

Marstech Limited

11 Kelfield Street, Etobicoke, Ontario, Canada, M9W 5A1
Telephone (416) 246-1116, Fax (416) 246-1020

Authorized by:
Professional Engineers
Ontario



Engineering &
Administrative



Testing For FCC
Submissions/Verifications

Approved Test Facility



TEST REPORT

REPORT DATE:	3 January 2003	REPORT NO:	22295D
CONTENTS:	See Table of Contents		
SUBMITTOR:	Thomson, Inc. 10330 North Meridian Street Indianapolis, IN 46290 USA		
SUBJECT:	Model No.: RD900WB FCC ID: G95-RD900WB		
TEST SPECIFICATION	FCC 47 CFR Part 15 NOTE: Tests Conducted Are "Type" Tests.		
DATE SAMPLE RECEIVED:	26 November 2002	DATE TESTED:	27 November 2002 and 02 December 2002
RESULTS:	Equipment tested complies with referenced specification.		
ALTERATIONS	None		
Tested by:	Edward Chang	Approved by:	Robert G. Marshall, P. Eng.
		Date:	Jan 3/03

THIS REPORT SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF MARSTECH LIMITED. This report was prepared by Marstech Limited for the account of the "Submitter". The material herein reflects Marstech's judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions made based on it, are the responsibility of such Third Parties. Marstech accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

TECHNICAL REPORT - FCC 2.1033(b)

Applicant

Thomson, Inc.
10330 North Meridian Street
Indianapolis, IN
46290 USA

FCC Identifier

G95-RD900WB

Manufacturer

Huiyang CCT Telecommunication Products Co. Ltd.
CCT Technology Park, San He Developmental Zone
HuiYang City, Guangdong Province, PRC

TABLE OF CONTENTS

<u>Exhibit</u>	<u>Description</u>	<u>FCC Ref.</u>	<u>Page</u>
A	Installation and Operating Instructions Furnished to the User.	2.1033(b)(3)	Exhibit A Exhibit A(1)
B	Description of Circuit Functions	2.1033(b)(4)	Exhibit B Exhibit B(1)
C	Block Diagram Schematic Diagram	2.1033(b)(5)	Exhibit C Exhibit C(1) Exhibit C(2)
D	Report of Measurements	2.1033(b)(6)	Exhibit D
E	Photographs Equipment Label Equipment - External Photos Internal Photos	2.1033(b)(7)	Exhibit E Exhibit E(1)-1 to -2 Exhibit E(2)-1 to 2 Exhibit E(2)-3 to -5
F	Verification Report (Not Part of Certification Package)		Exhibit F(1)

EXHIBIT D

[FCC Ref. 2.1033(b)(6)]

"Report of Measurements"

TABLE OF CONTENTS

TEST REPORT CONTAINING:

Exhibit D(1)-2	Product Description
Exhibit D(1)-3 to -4	Test Equipment List
Exhibit D(1)-5 to -7	15.107(a) Power Line Conducted Interference
Exhibit D(1)-8 to -11	15.247(a)(2) 6 dB Bandwidth
Exhibit D(1)-12	15.247(b) Maximum Peak Output Power
Exhibit D(1)-13 to -19	15.247(d) Peak Power Spectral Density
Exhibit D(1)-20 to -22	15.247(c) Bandwidth of Band Edge Measurement
Exhibit D(1)-23	15.247(c) Spurious RF Conducted Emissions
Exhibit D(1)-24 to -27	15.247(c) Spurious RF Radiated Emissions
Exhibit D(1)-28 to -29	FCC RF Exposure Requirements
Exhibit D(2)-1 to -2	Test Setup Photos
Exhibit D(2)-3	Test Setup Diagram for AC Conducted Line Testing
Exhibit D(3)	Measurement Facility (3 meter site)

PRODUCT DESCRIPTION

The Model RD900WB is a high power wide band 900MHz transmitter using a proprietary digital modulation, that operates at 905 MHz, 911 MHz, 917 MHz, and 923 MHz.

TEST FACILITY AND EQUIPMENT LIST

FACILITIES

- Radiated ANSI C63.4 (FCC OET/55) open field 3 metre test range. This test range is protected from the cold and moisture by a non-conductive enclosure.
- Conducted 2.5m Anechoic Chamber

EQUIPMENT

Anritsu 2601A Spectrum Analyzer
Advantest R3261A Spectrum Analyzer
Hewlett-Packard RF generator # 8640 B with an 002 doubler
A.H. Systems biconical antenna; 20 MHz to 330 MHz
A.H. Systems log periodic antenna; 300 MHz to 1.8 GHz
Compliance Design P950 Preamp (16 dB) ... 25 MHz to 1.0 GHz

NOTE:

The Anritsu 2601A Spectrum Analyzer and the Advantest R3261A Spectrum Analyzer are calibrated annually, and that calibration is directly traceable to the National Research Council of Canada. (NRC) This equipment is only used by qualified technicians and only for the purpose of EMI measurements. The three metre test range has been carefully evaluated to the ANSI document C63.4 and will be remeasured for reflections and losses every three years.

