Table of Contents

1.0 General Information

1.1 Product Description

Manufactured By ..... Elektrobit, Inc.

Address ..... 13606 NE 20th St. #201 Bellevue, WA 98005

Test Requested By: ..... Tim Stewart

Model ..... Sequence DT10

FCC ID xxxDT101

Serial Number(s) 9824001

Date of Test ..... October 7, 1998 through October 16, 1998

Job Number ELEK0001

The Equipment Under Test (EUT) is the Elektrobit, Inc. Sequence DT10, Serial No. 9824001, a High Data Rate Radio Modem designed for reliable wireless high speed data links in either point-to-point or point-to-multipoint configurations The modem is the answer for numerous data transmission needs ranging from intelligent transportation systems to surveillance applications in industrial sites, from process control to automatically guided vehicles. The Sequence DT10 is the best solution in any difficult or mobile environment where the use of cables is not possible or is impractical.
The transceiver operates on the 2.4 GHz ISM band ((ETS 300 328) and uses direct sequence spread spectrum technology. The use of the ISM band is license free in Europe, North America, Australia, and most of the Asian states, which allows introducing the wireless data link as simple as possible.
The typical range of the modem with the omnidirectional vertical antenna is up to several hundred meters in line of sight. The modem communicates with the host (terminal) equipment through an RS-485 asynchronous serial interface (up to 115 kb/s) using a modified set of standard AT commands. With these commands the host is able to change communication parameters, send broadcast messages and make calls to a remote modem.
The communication between radio modems is packet based with a data rate of up to 2 Mb/s. The physical layer of the communication protocol is compatible with the IEEE 802.11 draft standard for wireless LANs.

Hardware Description:

- Clocks/Oscillators Frequencies: 18.432 MHz

1.2 Related Submittals/Grants

None

1.3 Tested System Details

EUT and Peripherals

Item (Diagram #)	FCC ID	Description and Serial No.
EUT (A)	xxxDT101	Elektrobit, Inc. Sequence DT10, Serial No. 9824001.
485 PTBR Converter (B)		B & B Electronics Model 485 PTBR Converter.
Monitor (C)		Mag. Technology Model DX15FG, Serial No.MA3344000797.
Keyboard (F)		NMB Technologies Model RT 2258TWR, Serial No. C2364258.
Mouse (G)		Logitech Model M-S35, Serial No. LZA74452200.
Parallel Printer (E)		Epson Model P12PB, Serial No. OE11343090.
PC (D)		Intel.
DC Power Supply (H)		Instek, Model PC3030D, Serial No. 9565963.

Cables:

Item (Diagram #)	Descriptions
Mouse (3)	1.8 meters in length. Unshielded and no ferrites attached. PS/2 style connectors. Permanently attached to the mouse and connected to the mouse port of the PC.
Keyboard (4)	1.5 meters in length. Unshielded and no ferrites attached. PS/2 style connectors. Permanently attached to the keyboard and connected the keyboard port of the PC.
Video (2)	1.3 meters in length. Shielded and no ferrites attached. Metal connector backshells. Permanently attached to the monitor and connected to the video port of the PC.
Serial Cable (9)	1.2 meter in length. Unshielded and no ferrites attached. Plactic connector backshells. Connected from the EUT to the PC.
Parallel Cable (5)	1.8 meters in length. Shielded and no ferrites attached. Plastic connector backshells. Connected from the parallel printer to the PC.
Monitor Power (1)	1.8 meters in length. Shielded and no ferrites attached. AC connector. Connected from the monitor to the AC Mains.
Printer Power (6)	1.9 meters in length. Unshielded and no ferrites attached. AC connector. Connected from the printer to the AC Mains.
PC Power (7)	1.8 meters in length. Unshielded and no ferrites attached. AC connector. Connected from the PC to the AC Mains.
DC Pwr Supply (8)	1.8 meters in length. Unshielded and no ferrites attached. AC connector. Connected from the power supply to the AC Mains.
DC Power Leads (10)	0.5 meters in length. Unshielded and no ferrites attached. AC connector. Connected from the power supply to the converter.
EUT Power/Data (11)	1.2 meters in length. Unshielded and no ferrites attached. Plastic connector. Connected from the converter to the EUT.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (1992). Radiated testing was performed at an antenna to EUT distance of 3 meters. Please reference Appendix I for further detail on Test Methodology.

1.5 Test Facility

The Open Area Test Site and conducted measurement facility used to collect the radiated and conducted data is located at

Northwest EMC, Inc.
30475 NE Trails End Ln
Newberg, OR 97132
(503) 537-5566
Fax: 537-5562

The Open Area Test Site, and conducted measurement facility is located in Newberg, OR, at the address shown above. These sites have been fully described in reports filed with the FCC (Federal Communications Commission), and accepted by the FCC in letters maintained in our files.

Northwest EMC, Inc. is recognized under the United States Department of Commerce, National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP) for satisfactory compliance with criteria established in Title 15, Part 285 Code of Federal Regulations. These criteria encompass the requirements of ISO/IEC Guide 25 and the relevant requirements of ISO 9002 (ANSI/ASQC Q92-1987) as suppliers of calibration or test results. NVLAP Lab Code: 200059-0.

Northwest EMC, Inc. has been assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

3.0 System Test Configuration

3.1 Justification

All operating modes of the EUT were investigated. Data was taken with the EUT configured for low, mid, and high XMIT frequencies.

Radiated emissions were measured with the antenna connected.

3.2 EUT Exercise Software

The Sequence DT10 Modem hardware and software (firmware) versions may be interrogated from the device by using the command "AT17". The latest versions are; Hardware Ver. 1.2 and Software Ver. 1.4f1.

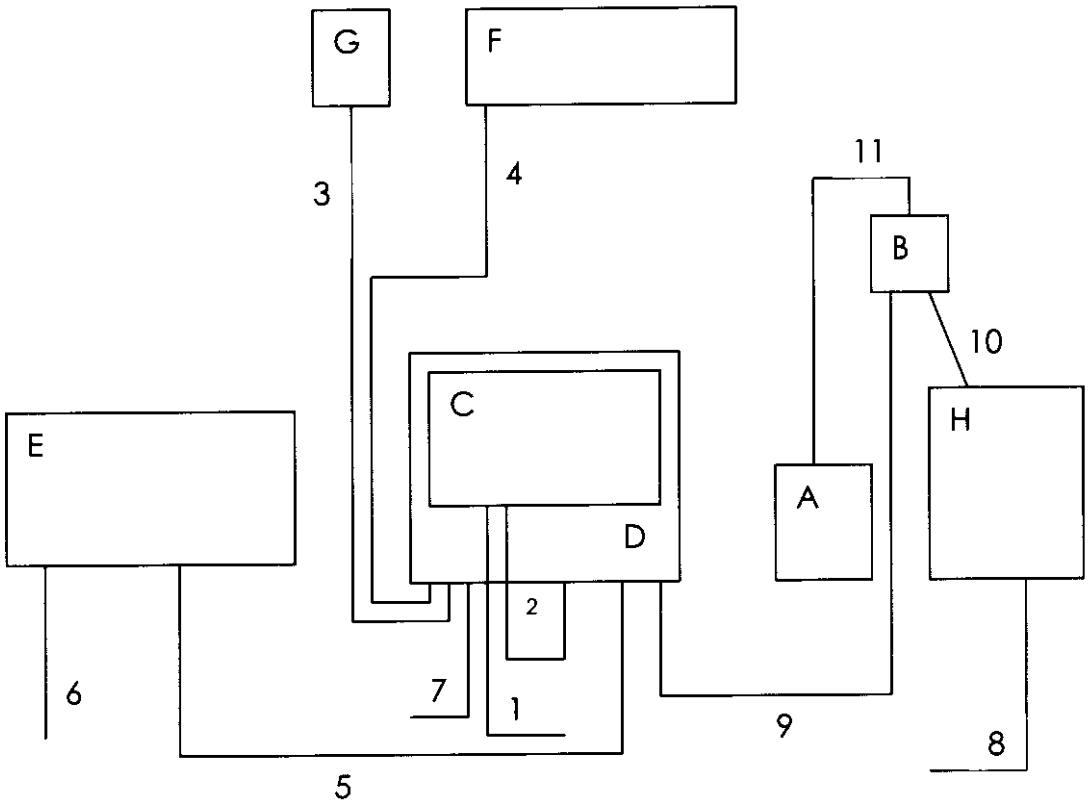
3.3 Special Accessories

None

3.4 Equipment Modifications

None.

Figure 3.1: Configuration of Tested System



4.0 Block Diagram

1. RF BOARD

The block diagram of the RF board is shown in Figure 1.

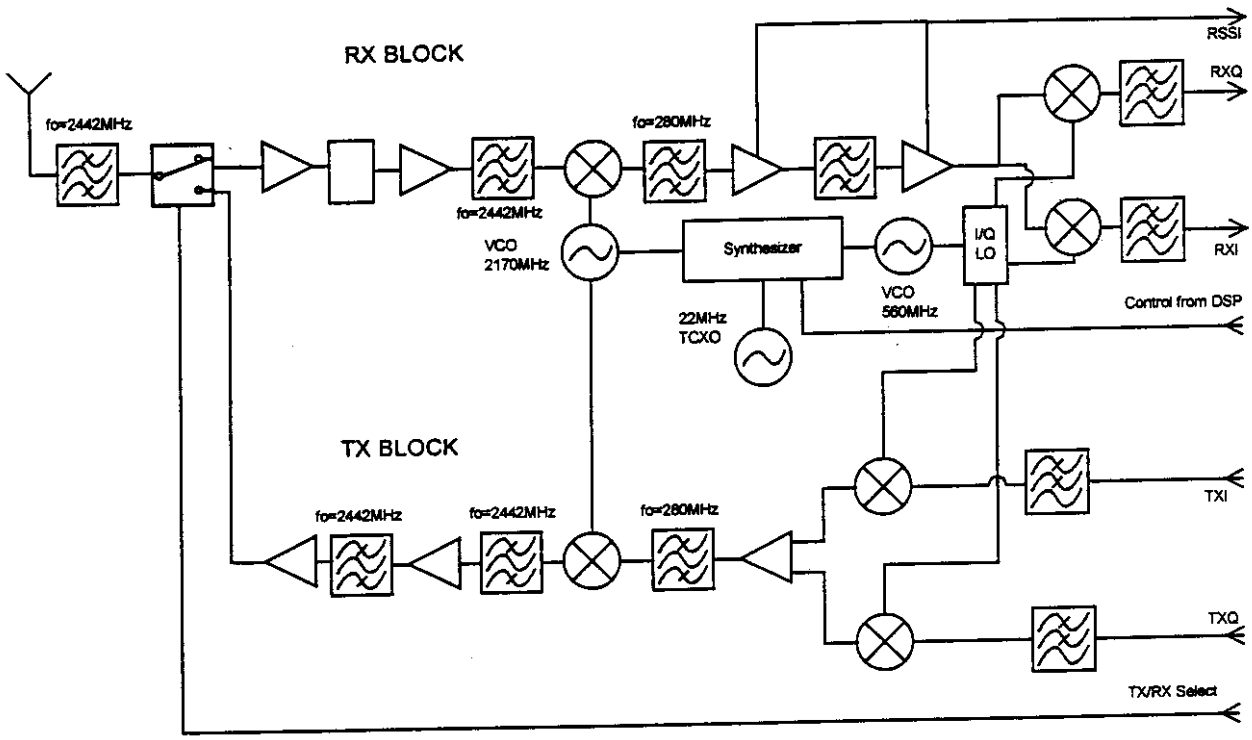


Figure 1. The RF block diagram.

The reference frequency for the RF parts is 22MHz, which is produced by a temperature compensated crystal oscillator. A double synthesizer is used to control two VCO's. The first VCO generates the frequency which is 280 MHz below the center frequency of the RF channel. The center frequency can be selected from 2422 MHz to 2462 MHz. The second VCO generates a fixed frequency of 560 MHz, which is divided by two when generating the 280 MHz IF signals for I and Q.

4.0 Block Diagram

2. BASEBAND BOARD

The block diagram of the baseband board is shown in Figure 2.

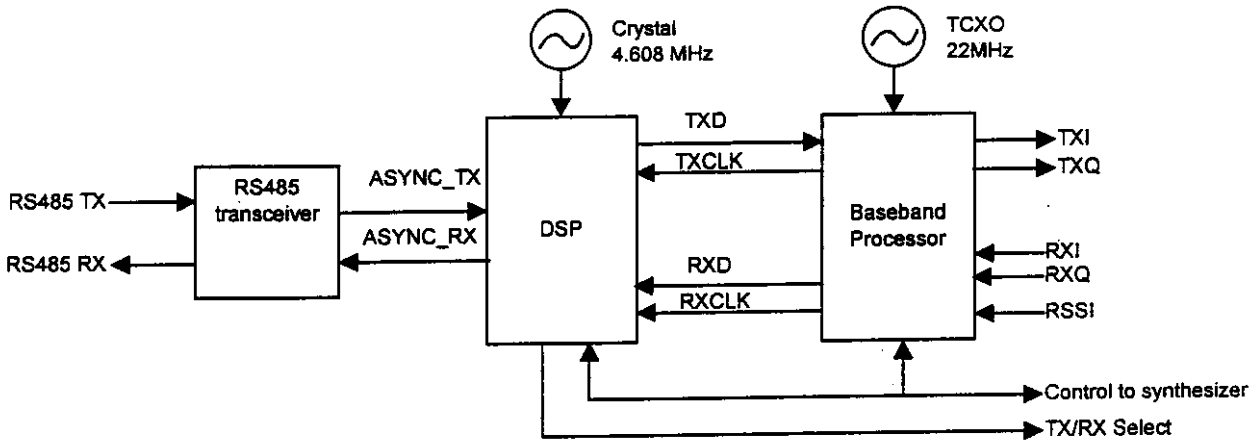


Figure 2. The Baseband block diagram

The baseband board contains two frequency generators: A 22 MHz TCXO is used as a master clock for the baseband processor. All the clocks used in DSSS signal processing are derived from this clock. The DSP uses a crystal of 4.608 MHz as its clock source. This clock is multiplied by 4 internally in the DSP to produce the operating clock of 18.432 MHz.

6.0 Conducted Emissions Data

6.1 The initial step in collecting conducted data is a spectrum analyzer, peak scan of the entire measurement range. All signals with less than 3 dB margin are then measured using a quasi-peak detector. Complete graphs and data sheets may be referenced on the following page. Minimum margins are listed below:

FCC Part 15 Specification Limits

Frequency (MHz)	Detector	Measured Level (dBuV)	Adjusted Level (dBuV)	Limit (dBuV)	Margin (dB)*	Lead
0.477	QP	29.9	36.9	48.0	11.1	High
0.454	QP	30.0	37.0	48.0	11.0	High
0.484	QP	28.7	35.7	48.0	12.3	High
0.519	QP	27.5	34.5	48.0	13.5	High
0.583	QP	24.2	31.2	48.0	16.8	High
0.630	QP	23.4	30.4	48.0	17.6	High

Frequency (MHz)	Detector	Measured Level (dBuV)	Adjusted Level (dBuV)	Limit (dBuV)	Margin (dB)*	Lead
0.450	QP	36.2	43.2	48.0	4.8	Low
0.487	QP	30.9	37.9	48.0	10.1	Low
0.508	QP	30.3	37.3	48.0	10.7	Low
0.530	QP	29.2	36.2	48.0	11.8	Low
0.554	QP	27.5	34.5	48.0	13.5	Low
0.477	QP	29.9	36.9	48.0	11.1	Low

The emission levels shown above were made using a Quasi-Peak detector. Measurements were also made using an average detector. Since the difference in those measurements was greater than 6 dB, a 13 dB relaxation was applied to the Quasi-Peak measurements. (Reference 15.107 (3d)).

All readings listed above are Quasi-Peak, using an IF Bandwidth of 9 kHz, a video filter was not used.

Judgment: Passed, minimum margin of 4.8 dB.

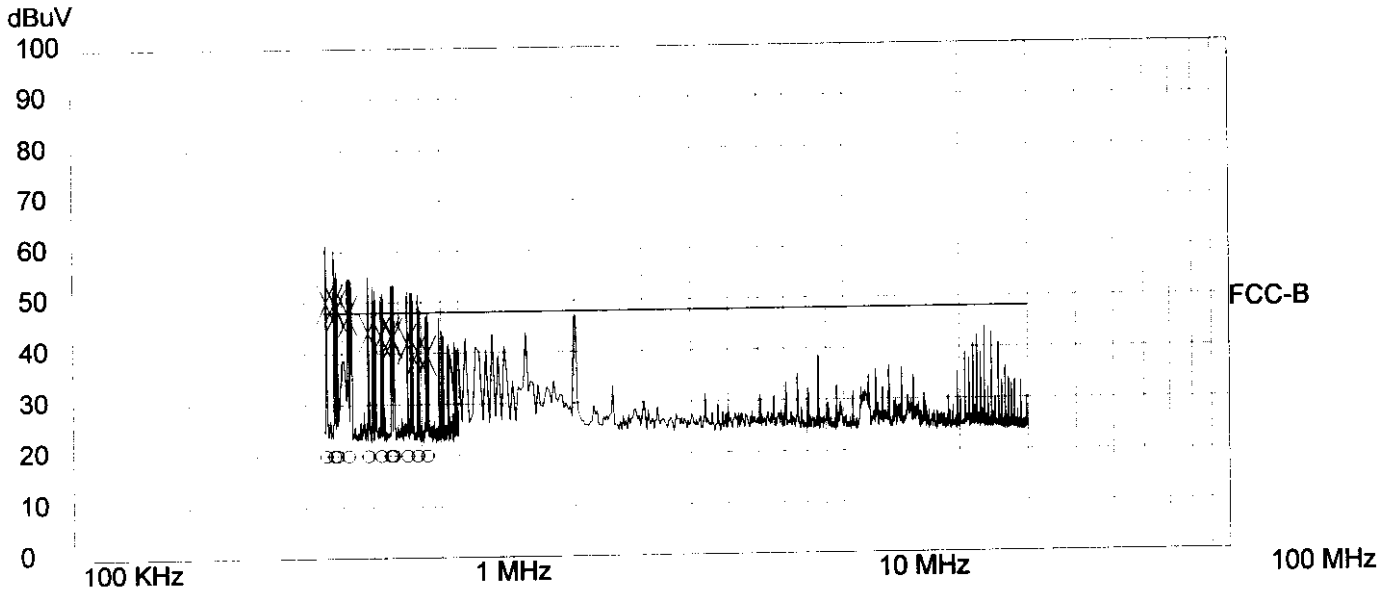
Test Personnel:

Typed/Printed Name: Daniel Haas

Northwest EMC, Inc.

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Elektrobit, Inc.
Job Number: ELEK0001
Date/Time: 10-16-1998 07:38
Tested By: Daniel Haas, TE01
Comments: Modem transmitting test data. Whip antenna. Mid frequency. Run #1.

