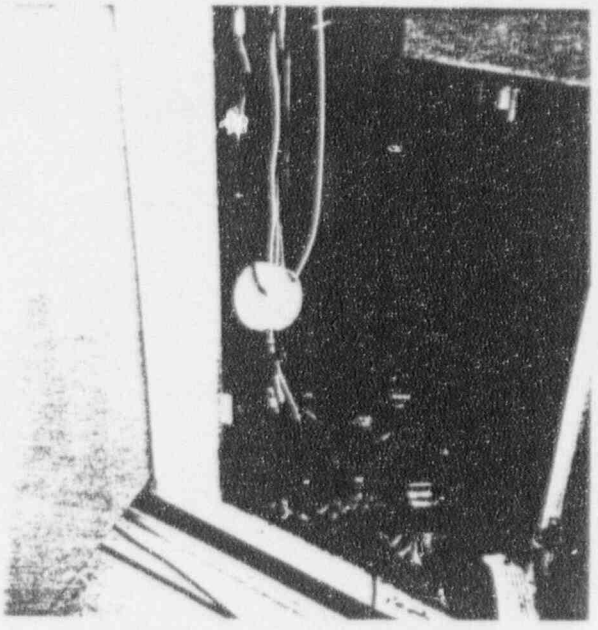
1 METER CALIBRATION
GAIN AND ANTENNA FACTORS FOR LOG PERIODIC

MODEL NUMBER: SAS-200/510
S/N : 715
DATE : 06-NOV-92

FREQUENCY (MHz)	ANTENNA FACTOR (dB)	GAIN dBi	GAIN NUMERIC
290	16.7	2.79	1.90
300	16.8	2.98	1.99
325	16.8	3.68	2.33
350	16.8	4.32	2.70
375	17.2	4.52	2.83
400	16.9	5.38	3.45
425	17.4	5.41	3.47
450	18.2	5.11	3.24
475	18.5	5.28	3.37
500	19.0	5.22	3.33
525	19.3	5.34	3.42
550	19.7	5.35	3.43
575	20.4	5.03	3.19
600	20.6	5.20	3.31
625	21.0	5.18	3.28
650	21.1	5.40	3.47
675	20.6	6.23	4.20
700	20.9	6.24	4.21
725	20.9	6.55	4.52
750	21.2	6.54	4.51
775	22.2	5.83	3.83
800	22.5	5.80	3.80
825	23.4	5.17	3.29
850	24.1	4.73	2.97
875	23.9	5.18	3.30
900	23.8	5.53	3.57
925	23.6	5.96	3.95
950	24.0	5.80	3.80
975	23.8	6.22	4.19
1000	24.5	5.74	3.75
1100	28.1	4.97	3.14
1200	25.8	6.03	4.00
1300	27.8	4.72	2.96
1400	27.2	5.96	3.95
1500	30.0	3.76	2.38
1600	31.3	3.02	2.00
1700	30.3	4.55	2.85
1800	32.8	2.55	1.79

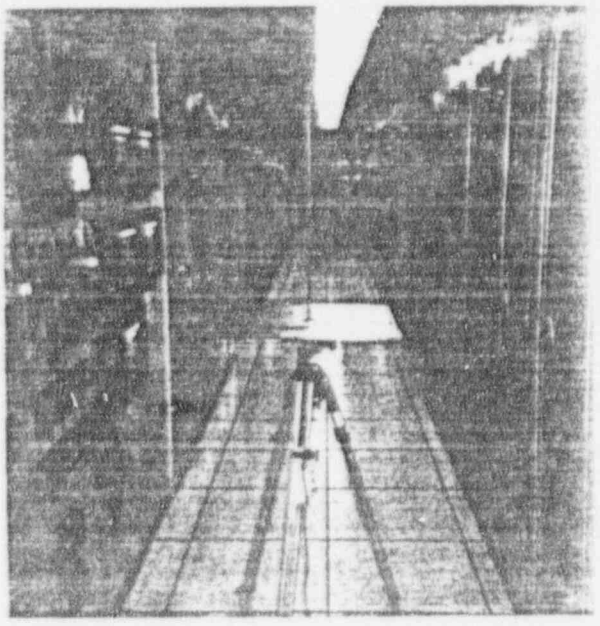
ADD ANTENNA FACTOR PLUS CABLE LOSS TO RECEIVER READING IN dBuV TO CONVERT TO FIELD INTENSITY IN dBuV/METER. CALIBRATION PER SAE ARP-958 (1 METER) OR ANSI C63.5 (3 AND 10 METERS)