ADDITIONAL TEST EQUIPMENT LIST

1. Spectrum Analyzer: HP 8591EM, S/N 3639A00995, Calibrated April 2002
2. Spectrum Analyzer: ANRITSU 2601A, S/N MT64544, Calibrated May 2002
3. Spectrum Analyzer: IFR AN940, S/N 635001039, Calibrated March 2002
4. Preamp: HP 8449B, S/N 3008A00378, Calibrated August 2002
5. Horn Antenna: Q-PAR 6878/24, S/N 1721, 1.5-18GHz
6. Line Impedance Stabilization Network.: Marstech, Cal. July 2002

15.107 (a) POWER LINE CONDUCTED INTERFERENCE**Requirements:**

Frequency of Emission (MHZ)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
37405	60	50

*Decreases with the logarithm of the frequency.

Test Procedure:

ANSI STANDARD C63.4-1992. using a 50 μ H LISN. Both lines were observed with the EUT transmitting. The bandwidth of the spectrum analyzer was 9KHz QP with an appropriate sweep speed. The ambient temperature of the EUT was 24°C with a humidity of 60%.

The spectrum was scanned from 0.15 to 30MHz.

Test Data:

The highest emission read for LINE was 38.17 dB μ V@ 0.21 MHz.

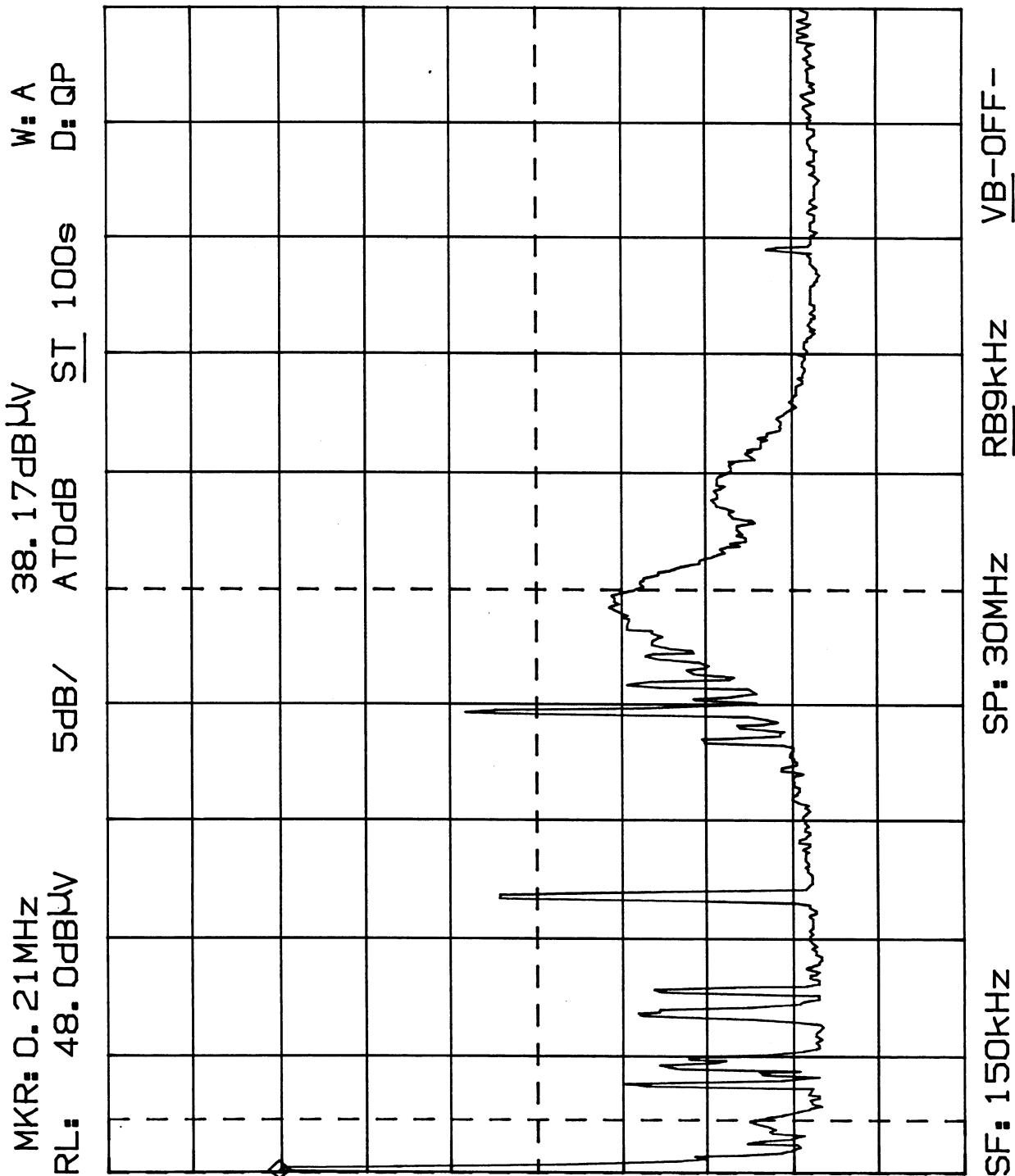
The highest emission read for NEUTRAL was 37.49 dB μ V@ 0.21 MHz.