FCC Part 15 Class B Conducted Emissions Limits HIGH LINE

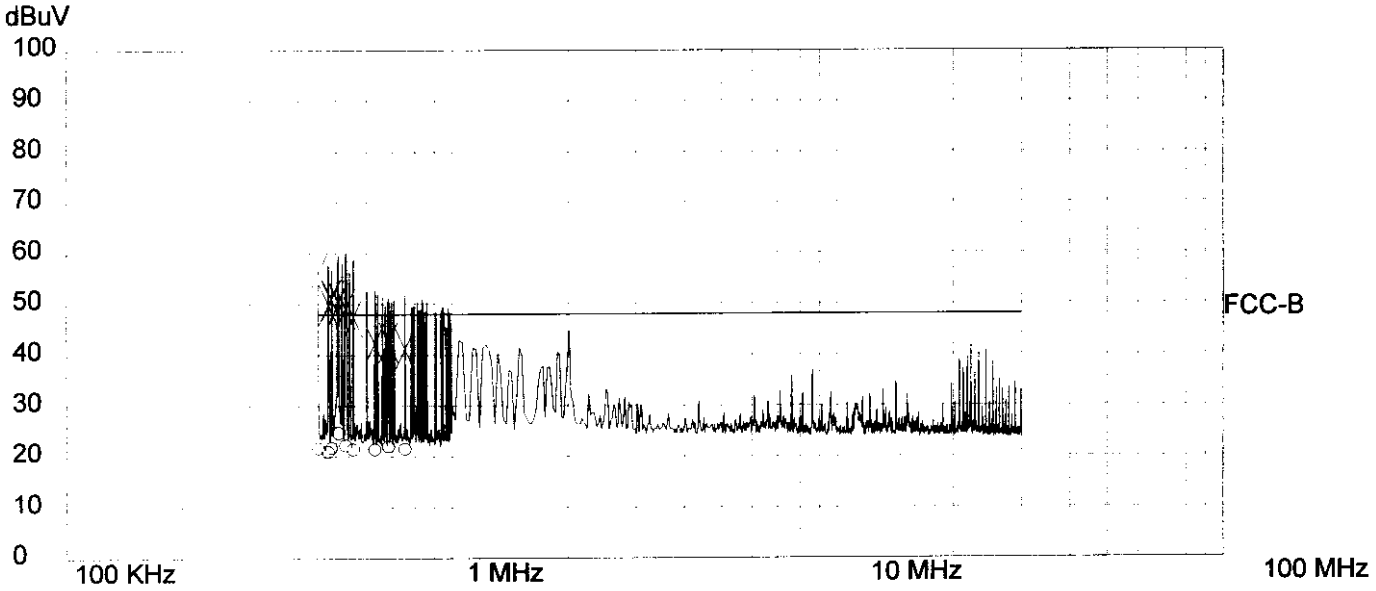


Frequency (MHz)	Meter Reading (dBuV)	Detector Function	Correction Factor (dB)	Line Tested	Adjusted Level (dBuV)	Spec. Limit (dBuV)	Compared To Limit (dB)
0.830	0.0	AV	20.0	High	20.0	48.0	-28.0
0.783	0.0	AV	20.0	High	20.0	48.0	-28.0
0.736	0.0	AV	20.0	High	20.0	48.0	-28.0
0.677	0.0	AV	20.0	High	20.0	48.0	-28.0
0.669	0.0	AV	20.0	High	20.0	48.0	-28.0
0.630	0.0	AV	20.0	High	20.0	48.0	-28.0
0.583	0.0	AV	20.0	High	20.0	48.0	-28.0
0.519	0.0	AV	20.0	High	20.0	48.0	-28.0
0.484	0.0	AV	20.0	High	20.0	48.0	-28.0
0.477	0.0	AV	20.0	High	20.0	48.0	-28.0
0.454	0.0	AV	20.0	High	20.0	48.0	-28.0
0.477	29.9	QP	20.0	High	49.9	48.0	1.9
0.454	30.0	QP	20.0	High	50.0	48.0	2.0
0.484	28.7	QP	20.0	High	48.7	48.0	0.7
0.519	27.5	QP	20.0	High	47.5	48.0	-0.5
0.583	24.2	QP	20.0	High	44.2	48.0	-3.8
0.630	23.4	QP	20.0	High	43.4	48.0	-4.6
0.669	23.5	QP	20.0	High	43.5	48.0	-4.5
0.677	23.1	QP	20.0	High	43.1	48.0	-4.9
0.736	22.0	QP	20.0	High	42.0	48.0	-6.0
0.783	20.2	QP	20.0	High	40.2	48.0	-7.8
0.830	19.7	QP	20.0	High	39.7	48.0	-8.3

Northwest EMC, Inc.

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Elektrobit, Inc.
Job Number: ELEK0001
Date/Time: 10-16-1998 07:20:53
Tested By: Daniel Haas, TE01
Comments: Modem transmitting test data. Whip antenna. Mid frequency. Run #1.

FCC Part 15 Class B Conducted Emissions Limits LOW LINE



Frequency (MHz)	Meter Reading (dBuV)	Detector Function	Correction Factor (dB)	Line Tested	Adjusted Level (dBuV)	Spec. Limit (dBuV)	Compared To Limit (dB)
0.554	1.5	AV	20.0	High	21.5	48.0	-26.5
0.530	2.3	AV	20.0	High	22.3	48.0	-25.7
0.508	4.8	AV	20.0	High	24.8	48.0	-23.2
0.487	1.8	AV	20.0	High	21.8	48.0	-26.2
0.450	1.7	AV	20.0	High	21.7	48.0	-26.3
0.477	1.0	AV	20.0	High	21.0	48.0	-27.0
0.754	1.6	AV	20.0	High	21.6	48.0	-26.4
0.684	2.1	AV	20.0	High	22.1	48.0	-25.9
0.630	1.5	AV	20.0	High	21.5	48.0	-26.5
0.450	36.2	QP	20.0	High	56.2	48.0	8.2
0.487	30.9	QP	20.0	High	50.9	48.0	2.9
0.508	30.3	QP	20.0	High	50.3	48.0	2.3
0.530	29.2	QP	20.0	High	49.2	48.0	1.2
0.554	27.5	QP	20.0	High	47.5	48.0	-0.5
0.477	29.9	QP	20.0	High	49.9	48.0	1.9
0.684	22.6	QP	20.0	High	42.6	48.0	-5.4
0.754	21.2	QP	20.0	High	41.2	48.0	-6.8
0.630	22.3	QP	20.0	High	42.3	48.0	-5.7

7.0 Radiated Emissions Data

7.1 The following data lists the six most significant emission frequencies, total (corrected) levels, and specification margins. Correction factors, antenna height, table azimuth, etc., are contained in the data sheets immediately following. Explanation of the correction factors is given in paragraph 7.2 of this report. Complete graphs and data sheets may be referenced on the following pages. Minimum margins are listed below:

FCC Part 15 Specification Limits

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
154.015	QP	34.2	43.5	9.3	Vertical
220.016	QP	35.3	46.0	10.7	Vertical
601.363	QP	33.6	46.0	12.4	Vertical
544.092	QP	33.5	46.0	12.5	Vertical
66.000	QP	27.4	40.0	12.6	Vertical
152.002	QP	30.5	43.5	13.0	Vertical

Judgment: Passed, minimum margin of 9.3 dB.

Test Personnel:

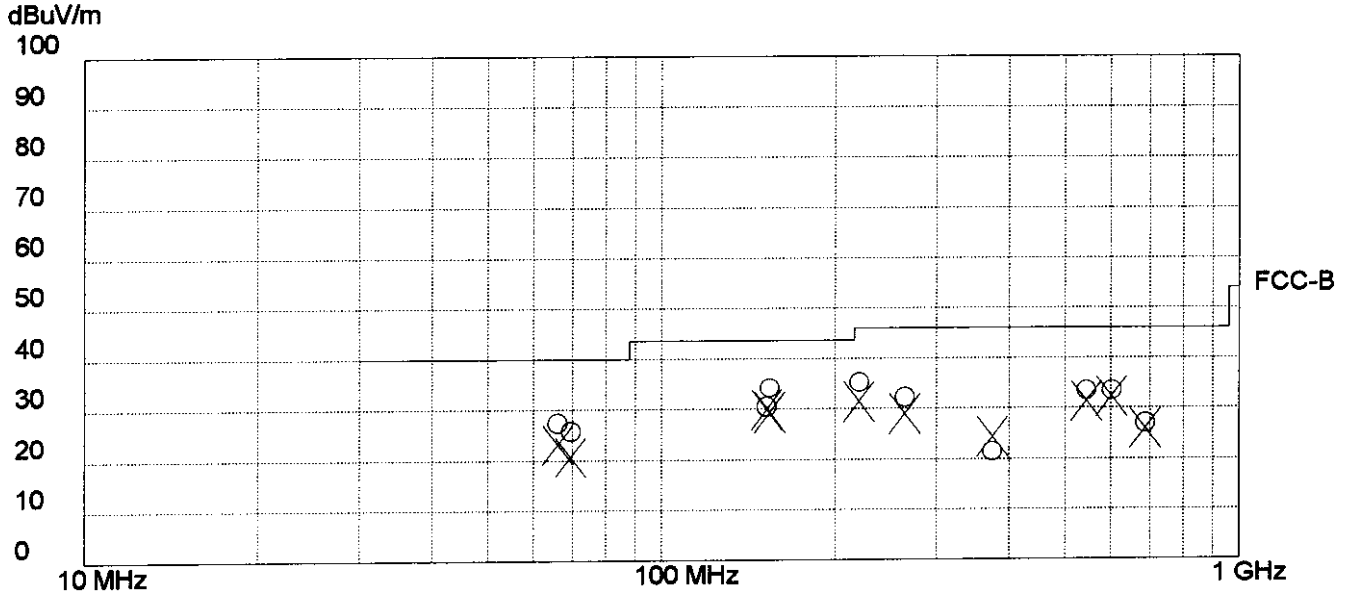
Typed/Printed Name: Daniel Haas

Northwest EMC, Inc.

EUT Name:	**Sequence DT10**
Serial Number:	**9824001**
Manufacturer:	**Electrobit, Inc.**
Job Number:	**ELEK0001**
Test Date:	**10-07-1998**
Tested By:	**Daniel Haas. TE04**
Test Distance:	**3 meters.**
Comments:	**Modem transmitting test data. Whip antenna Set to Channel 8**

Horizontal= X
Vertical = O

FCC Class B (3 Meter Limit)



Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
154.015	49.3	QP	14.4	VBIC	31.8	2.3	34.2	43.5	331.0	1.0	-9.3
220.016	52.0	QP	12.3	VLPA	31.7	2.7	35.3	46.0	80.0	1.0	-10.7
601.363	41.8	QP	19.7	VLPA	32.3	4.4	33.6	46.0	318.0	1.1	-12.4
544.092	42.6	QP	18.9	VLPA	32.2	4.2	33.5	46.0	289.0	1.0	-12.5
66.000	48.6	QP	9.1	VBIC	31.8	1.5	27.4	40.0	148.0	1.0	-12.6
152.002	46.3	QP	13.7	VBIC	31.8	2.3	30.5	43.5	0.0	1.0	-13.0
152.002	45.7	QP	13.7	HBIC	31.8	2.3	29.9	43.5	55.0	2.2	-13.6
601.365	40.5	QP	19.7	HLPA	32.3	4.4	32.3	46.0	96.0	1.8	-13.7
264.016	47.3	QP	13.9	VLPA	31.8	2.9	32.3	46.0	178.0	1.0	-13.7
153.999	44.5	QP	14.4	HBIC	31.8	2.3	29.4	43.5	247.0	1.4	-14.1
69.585	46.8	QP	9.4	VBIC	31.8	1.5	25.9	40.0	88.0	1.0	-14.1
220.017	48.1	QP	12.3	HLPA	31.7	2.7	31.4	46.0	295.0	1.7	-14.6
544.092	40.5	QP	18.9	HLPA	32.2	4.2	31.4	46.0	212.0	2.0	-14.6
264.014	43.9	QP	13.9	HLPA	31.8	2.9	28.9	46.0	164.0	1.3	-17.1
687.274	33.7	QP	21.0	VLPA	32.4	4.8	27.1	46.0	0.0	1.0	-18.9
687.278	32.6	QP	21.0	HLPA	32.4	4.8	26.0	46.0	112.0	1.6	-20.0
374.016	36.8	QP	16.3	HLPA	32.1	3.4	24.4	46.0	300.0	1.5	-21.6
374.016	33.9	QP	16.3	VLPA	32.1	3.4	21.5	46.0	342.0	1.0	-24.5

Signature

Temperature 65F 75% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Margin Sort

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Electrobit, Inc.
Job Number: ELEK0001
Test Date: 10-07-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Modem transmitting test data. Whip antenna Set to Channel 8

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
154.015	49.3	QP	14.4	VBIC	31.8	2.3	34.2	43.5	331.0	1.0	-9.3
220.016	52.0	QP	12.3	VLPA	31.7	2.7	35.3	46.0	80.0	1.0	-10.7
601.363	41.8	QP	19.7	VLPA	32.3	4.4	33.6	46.0	318.0	1.1	-12.4
544.092	42.6	QP	18.9	VLPA	32.2	4.2	33.5	46.0	289.0	1.0	-12.5
66.000	48.6	QP	9.1	VBIC	31.8	1.5	27.4	40.0	148.0	1.0	-12.6
152.002	46.3	QP	13.7	VBIC	31.8	2.3	30.5	43.5	0.0	1.0	-13.0
152.002	45.7	QP	13.7	HBIC	31.8	2.3	29.9	43.5	55.0	2.2	-13.6
601.365	40.5	QP	19.7	HLPA	32.3	4.4	32.3	46.0	96.0	1.8	-13.7
264.016	47.3	QP	13.9	VLPA	31.8	2.9	32.3	46.0	178.0	1.0	-13.7
153.999	44.5	QP	14.4	HBIC	31.8	2.3	29.4	43.5	247.0	1.4	-14.1
69.585	46.8	QP	9.4	VBIC	31.8	1.5	25.9	40.0	88.0	1.0	-14.1
220.017	48.1	QP	12.3	HLPA	31.7	2.7	31.4	46.0	295.0	1.7	-14.6
544.092	40.5	QP	18.9	HLPA	32.2	4.2	31.4	46.0	212.0	2.0	-14.6
66.000	44.4	QP	9.1	HBIC	31.8	1.5	23.2	40.0	204.0	3.6	-16.8
264.014	43.9	QP	13.9	HLPA	31.8	2.9	28.9	46.0	164.0	1.3	-17.1
687.274	33.7	QP	21.0	VLPA	32.4	4.8	27.1	46.0	0.0	1.0	-18.9
69.585	41.5	QP	9.4	HBIC	31.8	1.5	20.6	40.0	91.0	3.2	-19.4
687.278	32.6	QP	21.0	HLPA	32.4	4.8	26.0	46.0	112.0	1.6	-20.0
374.016	36.8	QP	16.3	HLPA	32.1	3.4	24.4	46.0	300.0	1.5	-21.6
374.016	33.9	QP	16.3	VLPA	32.1	3.4	21.5	46.0	342.0	1.0	-24.5

Signature

Temperature 65F 75% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Freq. Sort

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Electrobit, Inc.
Job Number: ELEK0001
Test Date: 10-07-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Modem transmitting test data. Whip antenna Set to Channel 8

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
66.000	44.4	QP	9.1	HBIC	31.8	1.5	23.2	40.0	204.0	3.6	-16.8
66.000	48.6	QP	9.1	VBIC	31.8	1.5	27.4	40.0	148.0	1.0	-12.6
69.585	41.5	QP	9.4	HBIC	31.8	1.5	20.6	40.0	91.0	3.2	-19.4
69.585	46.8	QP	9.4	VBIC	31.8	1.5	25.9	40.0	88.0	1.0	-14.1
152.002	46.3	QP	13.7	VBIC	31.8	2.3	30.5	43.5	0.0	1.0	-13.0
152.002	45.7	QP	13.7	HBIC	31.8	2.3	29.9	43.5	55.0	2.2	-13.6
153.999	44.5	QP	14.4	HBIC	31.8	2.3	29.4	43.5	247.0	1.4	-14.1
154.015	49.3	QP	14.4	VBIC	31.8	2.3	34.2	43.5	331.0	1.0	-9.3
220.016	52.0	QP	12.3	VLPA	31.7	2.7	35.3	46.0	80.0	1.0	-10.7
220.017	48.1	QP	12.3	HLPA	31.7	2.7	31.4	46.0	295.0	1.7	-14.6
264.014	43.9	QP	13.9	HLPA	31.8	2.9	28.9	46.0	164.0	1.3	-17.1
264.016	47.3	QP	13.9	VLPA	31.8	2.9	32.3	46.0	178.0	1.0	-13.7
374.016	33.9	QP	16.3	VLPA	32.1	3.4	21.5	46.0	342.0	1.0	-24.5
374.016	36.8	QP	16.3	HLPA	32.1	3.4	24.4	46.0	300.0	1.5	-21.6
544.092	42.6	QP	18.9	VLPA	32.2	4.2	33.5	46.0	289.0	1.0	-12.5
544.092	40.5	QP	18.9	HLPA	32.2	4.2	31.4	46.0	212.0	2.0	-14.6
601.363	41.8	QP	19.7	VLPA	32.3	4.4	33.6	46.0	318.0	1.1	-12.4
601.365	40.5	QP	19.7	HLPA	32.3	4.4	32.3	46.0	96.0	1.8	-13.7
687.274	33.7	QP	21.0	VLPA	32.4	4.8	27.1	46.0	0.0	1.0	-18.9
687.278	32.6	QP	21.0	HLPA	32.4	4.8	26.0	46.0	112.0	1.6	-20.0

Signature

Temperature 65F 75% Humidity

7.2 Out of Band Harmonics Data

7.2.1 The following data lists the six most significant emission frequencies, total (corrected) levels, and specification margins. Correction factors, antenna height, table azimuth, etc., are contained in the data sheets immediately following. Explanation of the correction factors is given in paragraph 7.2 of this report. Complete graphs and data sheets may be referenced on the following pages. Minimum margins are listed below:

FCC Part 15 Specification Limits

Frequency (MHz)	Detection	Total Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)*	Polarization
4893.900	AV	52.3	54.0	1.7	Vertical
7266.970	AV	52.3	54.0	1.7	Vertical
4923.900	AV	50.8	54.0	3.2	Vertical
4844.100	AV	49.4	54.0	4.6	Vertical
2487.960	AV	30.4	54.0	5.2	Vertical
2487.960	AV	44.7	54.0	9.3	Horizontal

Judgment: Passed, minimum margin of 1.7 dB.

Test Personnel:

Typed/Printed Name: Daniel Haas

Northwest EMC, Inc.

Version 5.3, April 1998
Margin Sort

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Electrobit, Inc.
Job Number: ELEK0001
Test Date: 10-07-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Modem transmitting test data. Whip antenna

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
2487.960	63.7	PK	30.4	VHRN	34.4	2.7	62.4	54.0	220.0	1.0	8.4
Highest measured level in restricted band.											
2487.960	61.2	PK	30.4	HHRN	34.4	2.7	59.9	54.0	180.0	1.0	5.9
Highest measured level in restricted band.											
7266.970	49.3	PK	38.5	VHRN	32.9	4.6	59.5	54.0	230.0	1.1	5.5
Low Level, Ch.3											
4893.900	50.6	PK	35.7	VHRN	35.0	3.0	54.3	54.0	230.0	1.0	0.3
Mid Level, Ch.8											
7266.970	43.8	PK	38.5	HHRN	32.9	4.6	54.0	54.0	230.0	1.0	0.0
Low Level, Ch.3											
4923.900	49.4	PK	35.7	VHRN	35.0	3.0	53.1	54.0	270.0	1.0	-0.9
High Level, Ch.11											
4893.900	48.6	AV	35.7	VHRN	35.0	3.0	52.3	54.0	230.0	1.0	-1.7
Mid Level, Ch.8											
7266.970	42.1	AV	38.5	VHRN	32.9	4.6	52.3	54.0	230.0	1.1	-1.7
Low Level, Ch.3											
4844.100	48.2	PK	35.5	VHRN	35.0	3.0	51.7	54.0	280.0	1.0	-2.3
Low Level, Ch.3											
4923.900	47.1	AV	35.7	VHRN	35.0	3.0	50.8	54.0	270.0	1.0	-3.2
High Level, Ch.11											
4844.100	45.9	AV	35.5	VHRN	35.0	3.0	49.4	54.0	280.0	1.0	-4.6
Low Level, Ch.3											
2487.960	50.1	AV	30.4	VHRN	34.4	2.7	48.8	54.0	220.0	1.0	-5.2
Highest measured level in restricted band.											