9.0 PHOTOGRAPHS

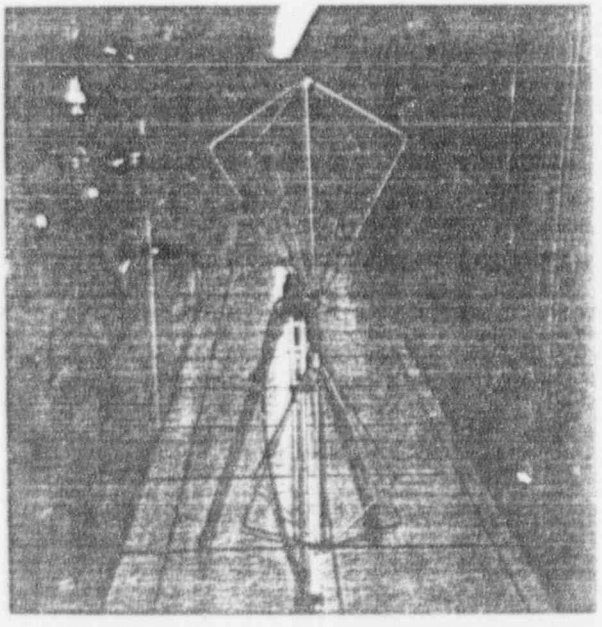


CE01/CE03/CE07 SETUP

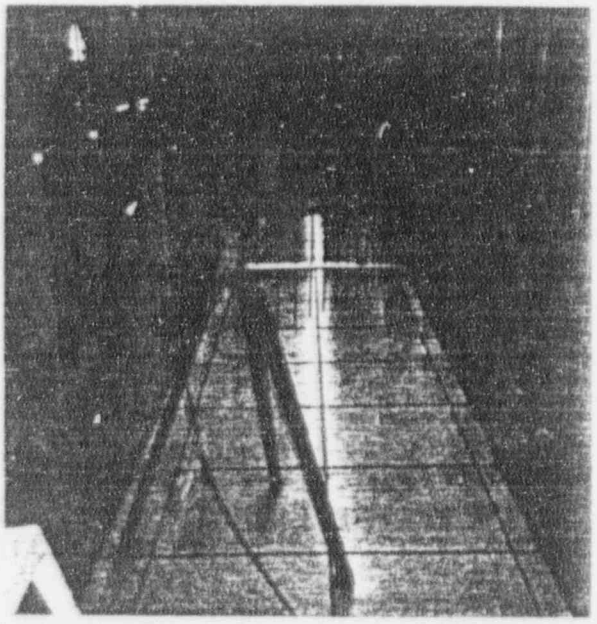
RE01 SETUP



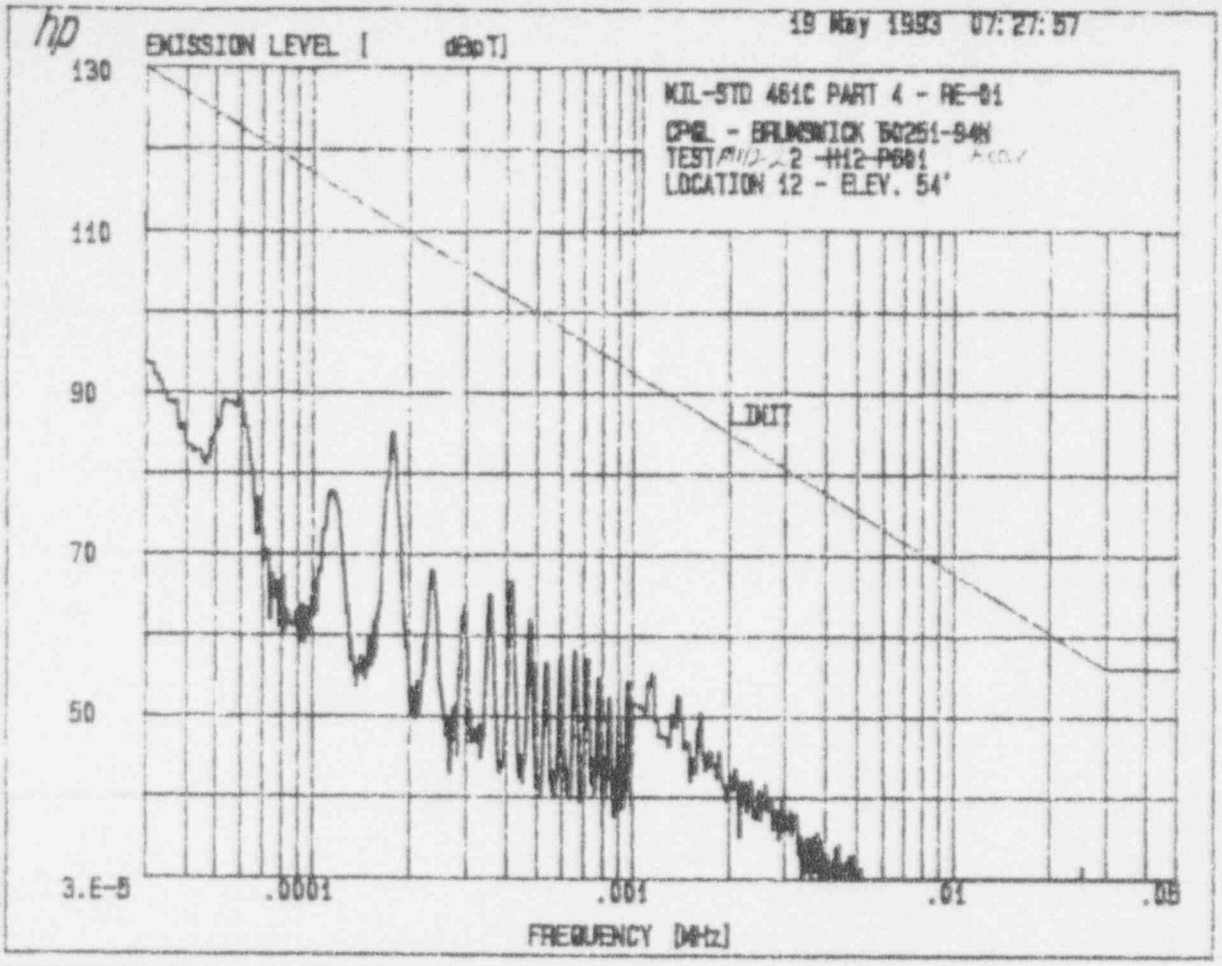
RE02 .014 TO 30 MHZ

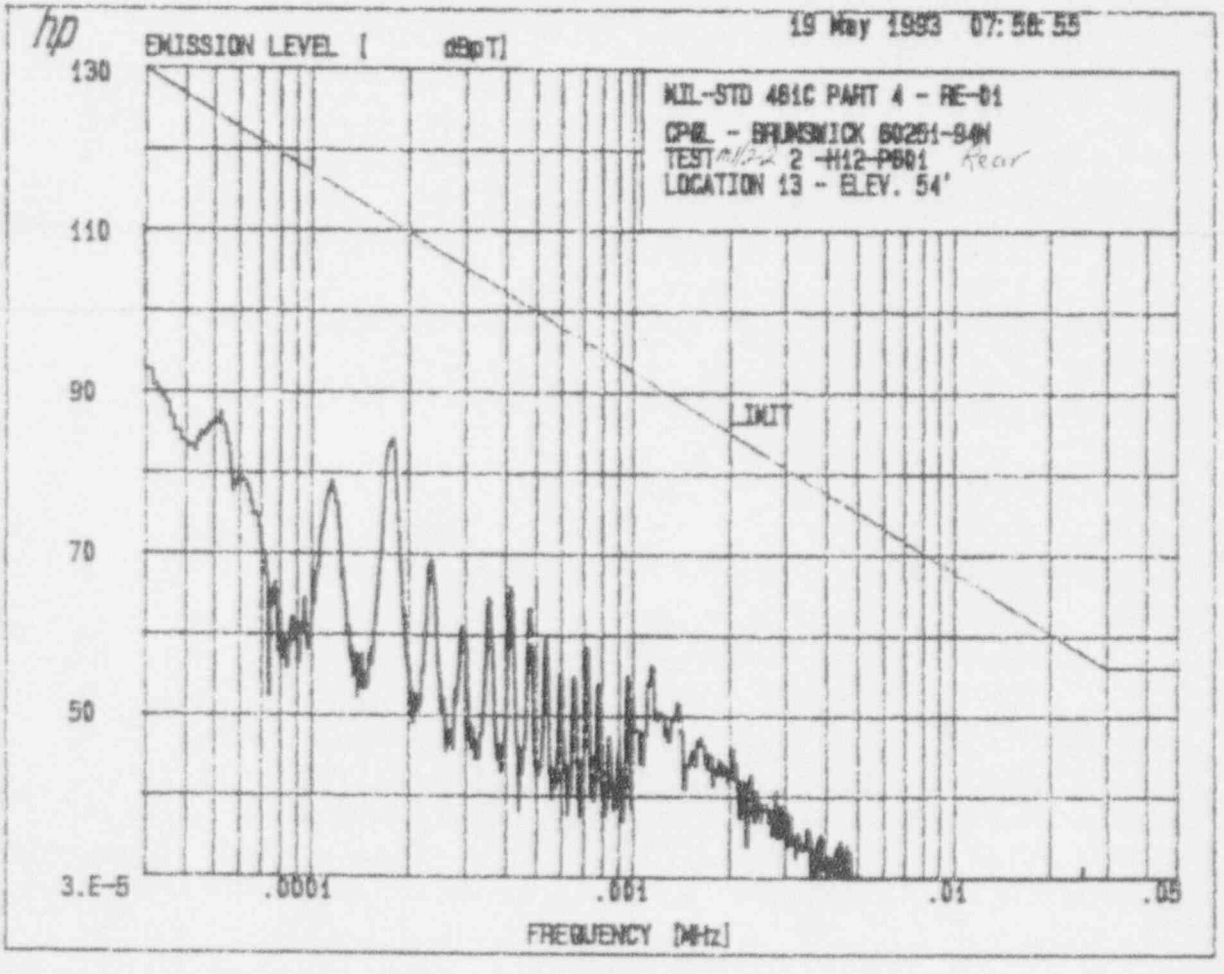


RE02 30 TO 300 MHZ



RE02 300 TO 1,000 MHZ


hp
EMISSION LEVEL [dBµT]
19 May 1993 07:27:57
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK 50251-94N
TEST MID 2 -H12-P601 Rear
LOCATION 12 - ELEV. 54'
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]


hp
EMISSION LEVEL [dBµT]
19 May 1993 07:58:55
MIL-STD 461C PART 4 - RE-01
CP&L - BRUNSWICK 50251-94N
TEST MID 2 -H12-P601 Rear
LOCATION 13 - ELEV. 54'
LIMIT
130
110
90
70
50
3.E-5
.0001
.001
.01
.05
FREQUENCY [MHz]

ATTACHMENT 2

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
TEST REPORT OF EMI MAIN CONTROL ROOM MAPPING DATA AND GE NUMAC LDM