The graphs on Exhibit D(1)-6 and -7 represent the emissions taken for this device.

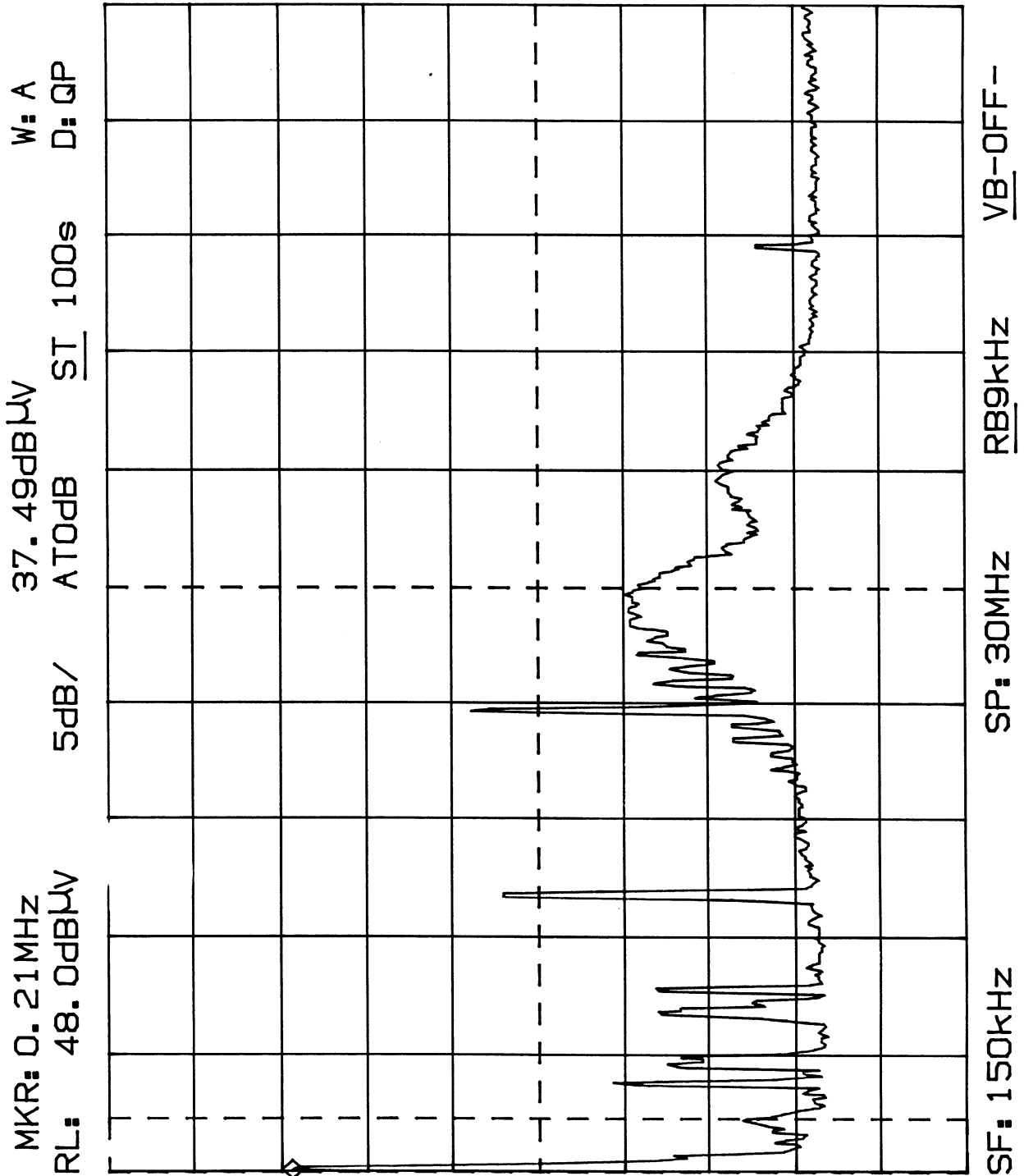
Test Results:

Both lines were observed. The measurements indicate that the unit DOES appear to meet the FCC requirements for this class of equipment.