Signature

Temperature 65F 75% Humidity

Northwest EMC, Inc.

Version 5.3, April 1998
Margin Sort

Equipment Tested: Sequence DT10
Serial Number: 9824001
Manufacturer: Electrobit, Inc.
Job Number: ELEK0001
Test Date: 10-07-1998
Tested By: Daniel Haas. TE04
Test Distance: 3 meters.
Comments: Modem transmitting test data. Whip antenna

FCC Class B (3 Meter Limit)

Frequency (MHz)	Meter Reading (dBuV)	Detector	Antenna Factor (dB/m)	Antenna Horizontal Vertical	Preamp Gain (dB)	Cable Loss (dB)	Adjusted Level (dBuV/m)	Spec Limit (dBuV/m)	Table Azimuth (degree)	Antenna Height (meters)	Compared (To Limit) (dB)
4893.900	42.2	PK	35.7	HHRN	35.0	3.0	45.9	54.0	270.0	1.0	-8.1
Mid Level, Ch.8											
4923.900	42.0	PK	35.7	HHRN	35.0	3.0	45.7	54.0	320.0	1.0	-8.3
High Level, Ch.11											
4844.100	41.7	PK	35.5	HHRN	35.0	3.0	45.2	54.0	85.0	1.0	-8.8
Low Level, Ch.3											
2487.960	46.0	AV	30.4	HHRN	34.4	2.7	44.7	54.0	180.0	1.0	-9.3
Highest measured level in restricted band.											
7266.970	33.4	AV	38.5	HHRN	32.9	4.6	43.6	54.0	230.0	1.0	-10.4
Low Level, Ch.3											
4893.900	35.7	AV	35.7	HHRN	35.0	3.0	39.4	54.0	270.0	1.0	-14.6
Mid Level, Ch.8											
4923.900	35.4	AV	35.7	HHRN	35.0	3.0	39.1	54.0	320.0	1.0	-14.9
High Level, Ch.11											
4844.100	35.0	AV	35.5	HHRN	35.0	3.0	38.5	54.0	85.0	1.0	-15.5
Low Level, Ch.3											

Signature

Temperature 65F 75% Humidity

7.3 Occupied (6dB) Bandwidth

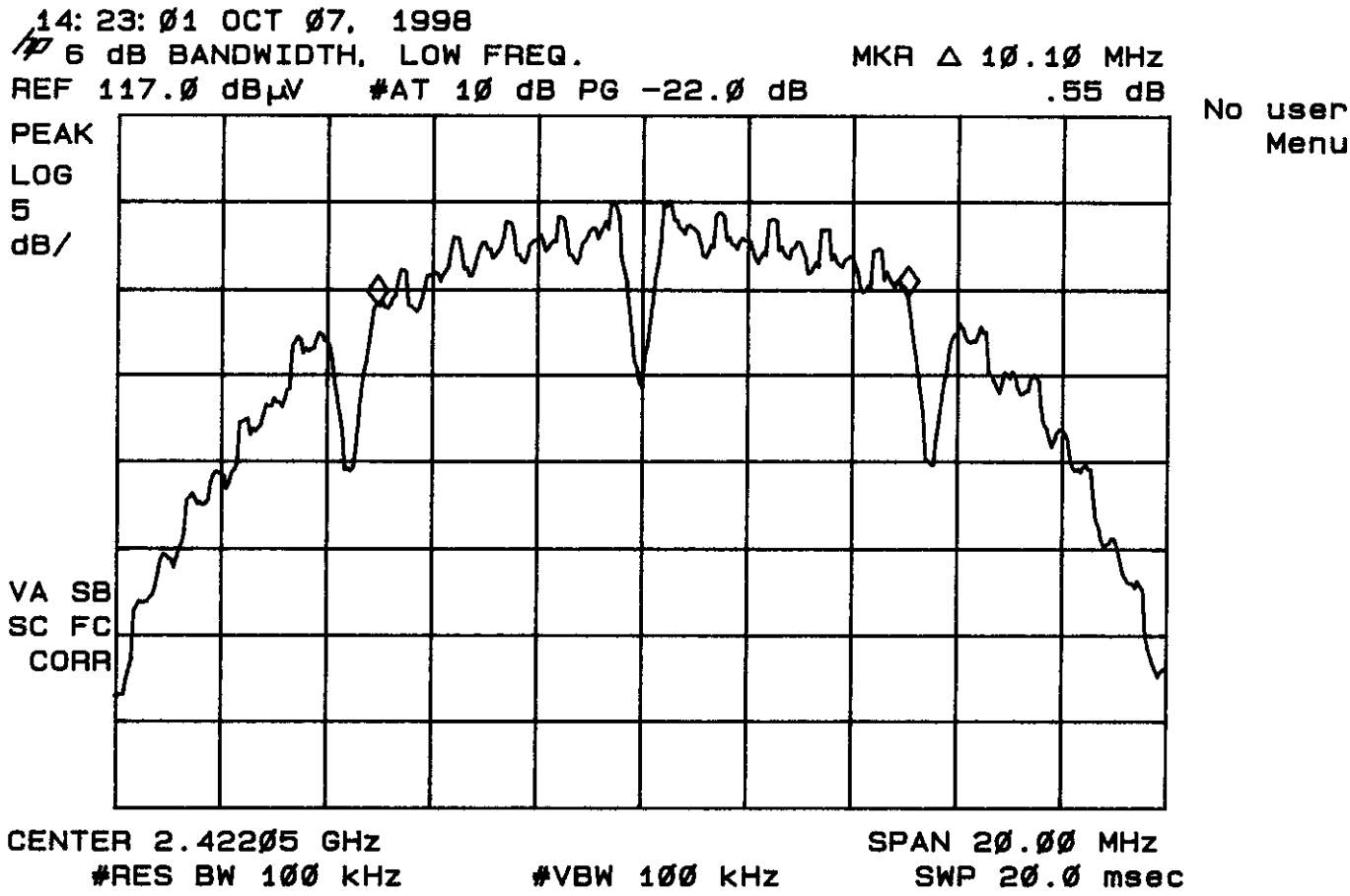
As per Section 15.247 (a2) , the following graphs show that the minimum 6dB bandwidth is greater 500 kHz. The bandwidth was measured with the EUT set to low, mid, and high band frequencies. The measurement was made with the spectrum analyzer's resolution bandwidth = 100 kHz. The span was set to 20 MHz.

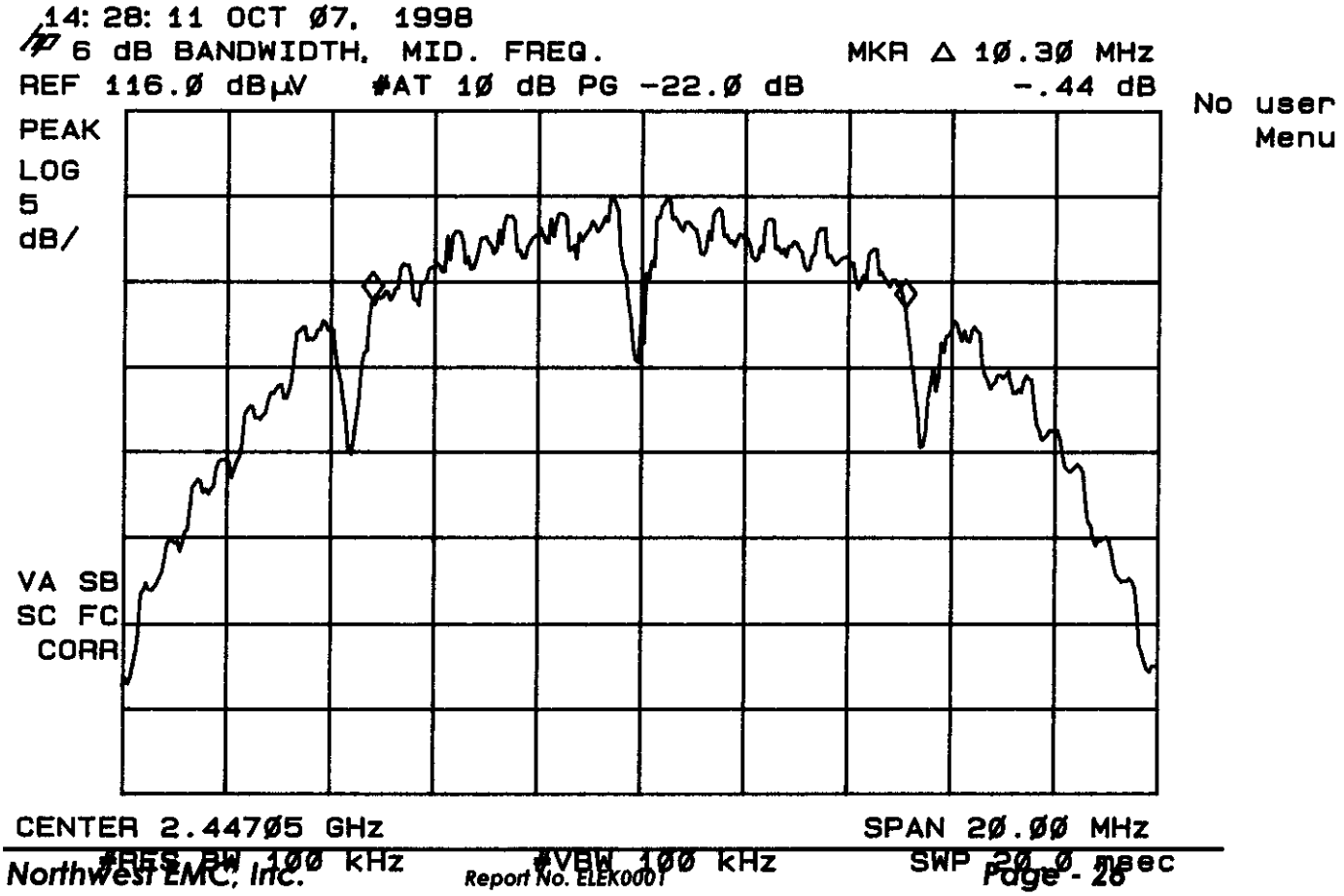
Band	Bandwidth (kHz)
Low	10.1 MHz
Mid	10.3 MHz
High	10.1 MHz

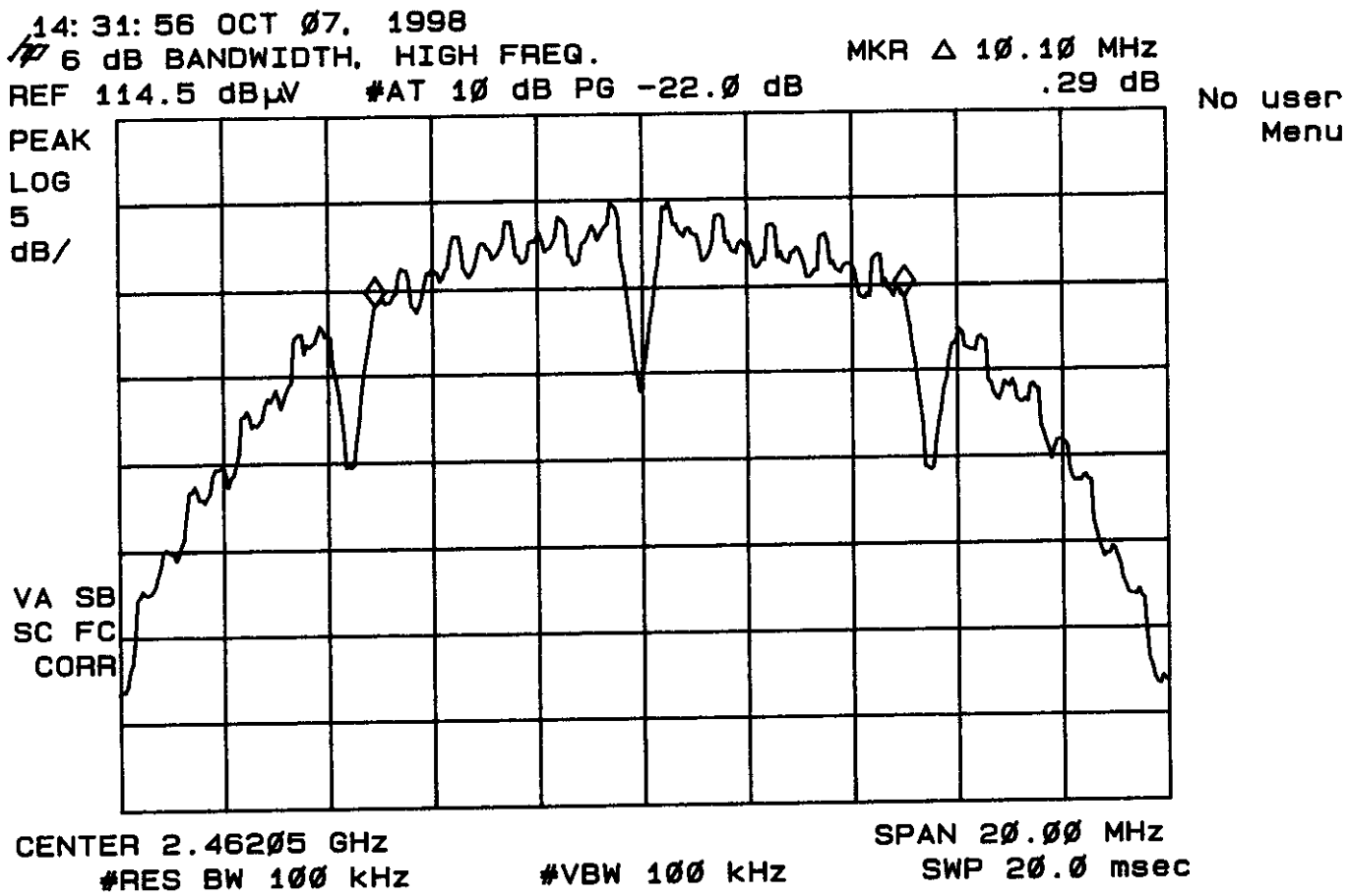
Additional high and low band plots show the direct sequence emission is greater than 20 dB down at the band edges.

Test Personnel:

Typed/Printed Name: Daniel Haas


14: 23: Ø1 OCT Ø7, 1998
6 dB BANDWIDTH, LOW FREQ.
MKR Δ 1Ø.1Ø MHz
REF 117.Ø dBµV
#AT 1Ø dB PG -22.Ø dB
.55 dB
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.422Ø5 GHz
SPAN 2Ø.ØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 2Ø.Ø msec


14: 28: 11 OCT Ø7, 1998
6 dB BANDWIDTH, MID. FREQ.
MKR Δ 1Ø.3Ø MHz
REF 116.Ø dBµV
#AT 1Ø dB PG -22.Ø dB
-.44 dB
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.447Ø5 GHz
SPAN 2Ø.ØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 2Ø.Ø msec


14: 31: 56 OCT Ø7, 1998
6 dB BANDWIDTH, HIGH FREQ.
MKR Δ 1Ø.1Ø MHz
.29 dB
REF 114.5 dBµV
#AT 1Ø dB PG -22.Ø dB
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.462Ø5 GHz
SPAN 2Ø.ØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 2Ø.Ø msec