POWER LINE CONDUCTED EMISSIONS
MODEL RD900WB; LINE



POWER LINE CONDUCTED EMISSIONS
MODEL RD900WB; NEUTRAL



15.247(a) 6 dB BANDWIDTH

Requirements:

The minimum 6 dB bandwidth shall be at least 500KHz.

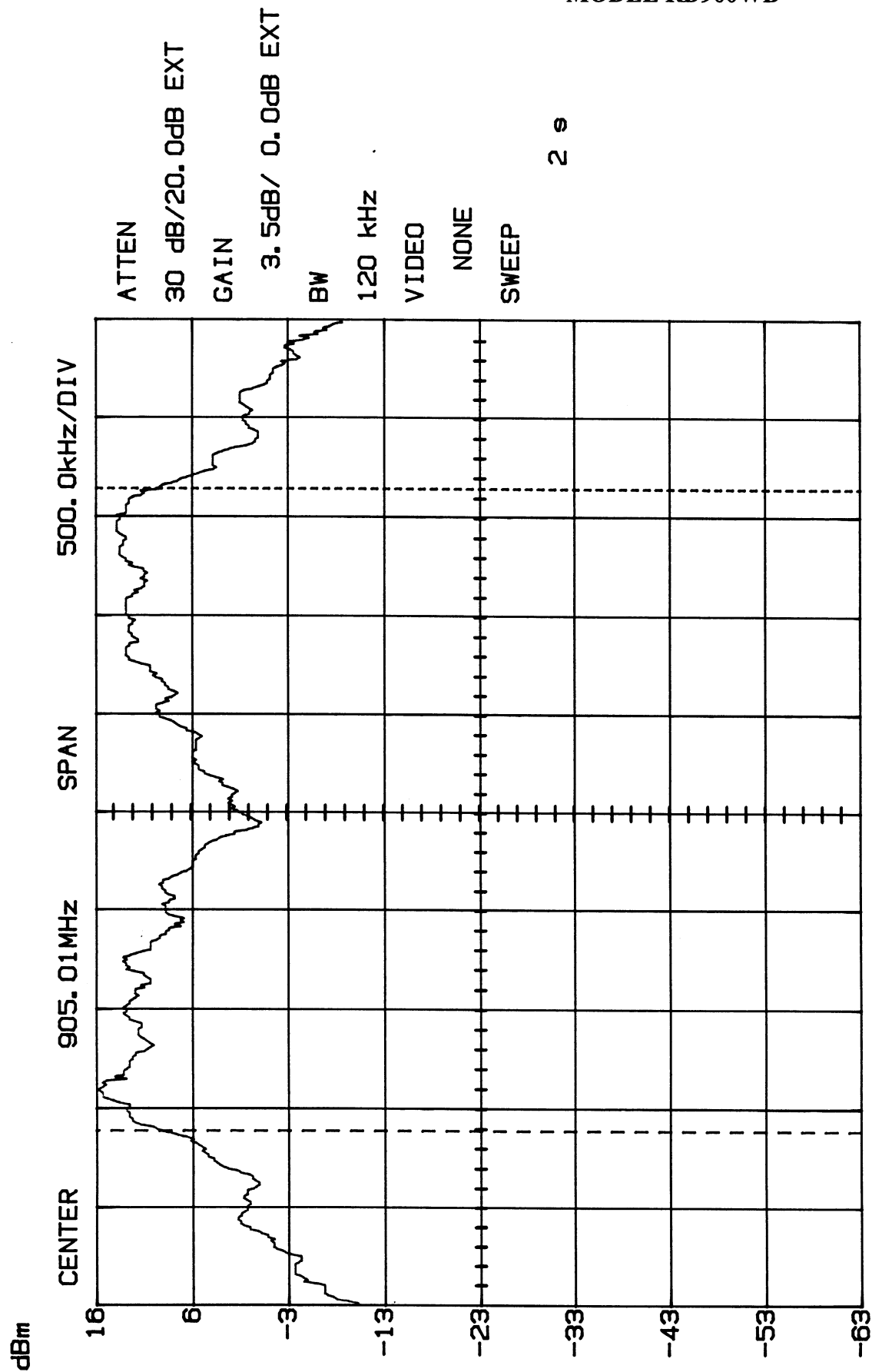
Measurement Procedure:

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.
2. Set RBW of SA to 100KHz and VBW to 1 MHz.
3. Capture the total emission using appropriate SA settings and then set the markers to measure the 6 dB total band using delta markers.
4. Print the bandwidth measurement.