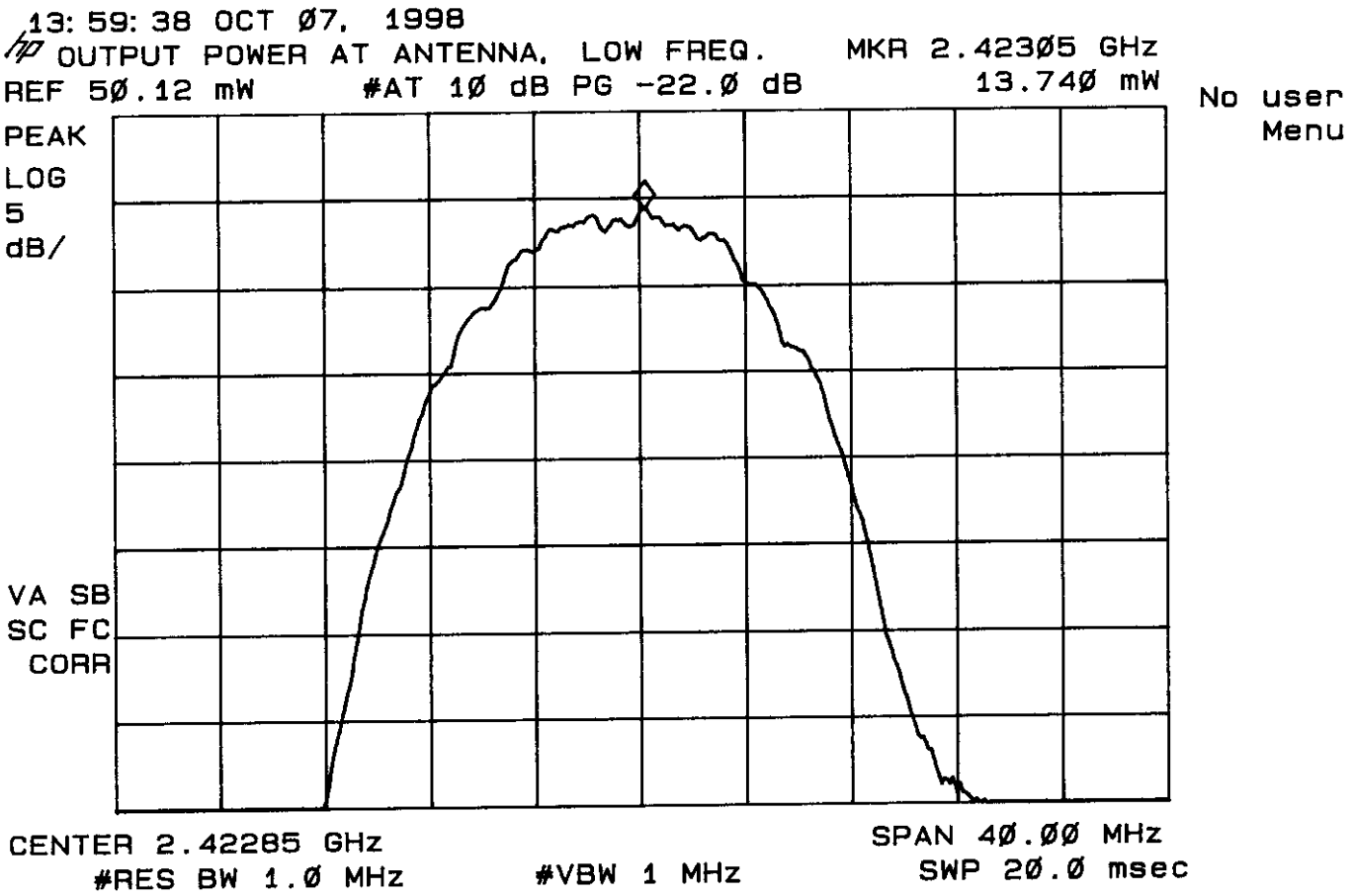
7.4 Power Output

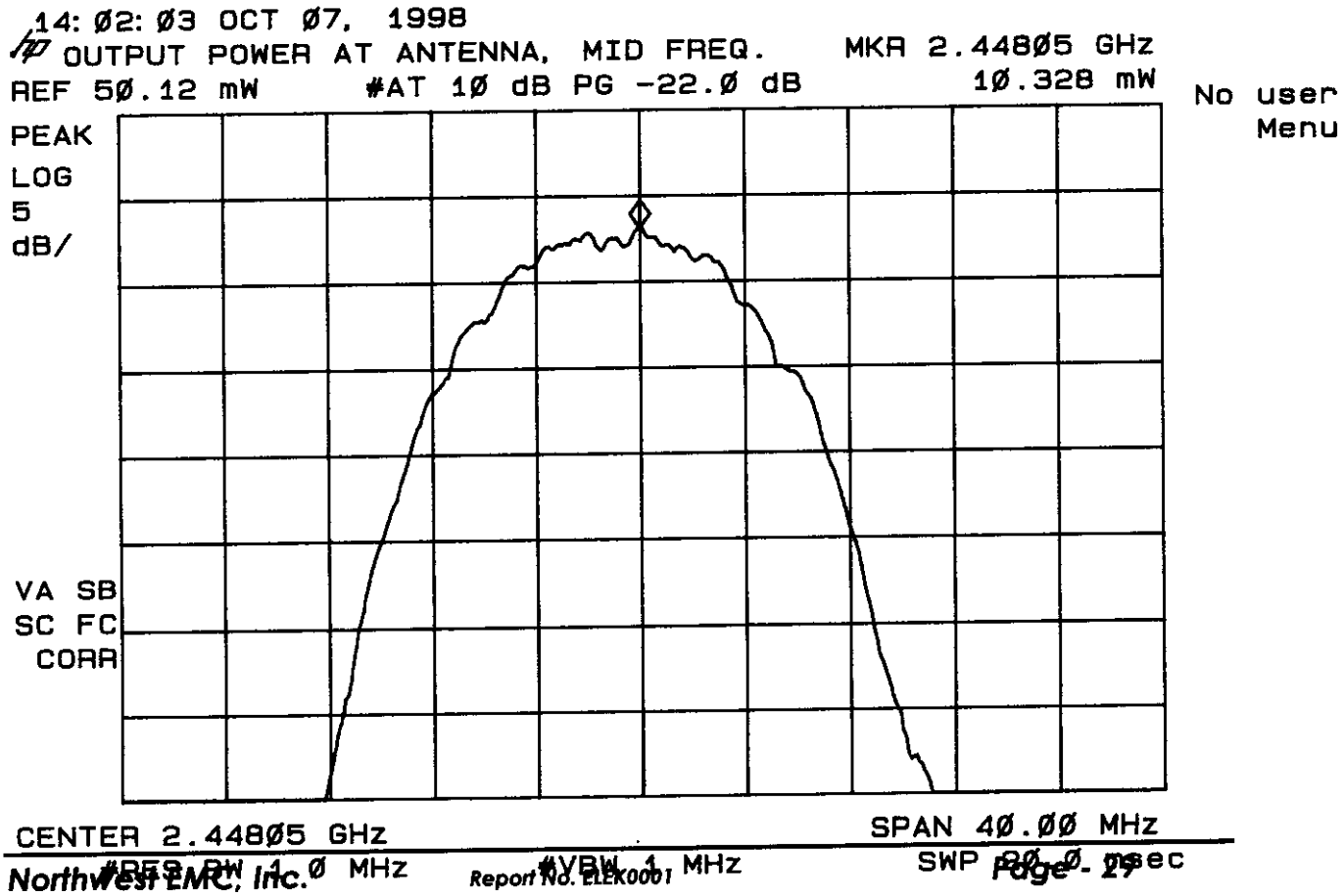
As per Section 15.247 (b), the following graphs show that the maximum peak output power of the EUT does not exceed 1 watt. The output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the antenna port of the EUT and the spectrum analyzer. The resolution bandwidth was set to 1 MHz. The data below also includes the cable loss of 2.0 dB and a 20 dB attenuator.

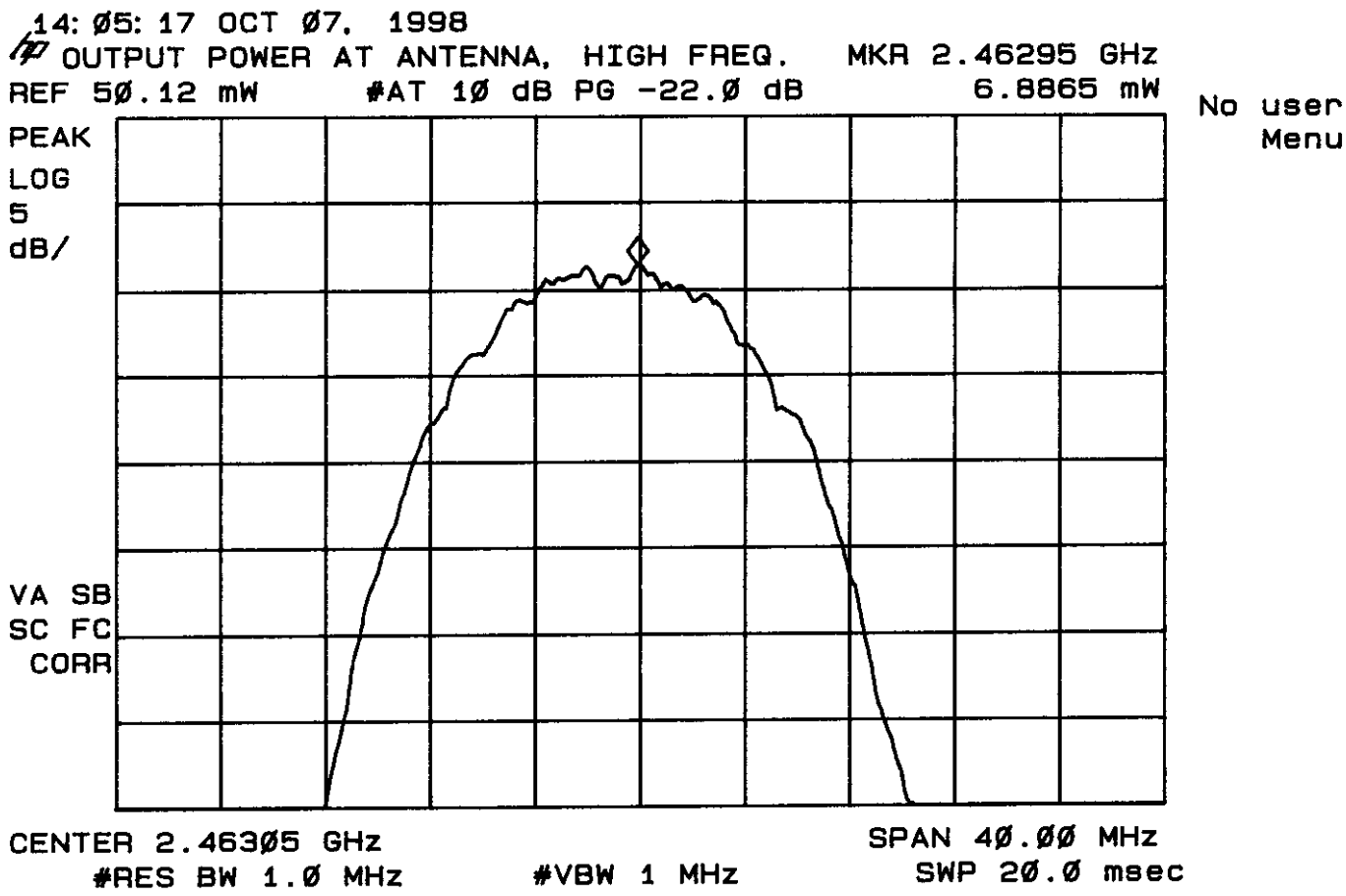
Frequency(GHz)	Power Output(dBm)
Low	13.740 mW
Mid	10.328 mW
High	6.8865 mW

Test Personnel:

Typed/Printed Name: Daniel Haas


13: 59: 38 OCT Ø7, 1998
OUTPUT POWER AT ANTENNA, LOW FREQ.
MKR 2.423Ø5 GHz
REF 5Ø.12 mW
#AT 1Ø dB PG -22.Ø dB
13.74Ø mW
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.42285 GHz
SPAN 4Ø.ØØ MHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SWP 2Ø.Ø msec


14: Ø2: Ø3 OCT Ø7, 1998
OUTPUT POWER AT ANTENNA, MID FREQ.
MKR 2.448Ø5 GHz
REF 5Ø.12 mW
#AT 1Ø dB PG -22.Ø dB
1Ø.328 mW
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.448Ø5 GHz
SPAN 4Ø.ØØ MHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SWP 2Ø.Ø msec


14: Ø5: 17 OCT Ø7, 1998
OUTPUT POWER AT ANTENNA, HIGH FREQ.
MKR 2.46295 GHz
REF 5Ø.12 mW
#AT 1Ø dB PG -22.Ø dB
6.8865 mW
No user Menu
PEAK
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.463Ø5 GHz
SPAN 4Ø.ØØ MHz
#RES BW 1.Ø MHz
#VBW 1 MHz
SWP 2Ø.Ø msec

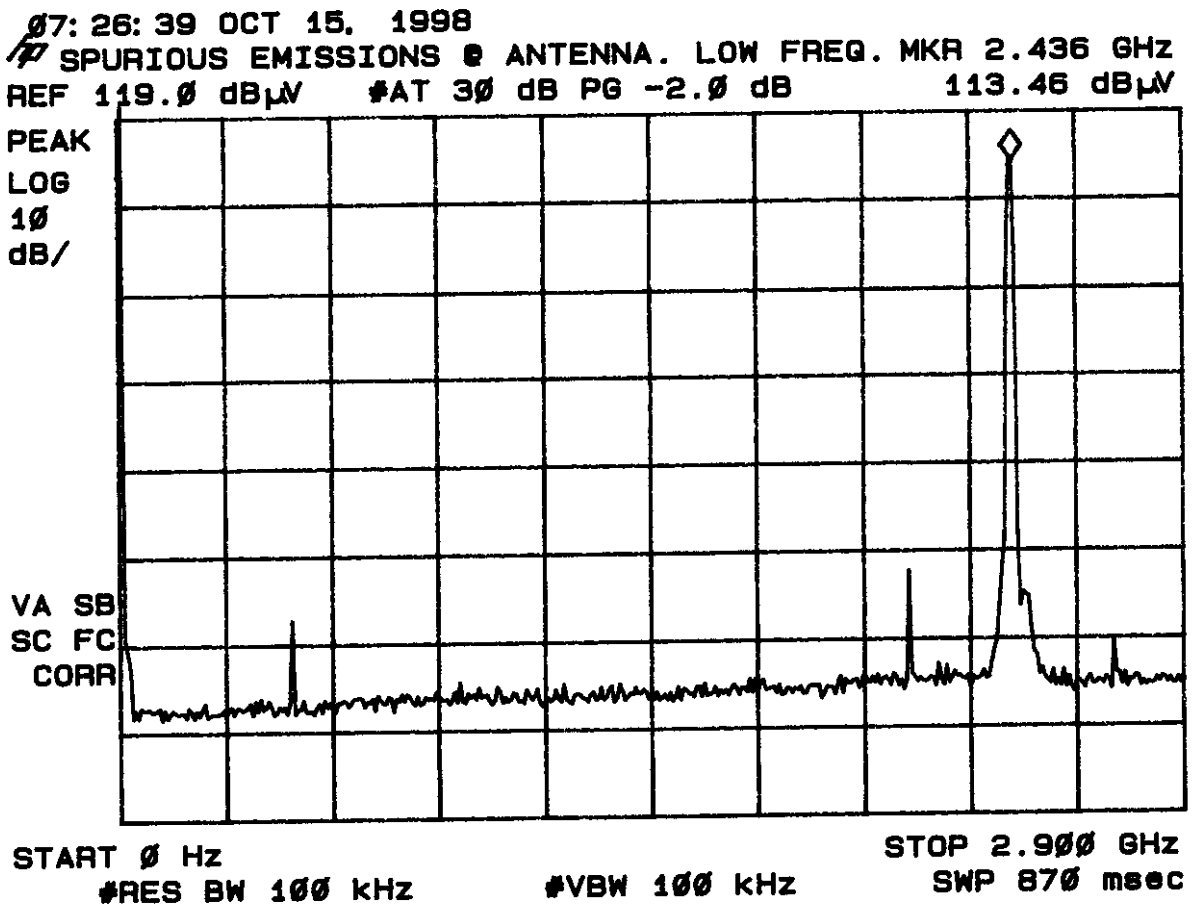
7.5 Antenna Conducted Emissions

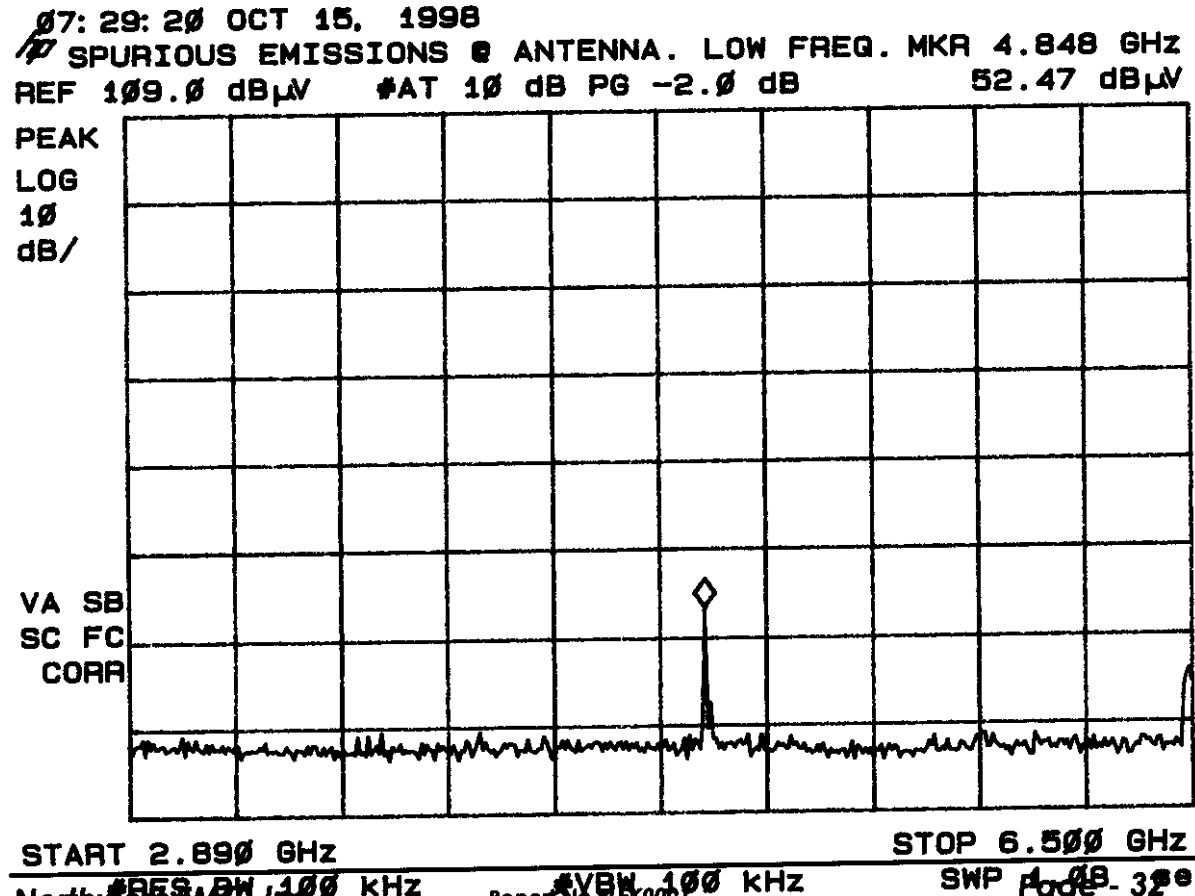
As per Section 15.247 (c), the following graphs show that the maximum level of harmonics/spurs are at least 20dB down from the highest emission level within the authorized band. The conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the antenna port of the EUT and the spectrum analyzer. The resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The EUT was scanned up to 25 GHz.

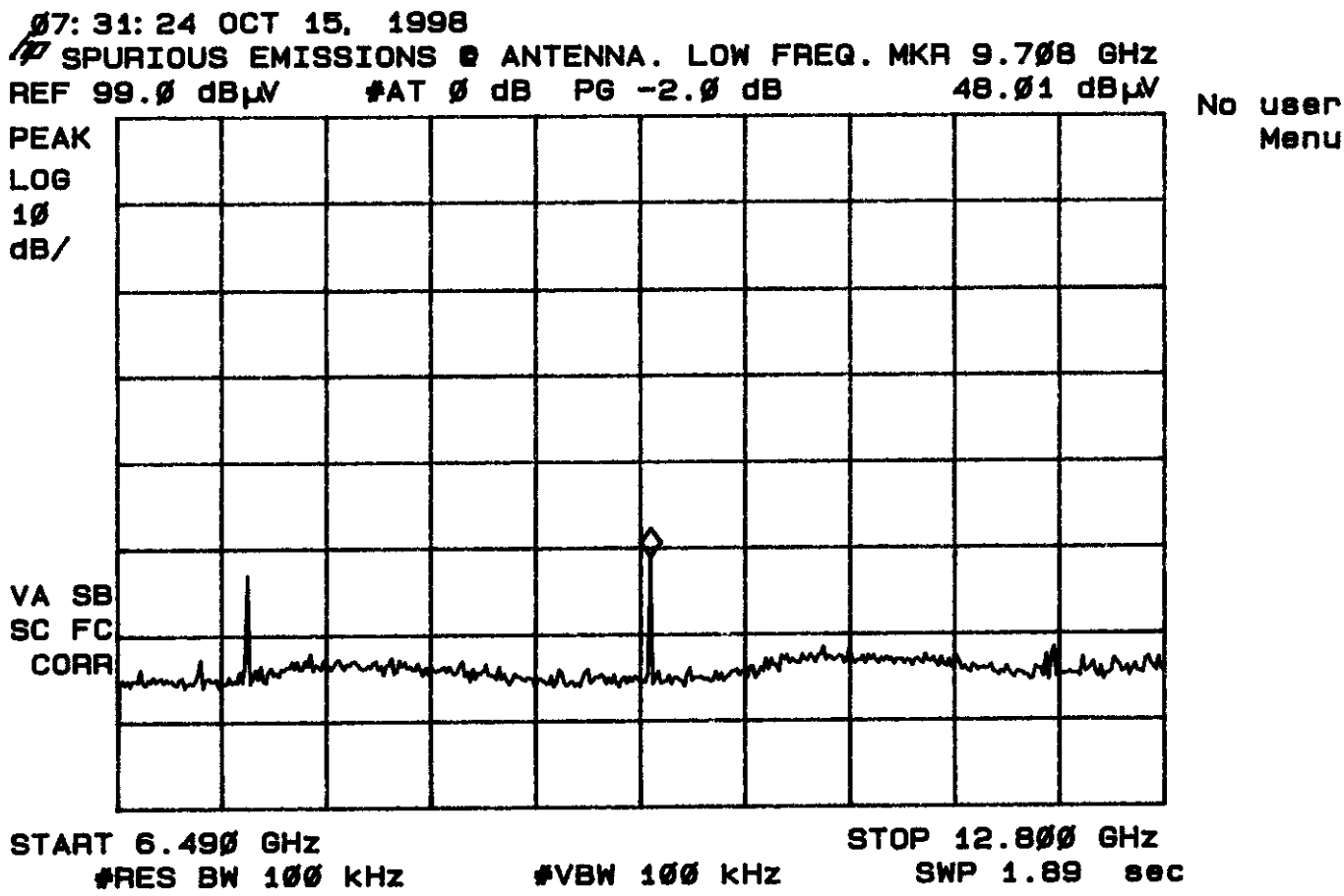
Results: All Harmonics or spurs are greater than 20dB below the level of the transmit frequency.

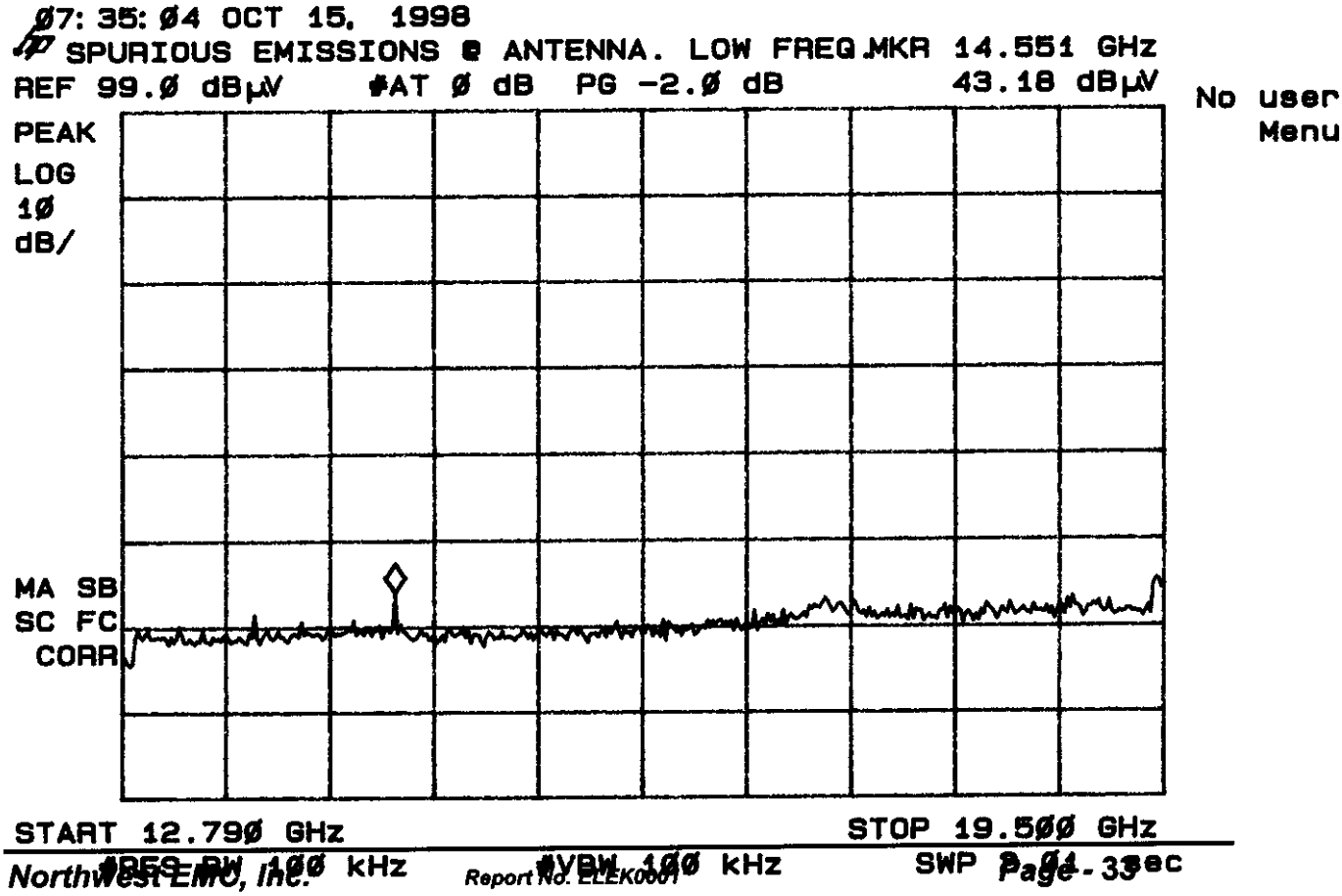
Test Personnel:

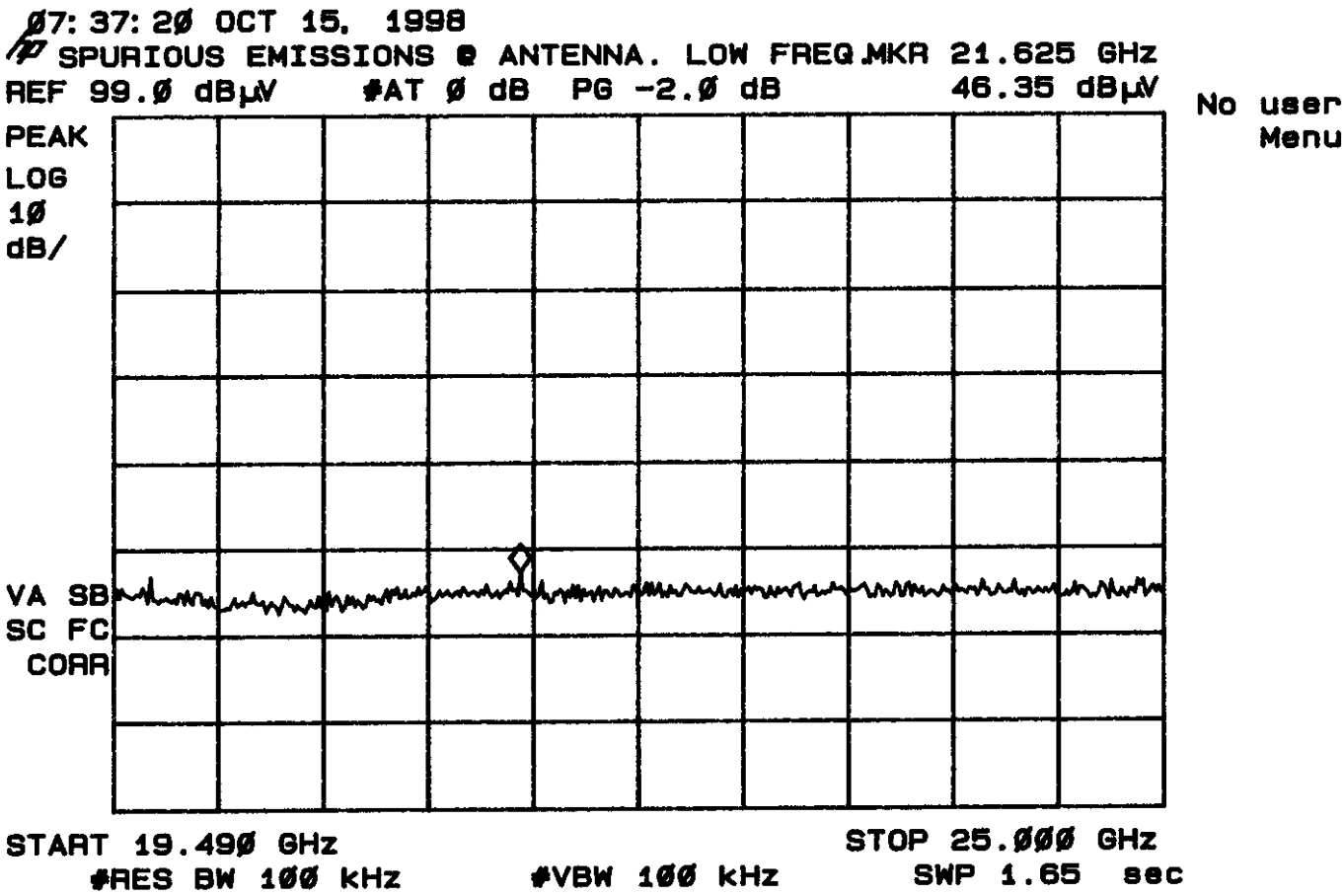
Typed/Printed Name: Daniel Haas

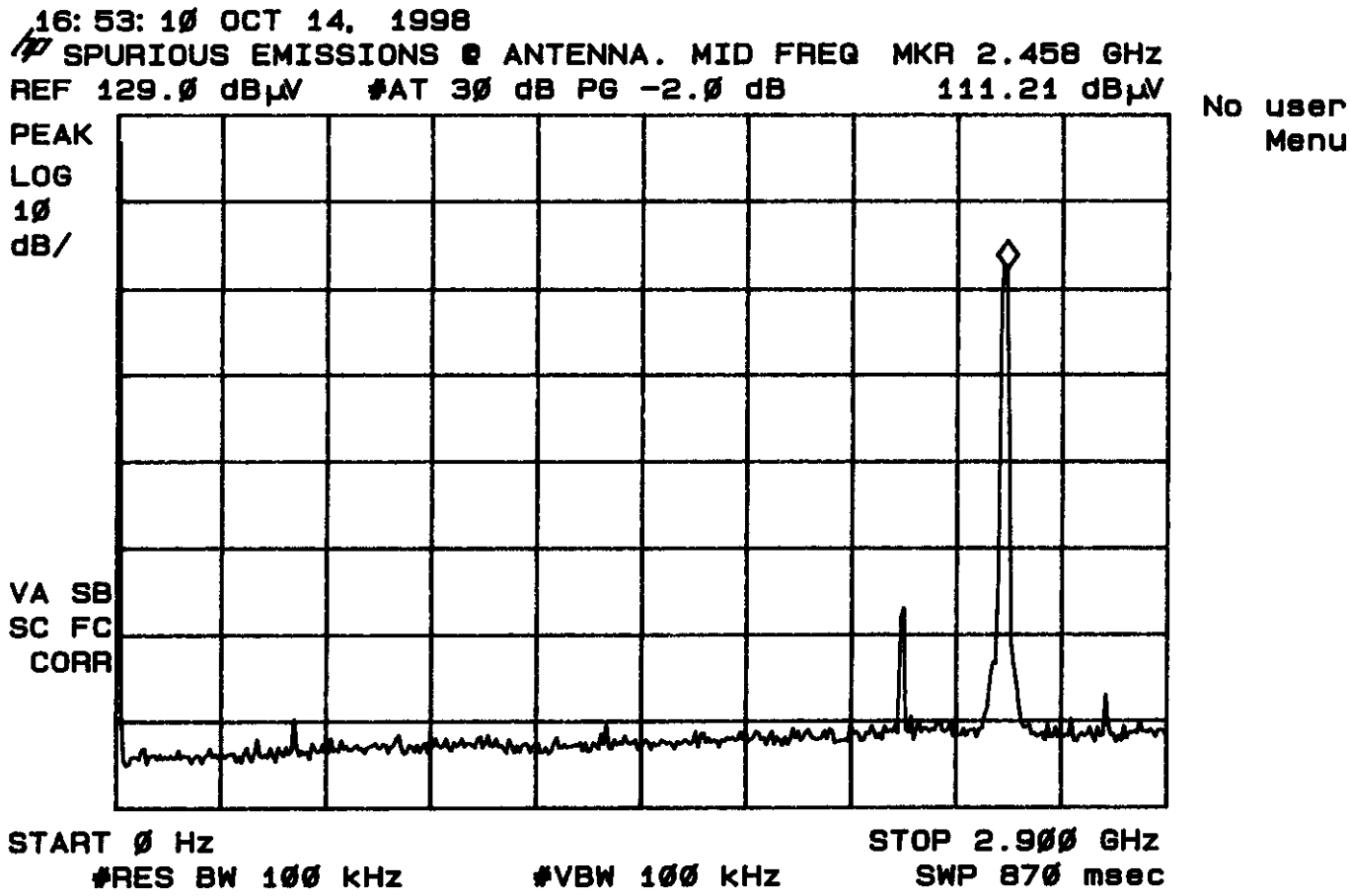

Ø7: 26: 39 OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. LOW FREQ. MKR 2.436 GHz
REF 119.Ø dBµV
#AT 3Ø dB PG -2.Ø dB
113.46 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START Ø Hz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
STOP 2.9ØØ GHz
SWP 87Ø msec

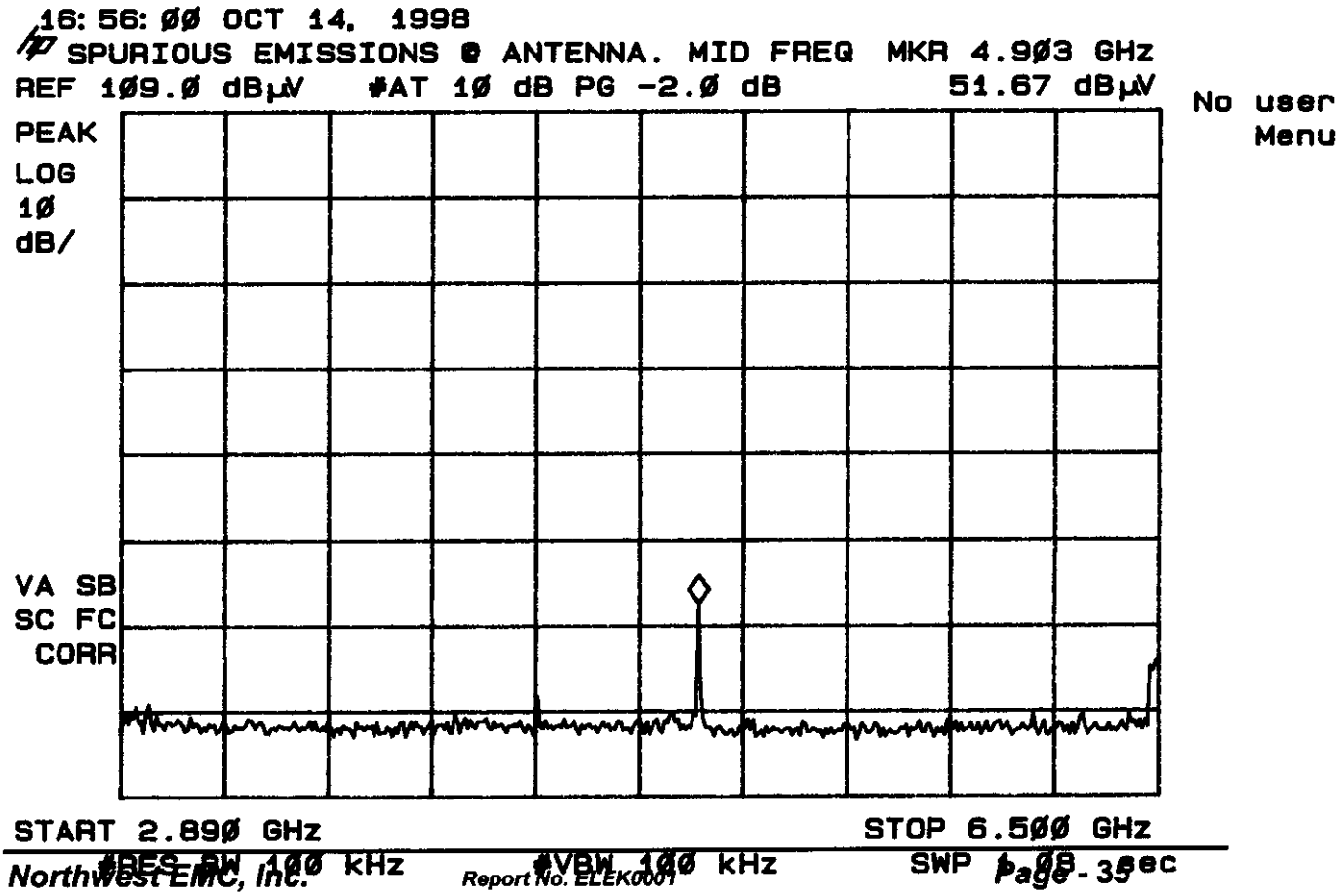

Ø7: 29: 2Ø OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. LOW FREQ. MKR 4.848 GHz
REF 1Ø9.Ø dBµV
#AT 1Ø dB PG -2.Ø dB
52.47 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 2.89Ø GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
STOP 6.5ØØ GHz
SWP 4.Ø8 sec

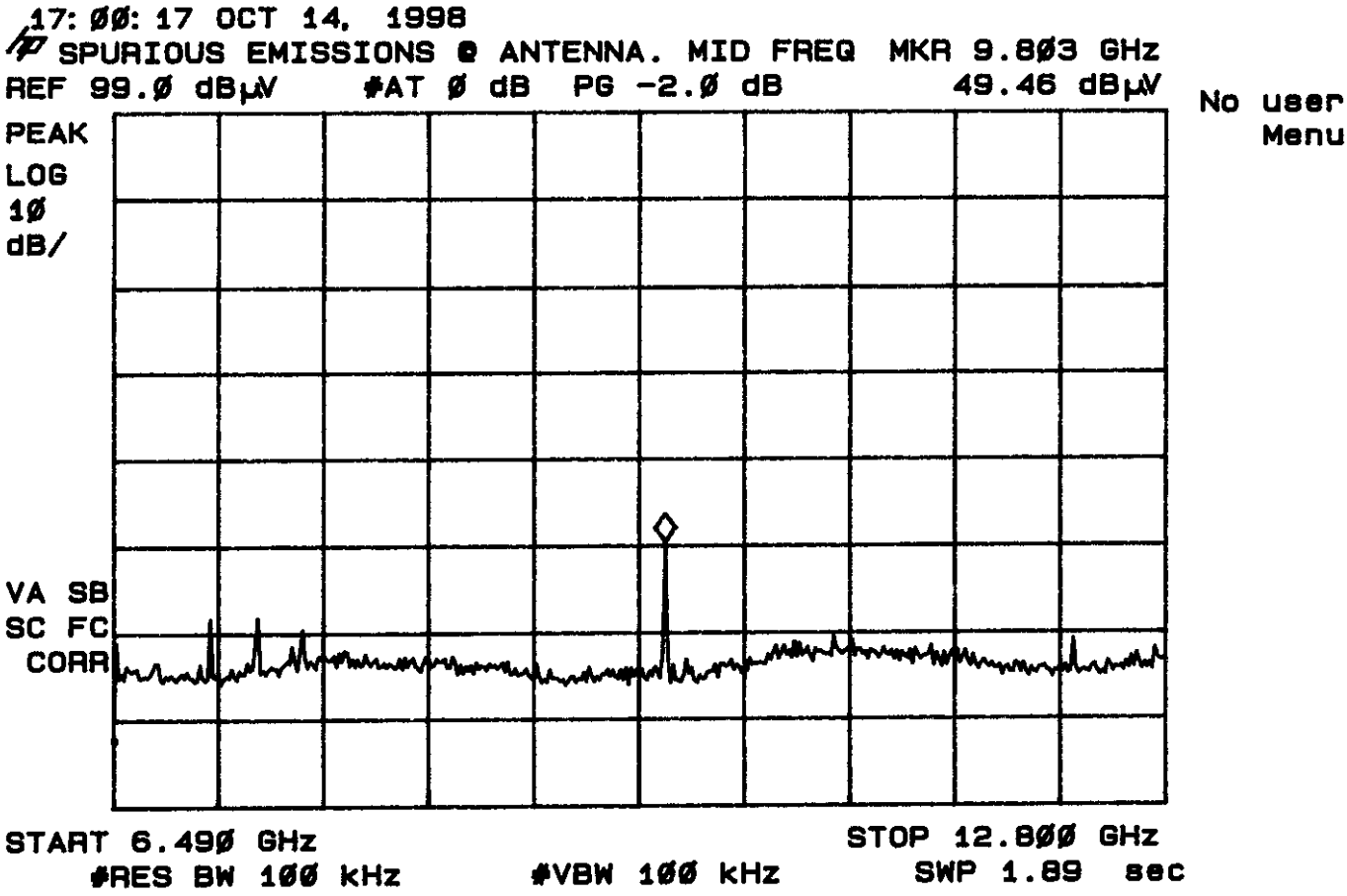

07: 31: 24 OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. LOW FREQ. MKR 9.708 GHz
REF 99.0 dBµV
#AT 0 dB
PG -2.0 dB
48.01 dBµV
No user Menu
PEAK
LOG
10
dB/
VA SB
SC FC
CORR
START 6.490 GHz
STOP 12.800 GHz
#RES BW 100 kHz
#VBW 100 kHz
SWP 1.89 sec