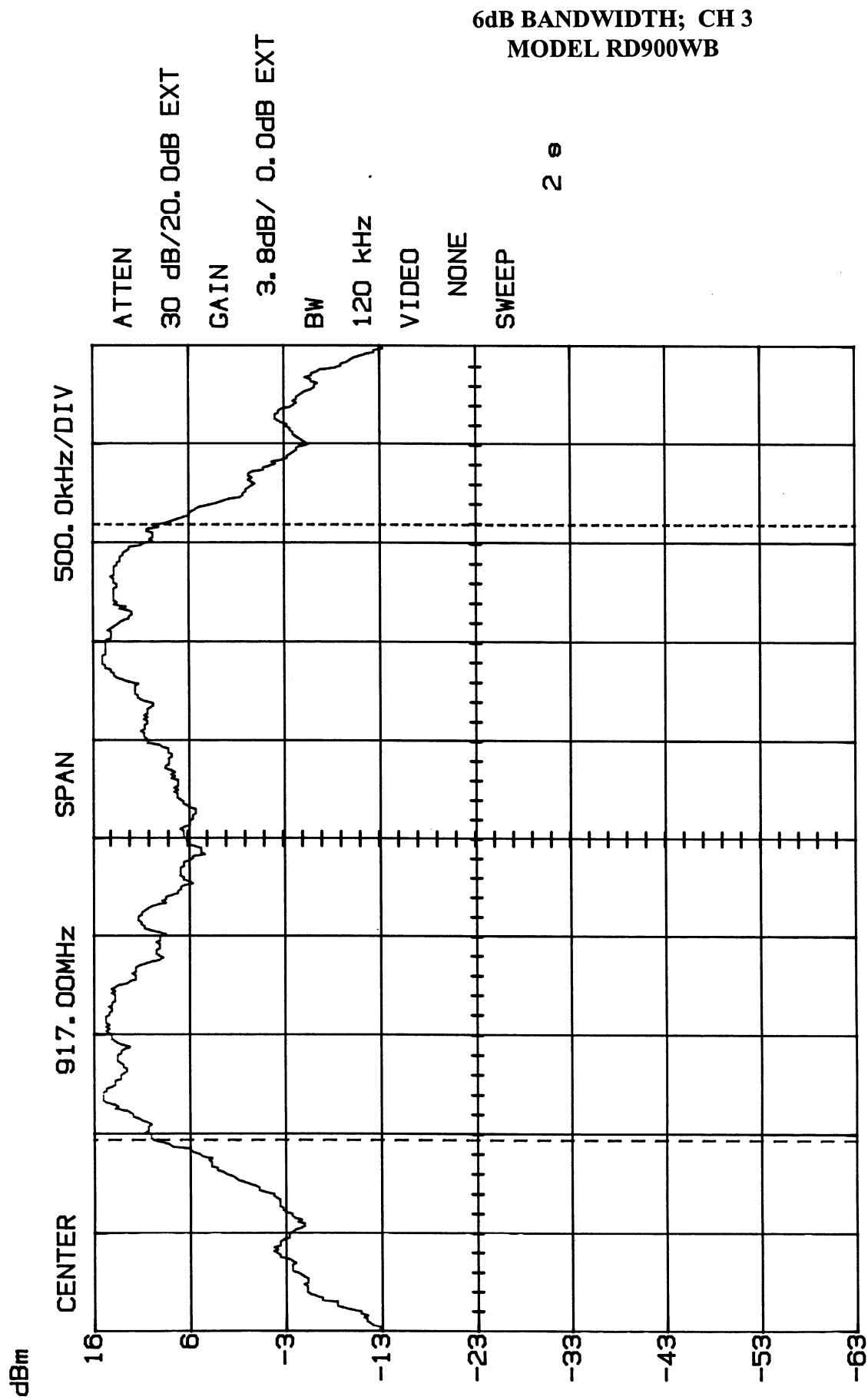
Measurement Data:

Channel 1: Bandwidth is 3.25 MHz [Refer to Exhibit D(1)-9]
Channel 3: Bandwidth is 3.12 MHz [Refer to Exhibit D(1)-10]
Channel 4: Bandwidth is 2.87 MHz [Refer to Exhibit D(1)-11]

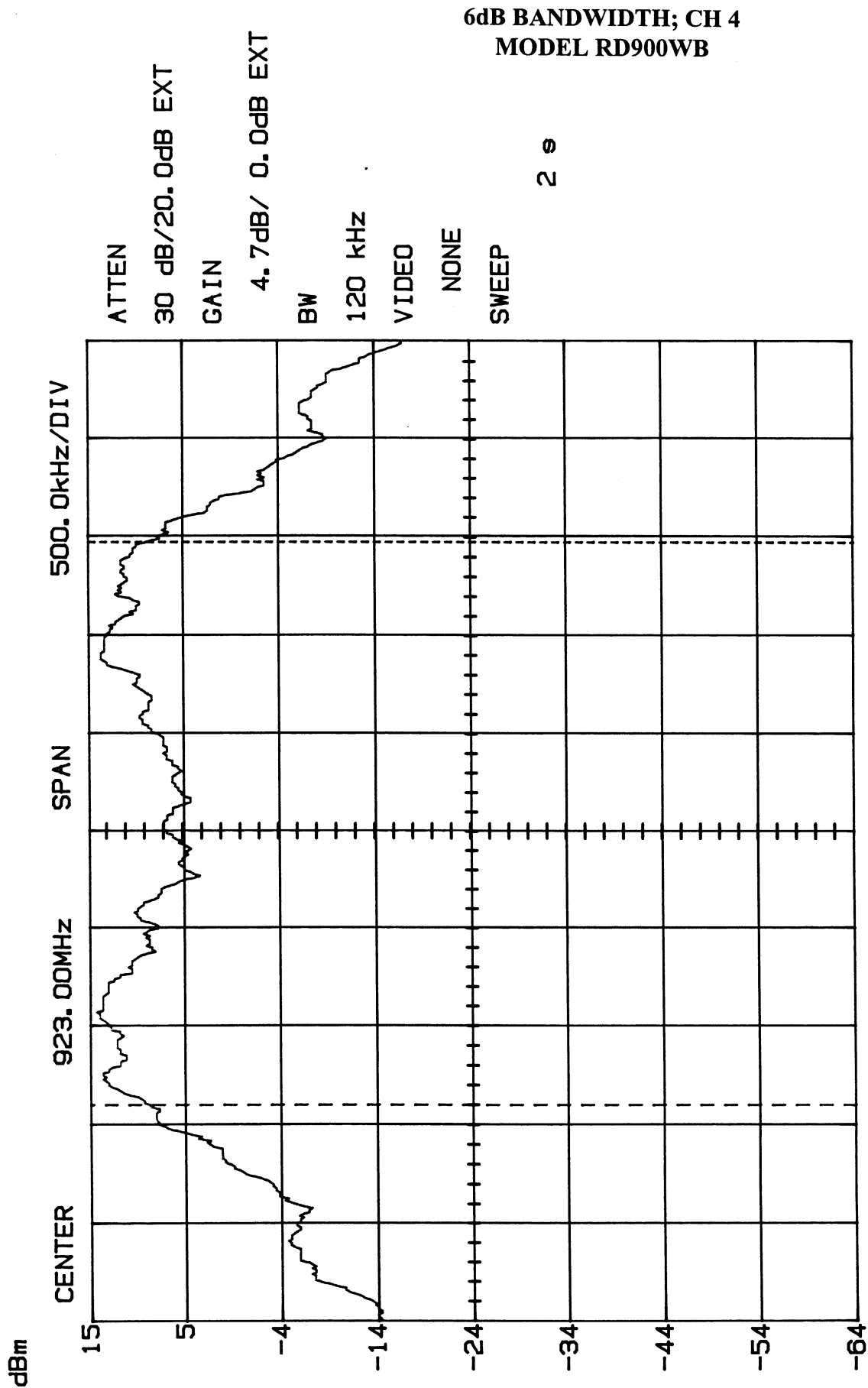
6dB BANDWIDTH; CH 1
MODEL RD900WB



14: 28: 25 12-02-2000



14:32:58 12-02-2002



M2 9.36dB/ 924.47MHz Δ 0.31dB/ 2.87MHz

14:39:57 12-02-2002

15.247(b) MAXIMUM PEAK OUTPUT POWER (Integral Antenna)**Requirements:**

The maximum peak output power of direct sequence systems shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Data - Refer Exhibit D(1)-26 F. S. Data