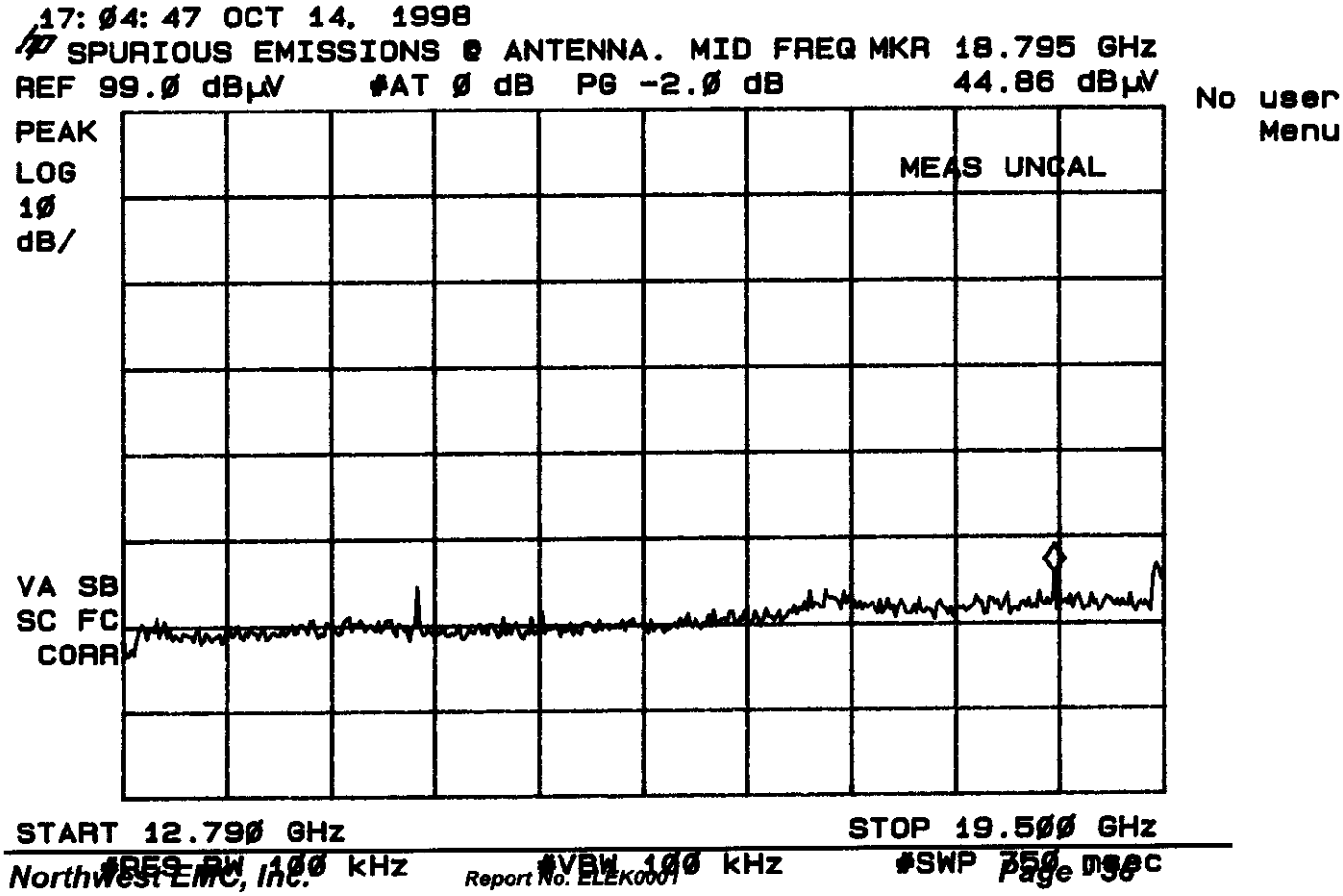

07: 35: 04 OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. LOW FREQ.MKR 14.551 GHz
REF 99.0 dBµV
#AT 0 dB
PG -2.0 dB
43.18 dBµV
No user Menu
PEAK
LOG
10
dB/
MA SB
SC FC
CORR
START 12.790 GHz
STOP 19.500 GHz
#RES BW 100 kHz
#VBW 100 kHz
SWP 2.11 sec

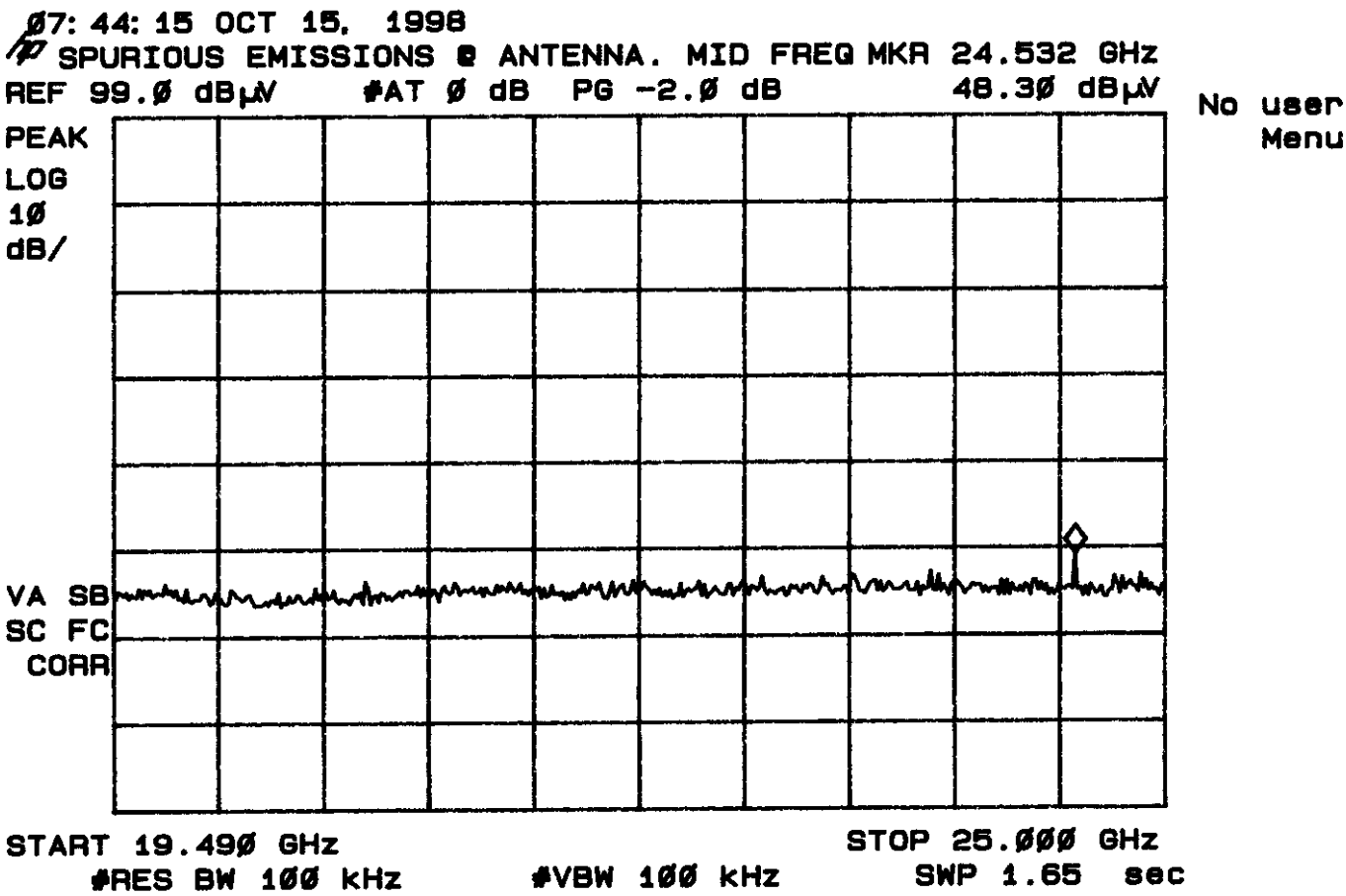

07: 37: 20 OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. LOW FREQ.MKR 21.625 GHz
REF 99.0 dBµV
#AT 0 dB PG -2.0 dB
46.35 dBµV
No user Menu
PEAK
LOG
10
dB/
VA SB
SC FC
CORR
START 19.490 GHz
STOP 25.000 GHz
#RES BW 100 kHz
#VBW 100 kHz
SWP 1.65 sec

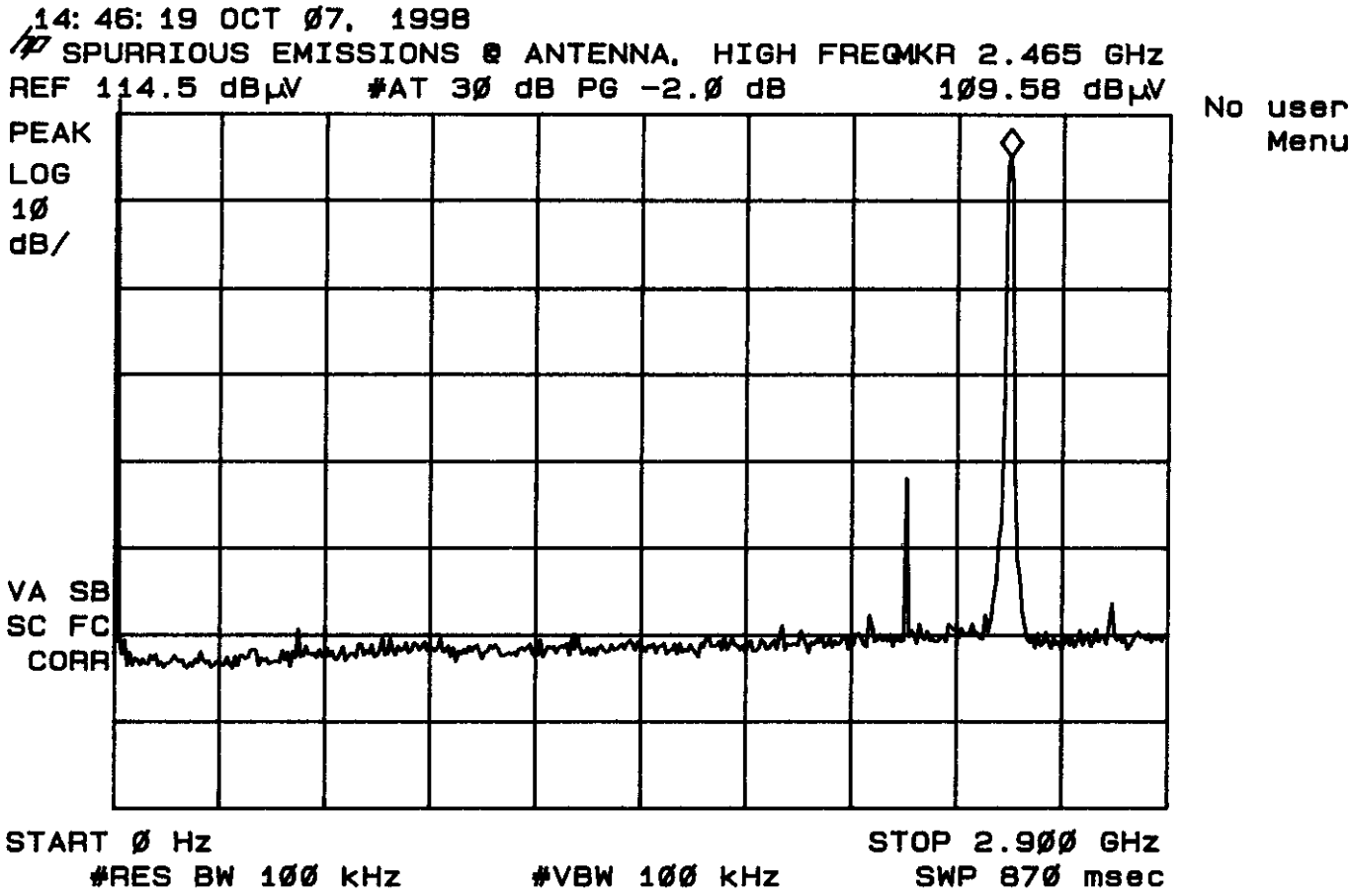

16: 53: 1Ø OCT 14, 1998
SPURIOUS EMISSIONS @ ANTENNA. MID FREQ MKR 2.458 GHz
REF 129.Ø dBµV #AT 3Ø dB PG -2.Ø dB 111.21 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START Ø Hz
STOP 2.9ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 87Ø msec

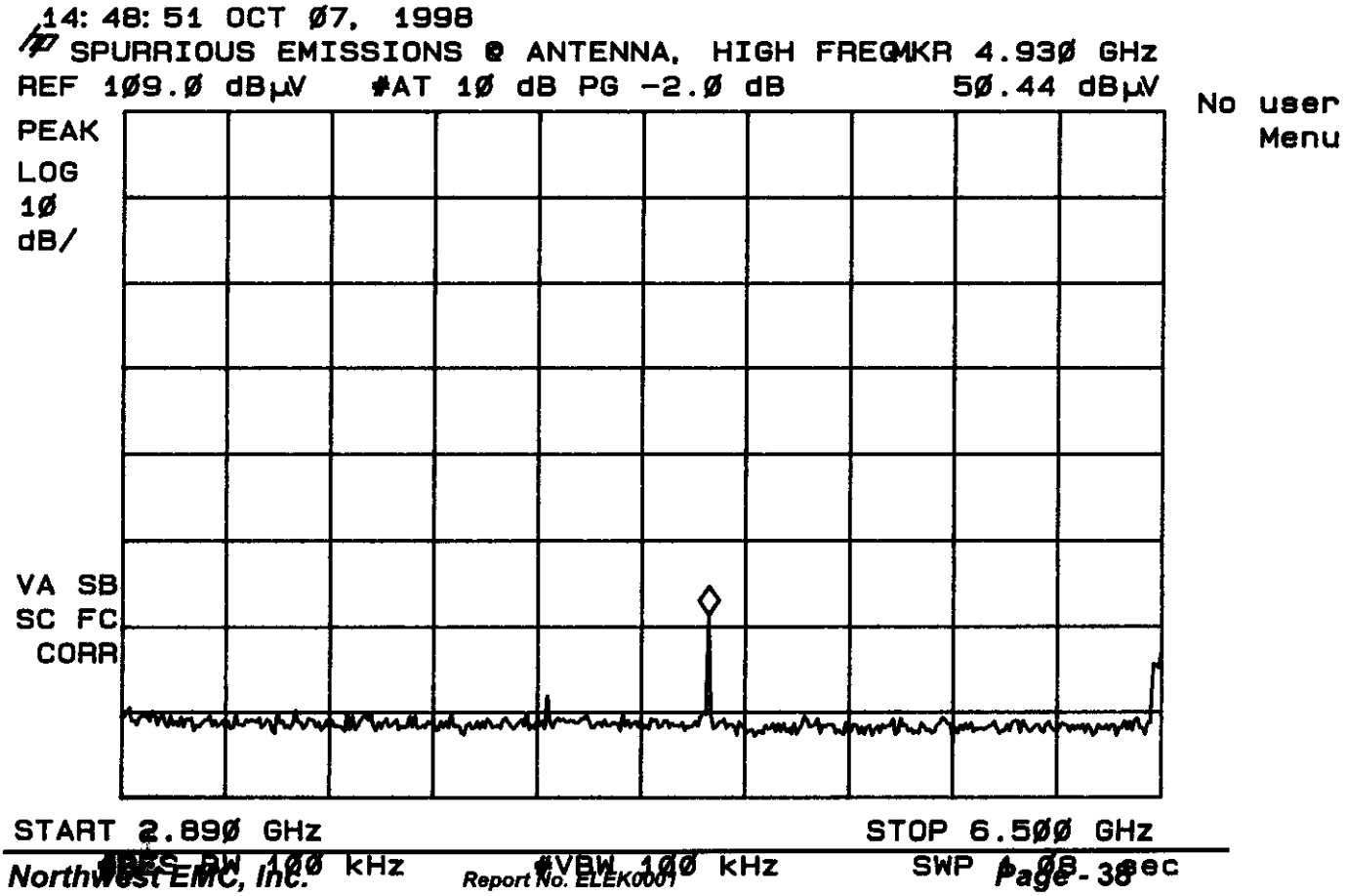

16: 56: ØØ OCT 14, 1998
SPURIOUS EMISSIONS @ ANTENNA. MID FREQ MKR 4.9Ø3 GHz
REF 1Ø9.Ø dBµV #AT 1Ø dB PG -2.Ø dB 51.67 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 2.89Ø GHz
STOP 6.5ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 1.Ø8 sec

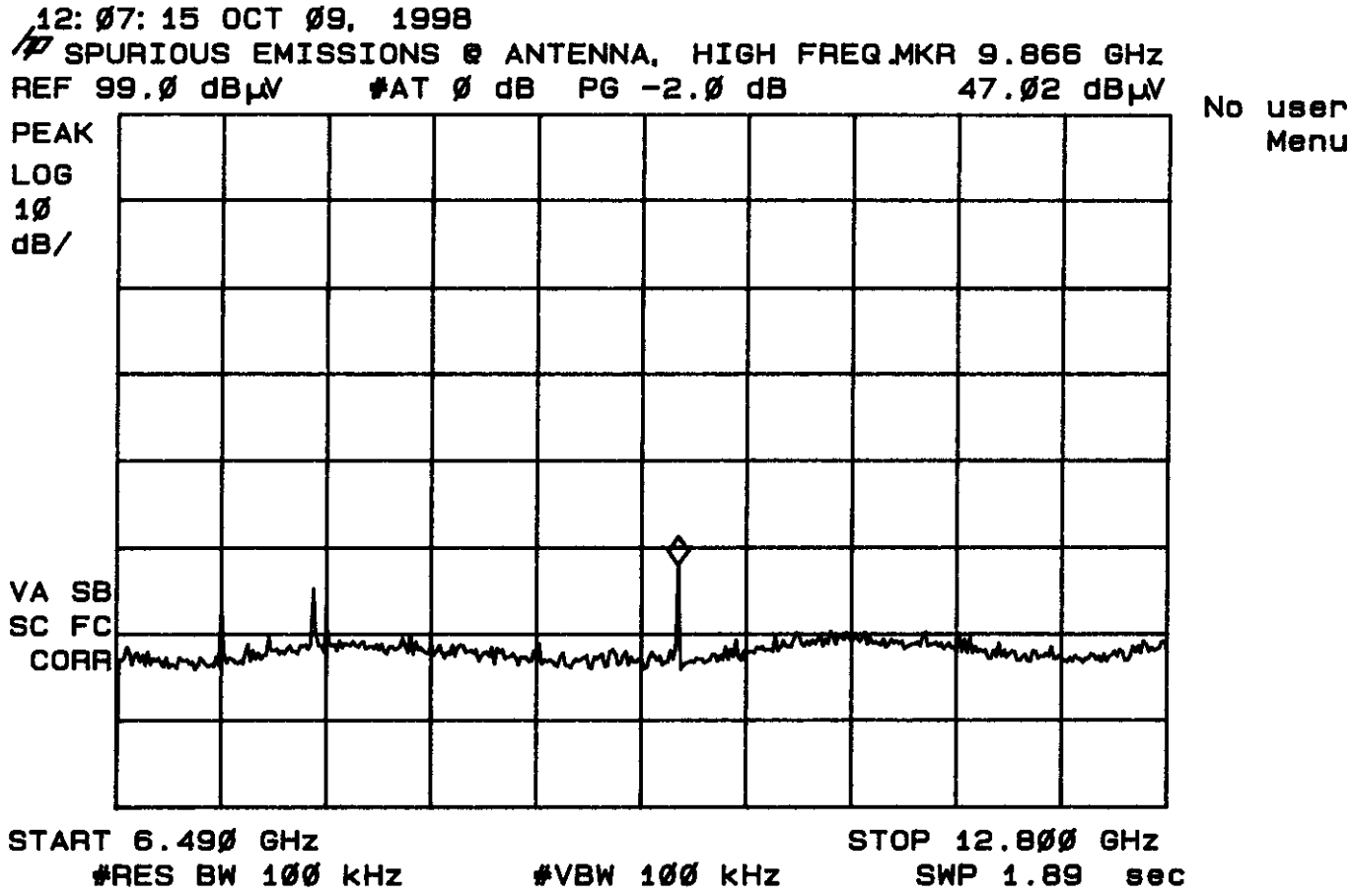

17: ØØ: 17 OCT 14, 1998
SPURIOUS EMISSIONS @ ANTENNA. MID FREQ MKR 9.8Ø3 GHz
REF 99.Ø dBµV #AT Ø dB PG -2.Ø dB 49.46 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 6.49Ø GHz
STOP 12.8ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 1.89 sec