1. MAX Field Strength (dipole) = 110 dB μ V/M (F.S.)

2. MAX Field Strength (dipole) = 0.316V/M (F.S.)

3.
$$F.S. = \sqrt{\frac{49.2 \times P_T(ERP)}{3}}$$

$$P_T(ERP) = \frac{(F.S.)^2 \times 9}{49.2}$$

$$P_T(ERP) = \frac{(0.316)^2 \times 9}{49.2} = 0.018W$$

$$P_T(ERP) = 18 mW$$

4. $P_T(EiRP) = P_T(ERP) \times 1.64 = 30mW$

15.247(d) PEAK POWER SPECTRAL DENSITY**Requirements:**

For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

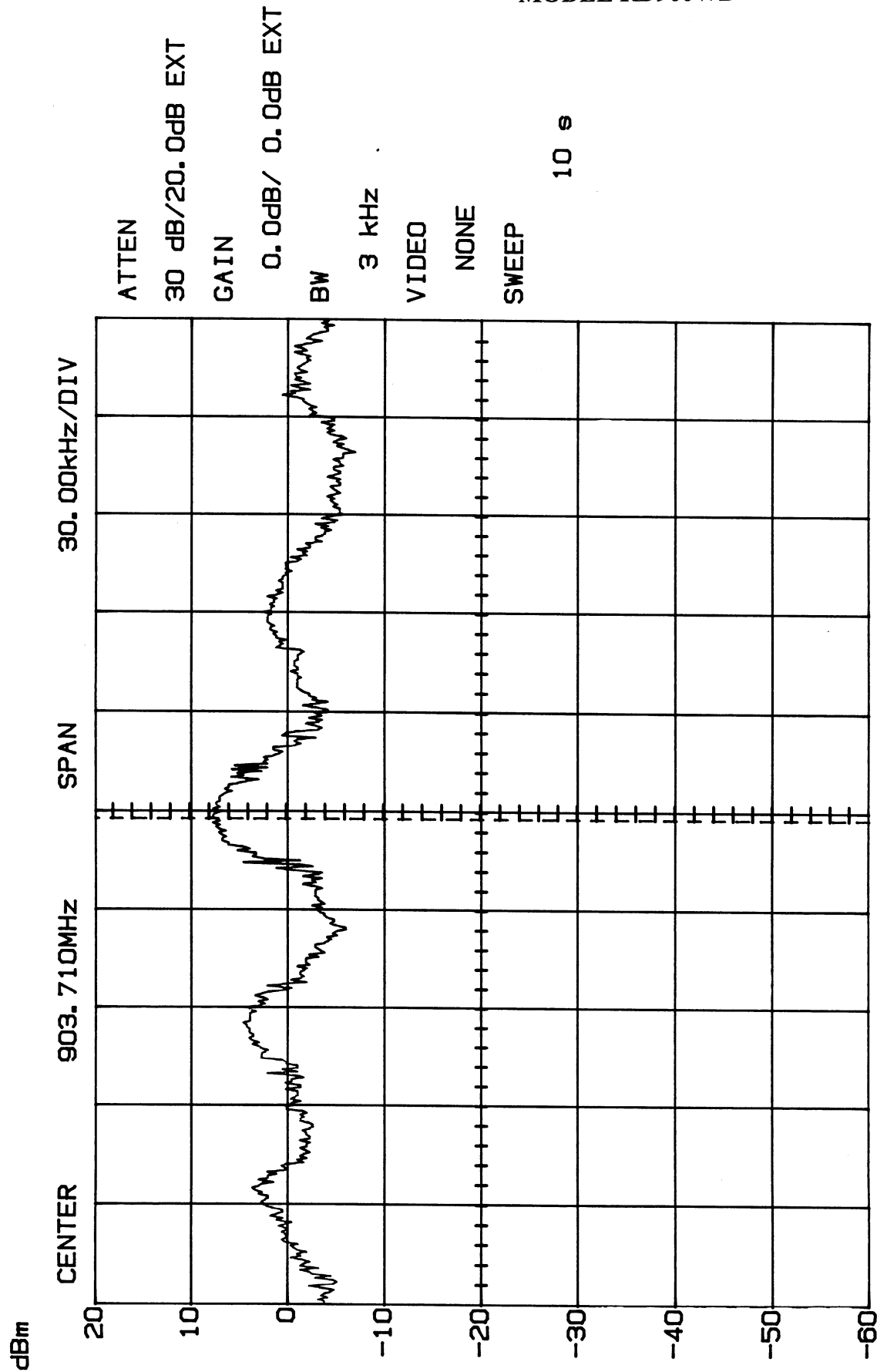
Measurement Procedure:

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.
2. Set RBW = 3 kHz, SPAN = 30 kHz, VBW = OFF.
3. Measure the highest amplitude for channels 1, 3 and 4.
4. Plot graph.