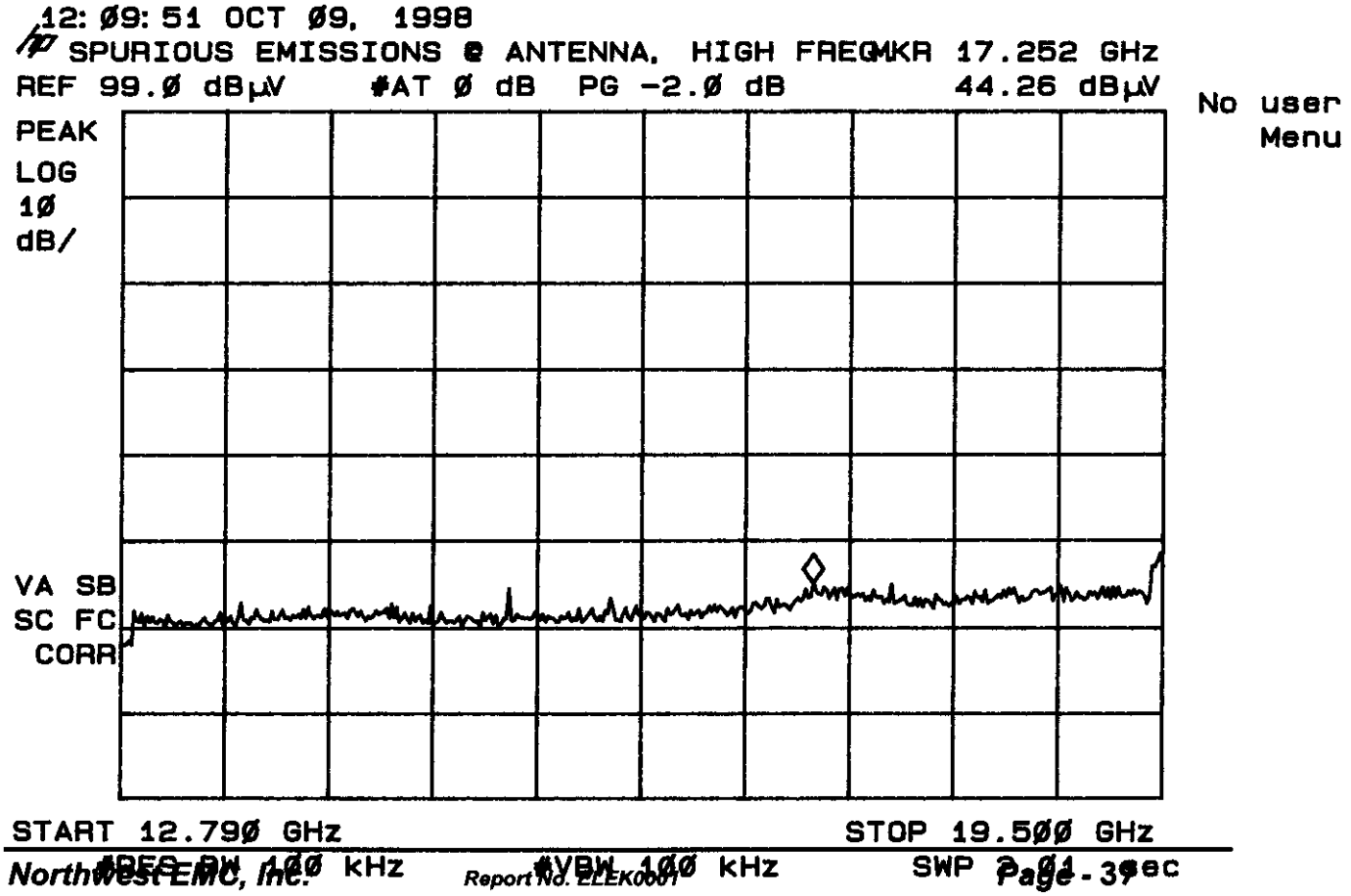

17: Ø4: 47 OCT 14, 1998
SPURIOUS EMISSIONS @ ANTENNA. MID FREQ MKR 18.795 GHz
REF 99.Ø dBµV #AT Ø dB PG -2.Ø dB 44.86 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
MEAS UNCAL
VA SB
SC FC
CORR
START 12.79Ø GHz
STOP 19.5ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 350 msec

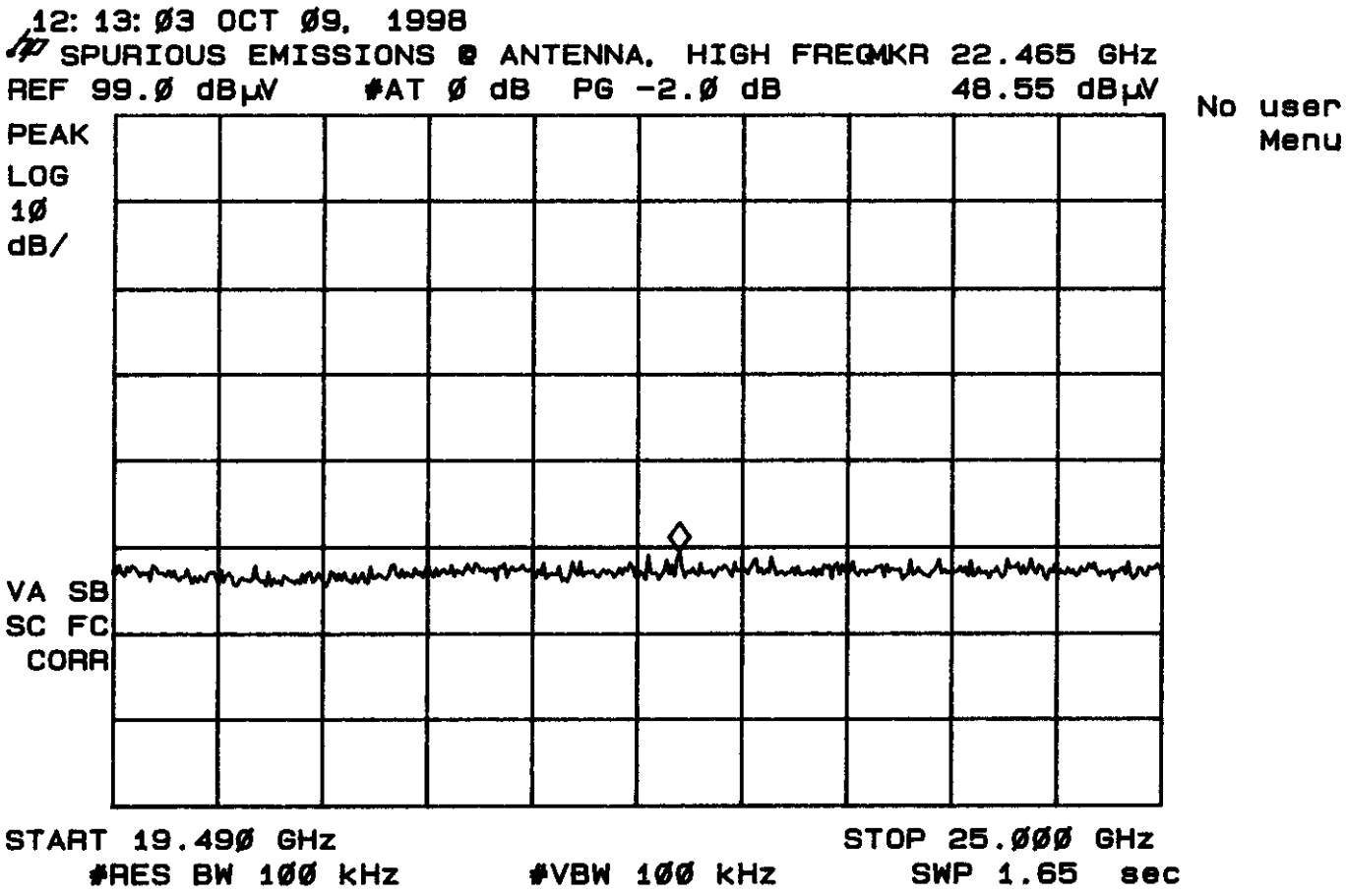

07: 44: 15 OCT 15, 1998
SPURIOUS EMISSIONS @ ANTENNA. MID FREQ MKR 24.532 GHz
REF 99.0 dBµV
#AT 0 dB
PG -2.0 dB
48.30 dBµV
No user Menu
PEAK
LOG
10
dB/
VA SB
SC FC
CORR
START 19.490 GHz
STOP 25.000 GHz
#RES BW 100 kHz
#VBW 100 kHz
SWP 1.65 sec

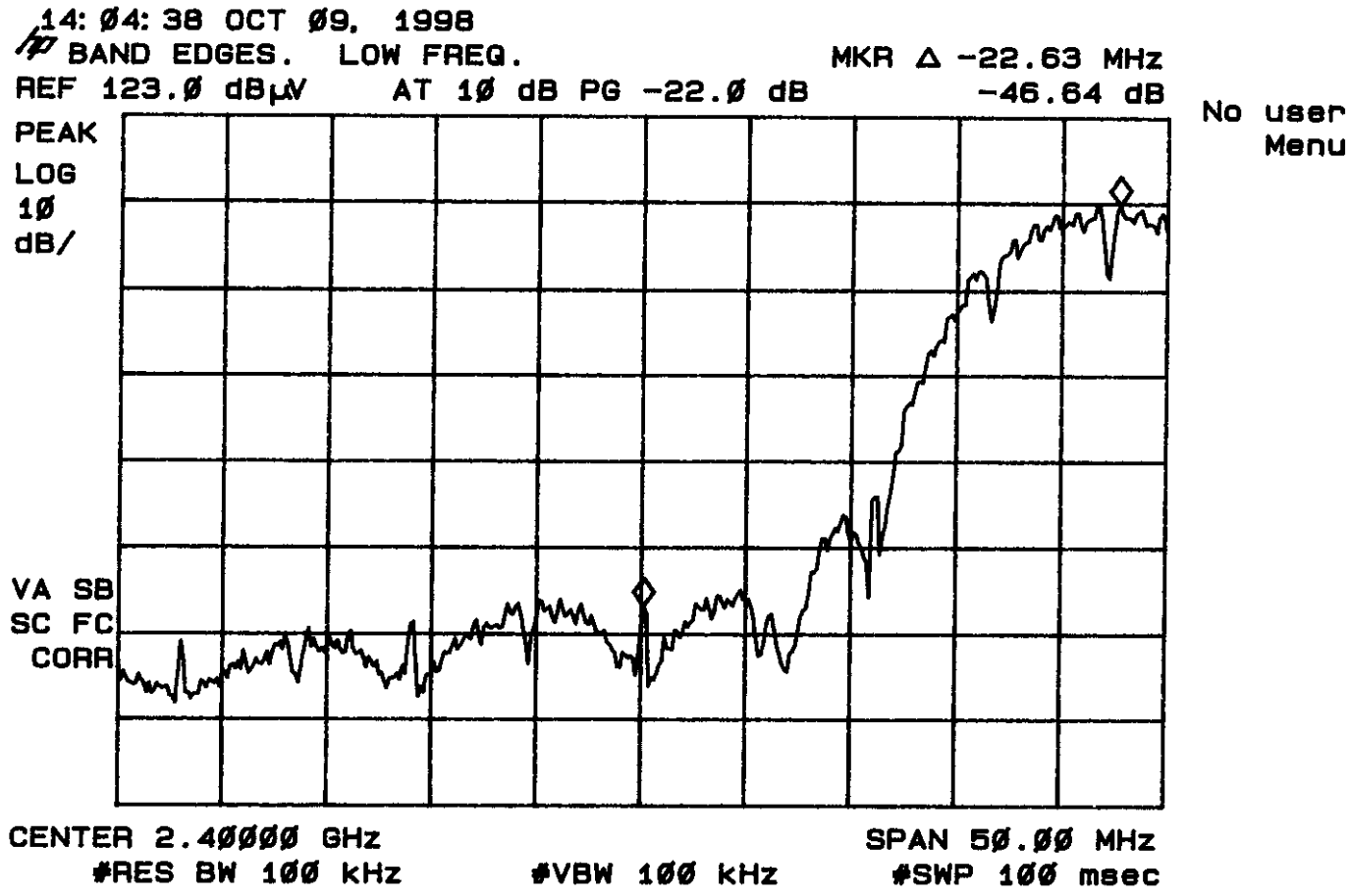

14: 46: 19 OCT Ø7, 1998
SPURRIOUS EMISSIONS @ ANTENNA, HIGH FREQ
MKR 2.465 GHz
REF 114.5 dBµV
#AT 3Ø dB PG -2.Ø dB
1Ø9.58 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START Ø Hz
STOP 2.9ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 87Ø msec

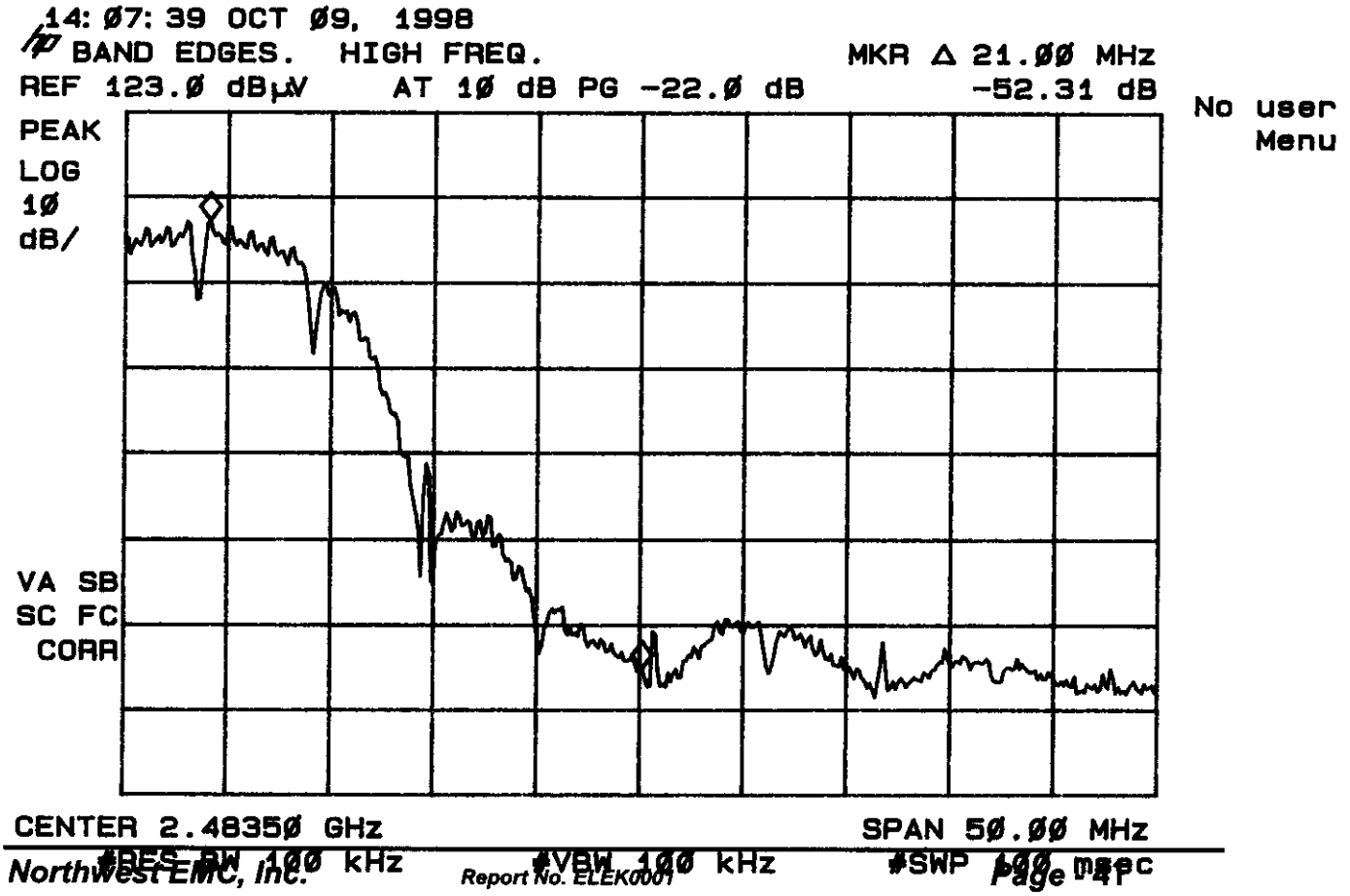

14: 48: 51 OCT Ø7, 1998
SPURRIOUS EMISSIONS @ ANTENNA, HIGH FREQ
MKR 4.93Ø GHz
REF 1Ø9.Ø dBµV
#AT 1Ø dB PG -2.Ø dB
5Ø.44 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 2.89Ø GHz
STOP 6.5ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 4.Ø8 sec


12: Ø7: 15 OCT Ø9, 1998
SPURIOUS EMISSIONS @ ANTENNA, HIGH FREQ
MKR 9.866 GHz
REF 99.Ø dBµV
#AT Ø dB
PG -2.Ø dB
47.Ø2 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 6.49Ø GHz
STOP 12.8ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 1.89 sec


12: Ø9: 51 OCT Ø9, 1998
SPURIOUS EMISSIONS @ ANTENNA, HIGH FREQ
MKR 17.252 GHz
REF 99.Ø dBµV
#AT Ø dB
PG -2.Ø dB
44.26 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 12.79Ø GHz
STOP 19.5ØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 2.Ø1 sec


12: 13: Ø3 OCT Ø9, 1998
SPURIOUS EMISSIONS @ ANTENNA, HIGH FREQMKR 22.465 GHz
REF 99.Ø dBµV
#AT Ø dB
PG -2.Ø dB
48.55 dBµV
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
START 19.49Ø GHz
STOP 25.ØØØ GHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
SWP 1.65 sec


14: Ø4: 38 OCT Ø9, 1998
BAND EDGES. LOW FREQ.
MKR Δ -22.63 MHz
REF 123.Ø dBµV
AT 1Ø dB PG -22.Ø dB
-46.64 dB
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
CENTER 2.4ØØØØ GHz
SPAN 5Ø.ØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1ØØ msec


14: Ø7: 39 OCT Ø9, 1998
BAND EDGES. HIGH FREQ.
MKR Δ 21.ØØ MHz
REF 123.Ø dBµV
AT 1Ø dB PG -22.Ø dB
-52.31 dB
No user Menu
PEAK
LOG
1Ø
dB/
VA SB
SC FC
CORR
CENTER 2.4835Ø GHz
SPAN 5Ø.ØØ MHz
#RES BW 1ØØ kHz
#VBW 1ØØ kHz
#SWP 1ØØ msec

7.6 Power Spectral Density

As per Section 15.247(d): Power spectral density, locate and zoom in on emission peak(s) within the passband. Set RBW = 3 kHz, VBW>RBW, sweep = (SPAN/3 kHz) e.g., for a span of 1.5 MHz, the sweep should be $1.5 \times 10^6 \div 3 \times 10^3 = 500$ seconds. The peak level measured must be no greater than +8 dBm. External attenuation is used and added to the reading. If necessary, the following FCC procedure is used for modifying the power spectral density measurements:

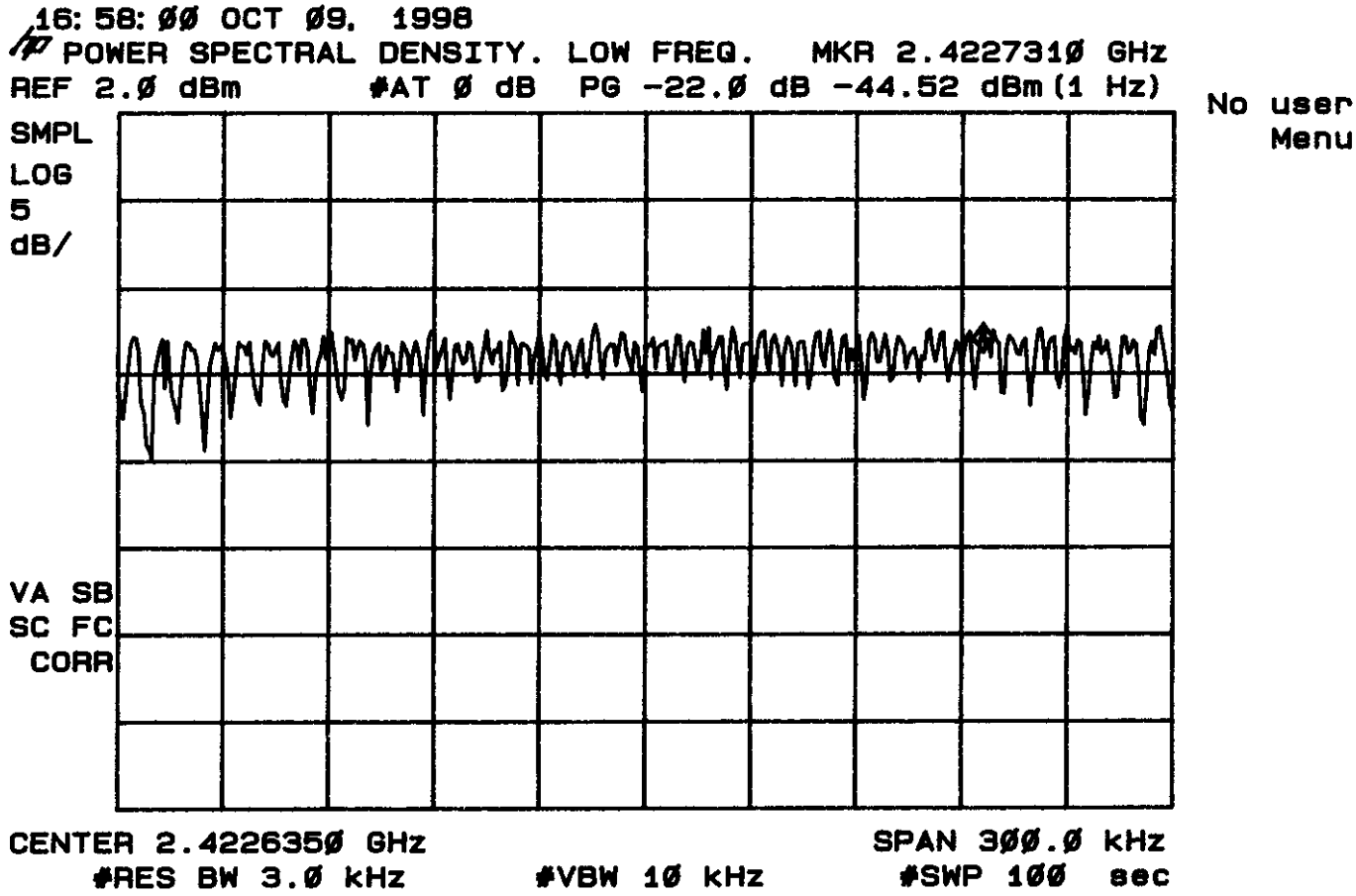
"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.7 dB for correction to 3 kHz."

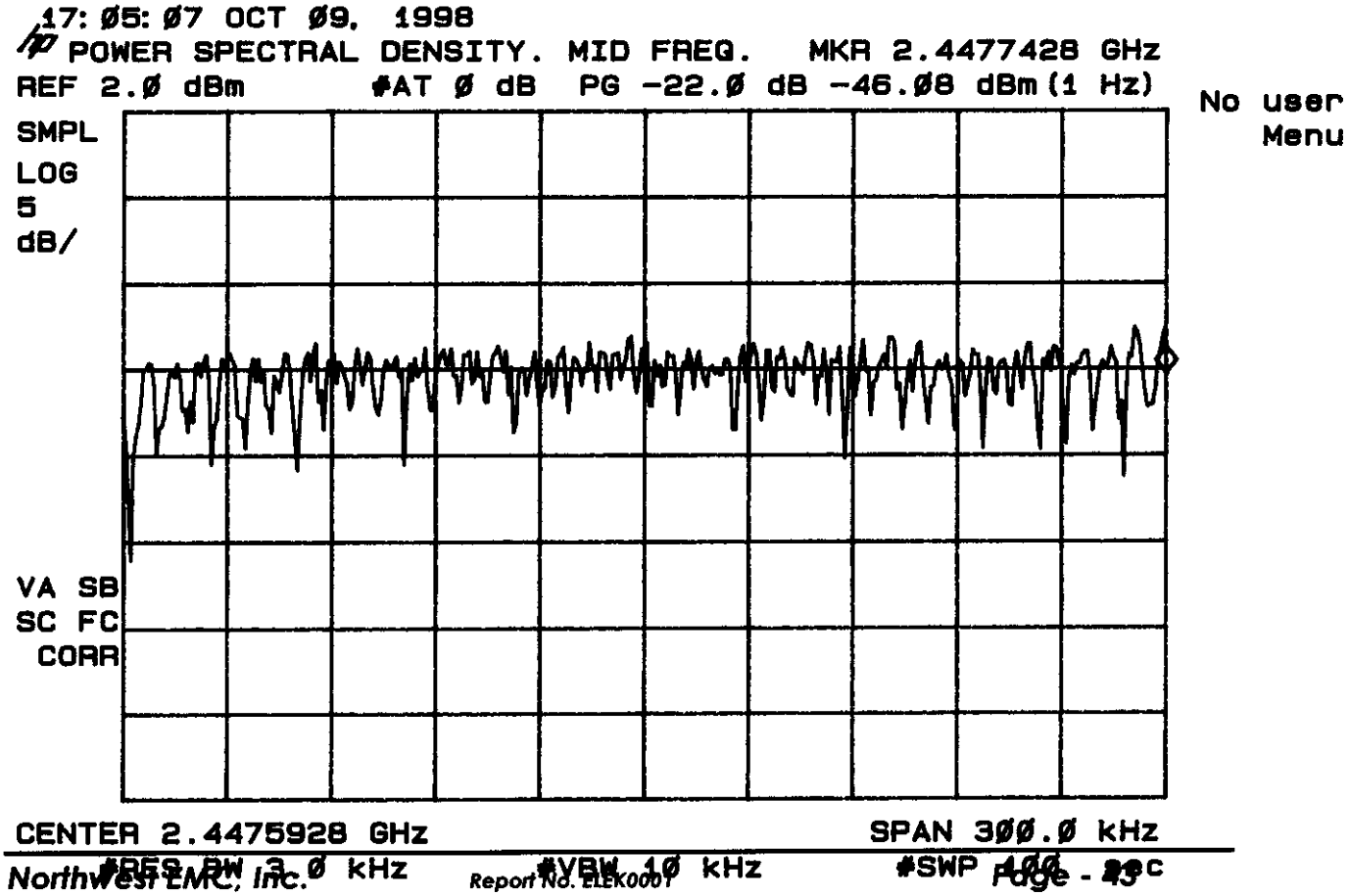
Data was taken using the 1 Hz noise power bandwidth on an HP spectrum analyzer. The data summary shown below includes the 34.7 dB correction to 3 kHz and the cable loss and external attenuation of 22 dB.

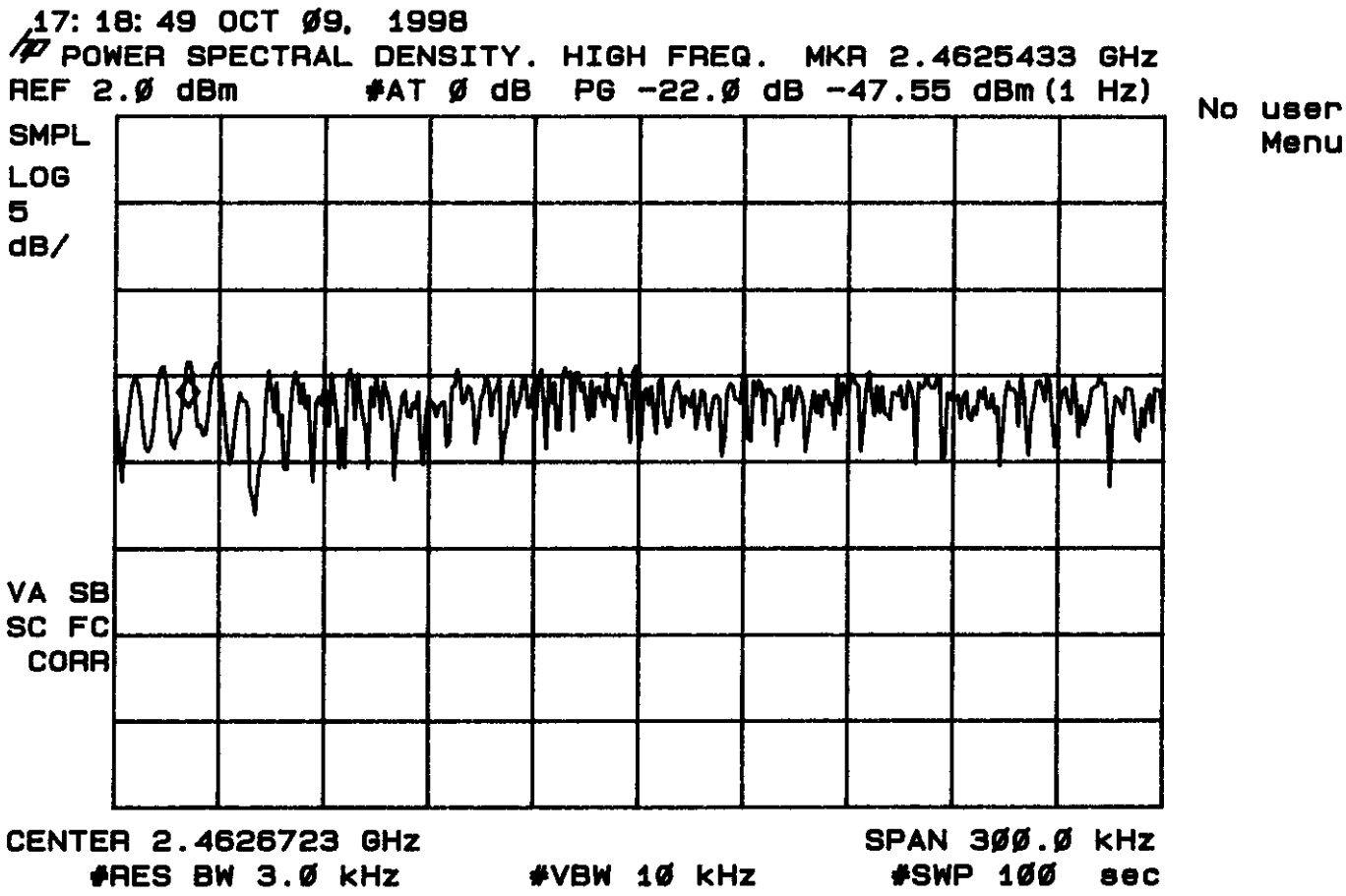
Low	-9.82dBm
Mid	-11.38dBm
High	-12.85dBm

Test Personnel:

Typed/Printed Name: Daniel Haas


16: 58: ØØ OCT Ø9, 1998
POWER SPECTRAL DENSITY. LOW FREQ. MKR 2.4227310 GHz
REF 2.Ø dBm #AT Ø dB PG -22.Ø dB -44.52 dBm(1 Hz)
No user Menu
SMPL
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.4226350 GHz
SPAN 3ØØ.Ø kHz
#RES BW 3.Ø kHz
#VBW 1Ø kHz
#SWP 1ØØ sec


17: Ø5: Ø7 OCT Ø9, 1998
POWER SPECTRAL DENSITY. MID FREQ. MKR 2.4477428 GHz
REF 2.Ø dBm #AT Ø dB PG -22.Ø dB -46.Ø8 dBm(1 Hz)
No user Menu
SMPL
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.4475928 GHz
SPAN 3ØØ.Ø kHz
#RES BW 3.Ø kHz
#VBW 1Ø kHz
#SWP 1ØØ sec


17: 18: 49 OCT Ø9, 1998
POWER SPECTRAL DENSITY. HIGH FREQ. MKR 2.4625433 GHz
REF 2.Ø dBm
#AT Ø dB PG -22.Ø dB -47.55 dBm (1 Hz)
No user Menu
SMPL
LOG
5
dB/
VA SB
SC FC
CORR
CENTER 2.4626723 GHz
SPAN 3ØØ.Ø kHz
#RES BW 3.Ø kHz
#VBW 1Ø kHz
#SWP 1ØØ sec

7.7 Processing Gain

Processing gain measurements were performed in accordance with the definitions, calculations, and explanation provided by Elektrobit Inc., and described on the following pages.

Description of the modem processing gain:

Definitions:

C is the carrier (or, in general, the signal);
I is the interference (or noise).

E_b is the energy per bit;
I_o is the interference per Hertz.

C/I can be expressed as follows:

$$\frac{C}{I} = \frac{E_b/I_o}{B/R},$$ where B is the spread spectrum bandwidth, and R is the symbol rate;

(therefore, B/R is the processing gain).

Calculations:

i. With spreading code turned off:

$$\left(\frac{C}{I}\right)_{off} = \frac{E_b/I_o}{R/R} = E_b/I_o.$$

ii. With spreading code turned on:

$$\left(\frac{C}{I}\right)_{on} = \frac{E_b/I_o}{B/R}.$$

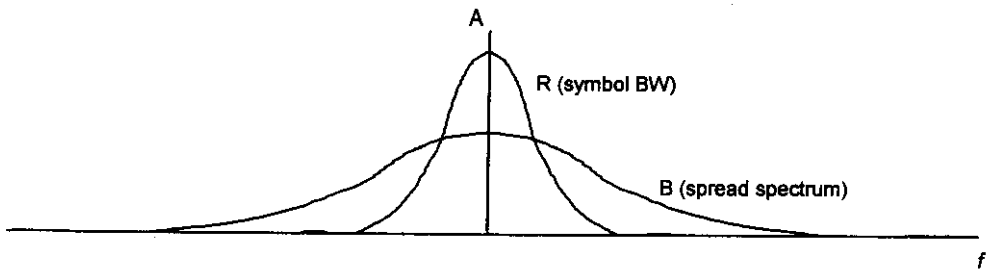
Therefore,

$$\frac{\left(\frac{C}{I}\right)_{off}}{\left(\frac{C}{I}\right)_{on}} = \frac{E_b/I_o}{\left(\frac{E_b/I_o}{B/R}\right)} = \frac{B}{R} = \text{processing gain (PG).}$$

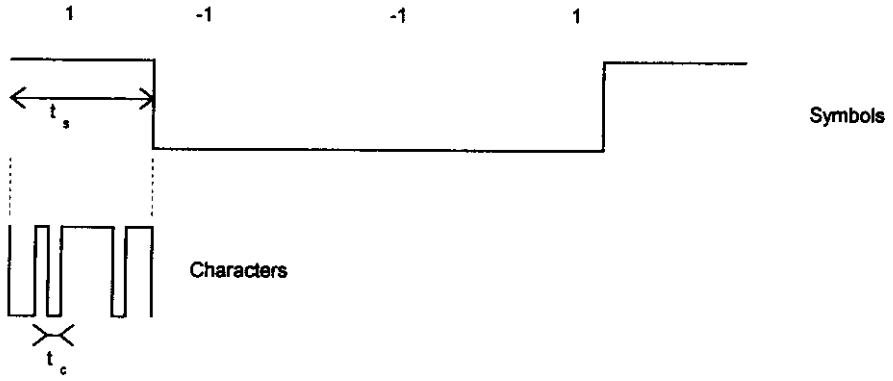
The processing gain can thus be measured by SNR (≙ C/I) measurements for the FCC. (Note that E_b/I_o is assumed to be identical in cases i and ii.)

Explanation of the processing gain:

Bandwidth expression:



Time expression:



The processing gain (PG) is given by

$$PG = \frac{B}{R} = \frac{t_s}{t_c}.$$

In the Sequence DT10 modem, R = 1 Mbps and B = 11 Mcps. Therefore, this calculation results in the following processing gain figure:

$$PG = \frac{11}{1} = 11,$$

giving 10 log (11) = 10.4 dB.

7.8 Field Strength Calculations

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured level. The basic equation with a sample calculation is as follows:
FS = RA + AF + CF - AG

where : FS = Field Strength

RA = Measured Level

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

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

FS = 52.5 + 7.4 + 1.1 - 29 = 32 dBuV/meter
Level in uV/m = Common Antilogarithm [(32 dBuV/m)/20] = 39.8 uV/m

7.9 Measurement Bandwidths

Peak Data

150 kHz - 30 MHz ..... 10 kHz
30 MHz - 1000 MHz..... 100 kHz
1000 MHz - 2000 MHz..... 1000 kHz

Quasi-peak Data

150 kHz - 30 MHz ..... 9 kHz
30 MHz - 1000 MHz..... 120 kHz

All radiated measurements are quasi-peak unless otherwise stated. A video filter was not used.
All conducted measurements are peak unless otherwise stated. A video filter was not used.

8.0 Measurement Equipment

Instrument	Model	Serial No.	Freq Range	Last Cal	Cal Due
Log Periodic Ant	EMCO 3146	4693	200 MHz - 1 GHz	01/31/98	01/31/99
Bicon Antenna	EMCO 3104	3600	30 MHz - 200 MHz	01/31/98	01/31/99
Spectrum Analyzer	HP 8568B	2601A02125	100 Hz - 1.5 GHz	09/01/98	09/01/99
Q-peak Adapter	HP 85650A	2043A00214	10 kHz - 1000 MHz	09/01/98	09/01/99
Pre-Amplifier	AR LN1000	15224	100 kHz-1300 MHz	07/20/98	07/20/99
Spectrum Analyzer	HP 8593E	3543A02557	9 kHz – 2.9 GHz	04/03/98	04/03/99
Horn Antenna	EMCO 3115	4074	100 Hz - 1.5 GHz	10/03/97	10/03/99
Pre-Amplifier	Miteq	565125	0.5 GHz – 18 GHz	06/15/98	06/15/99

Appendix I: Measurement Procedures

Each frequency was measured in both the horizontal and vertical antenna polarization's.

The EUT position was maximized for each frequency, for both the horizontal and vertical antenna polarization's, using a remotely controlled turntable.

The antenna height was varied from 1 - 4 meters at each frequency, for both the horizontal and vertical positions to maximize the emission level.

The cable and peripheral positions were manipulated to ensure maximum levels at each frequency for both horizontal and vertical antenna polarization's.

Measurements are made at an antenna to EUT distance of 3 meters.