Measurement Data: Refer to Exhibit D(1)-14 to -19 for plotted data

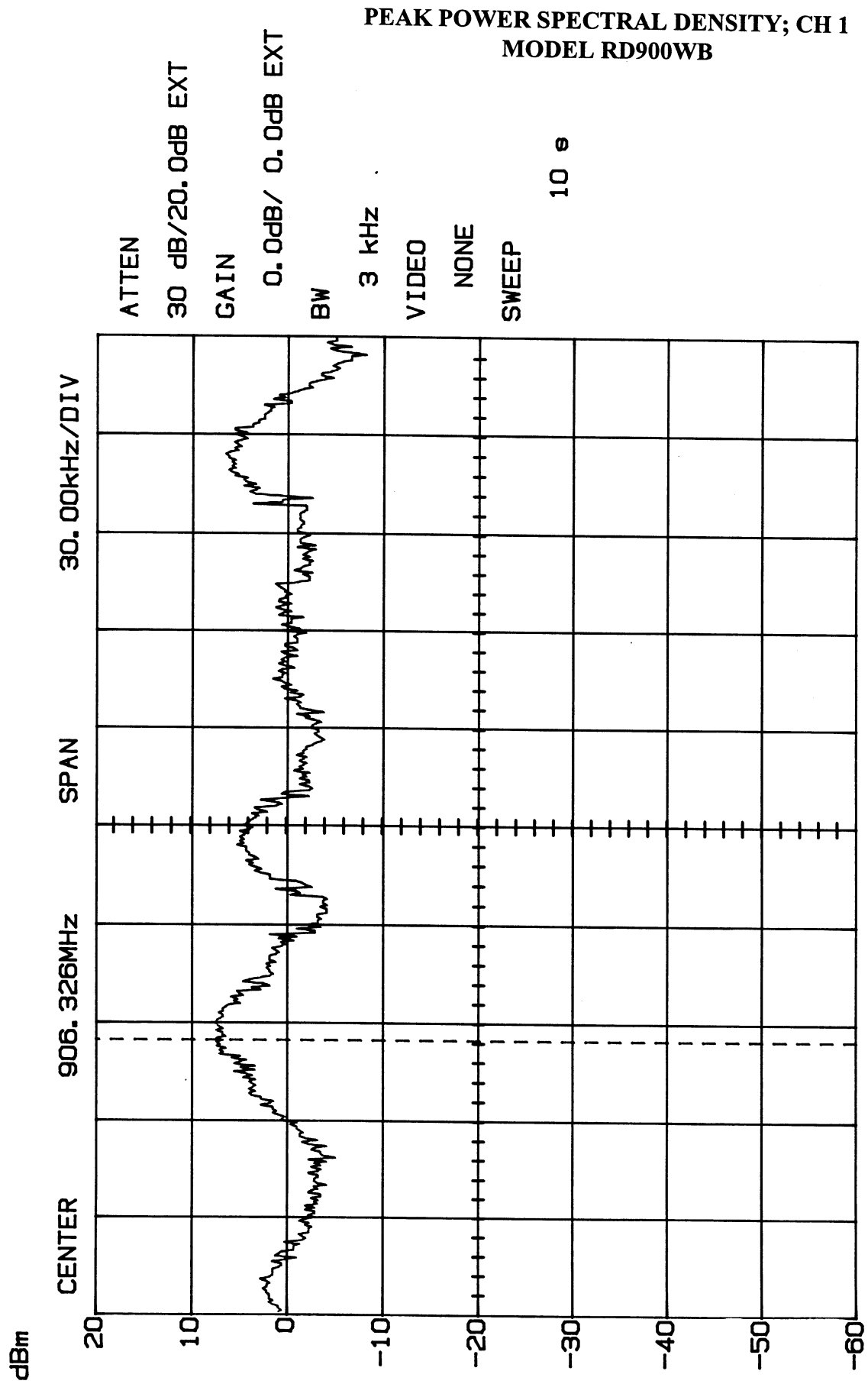
Channel 1: Maximum Peak Power Spectral Density is 7.50 dBm.
Channel 3: Maximum Peak Power Spectral Density is 7.81 dBm.
Channel 4: Maximum Peak Power Spectral Density is 7.50 dBm.

PEAK POWER SPECTRAL DENSITY; CH 1
MODEL RD900WB



M1 7.50dB/ 903.708MHz

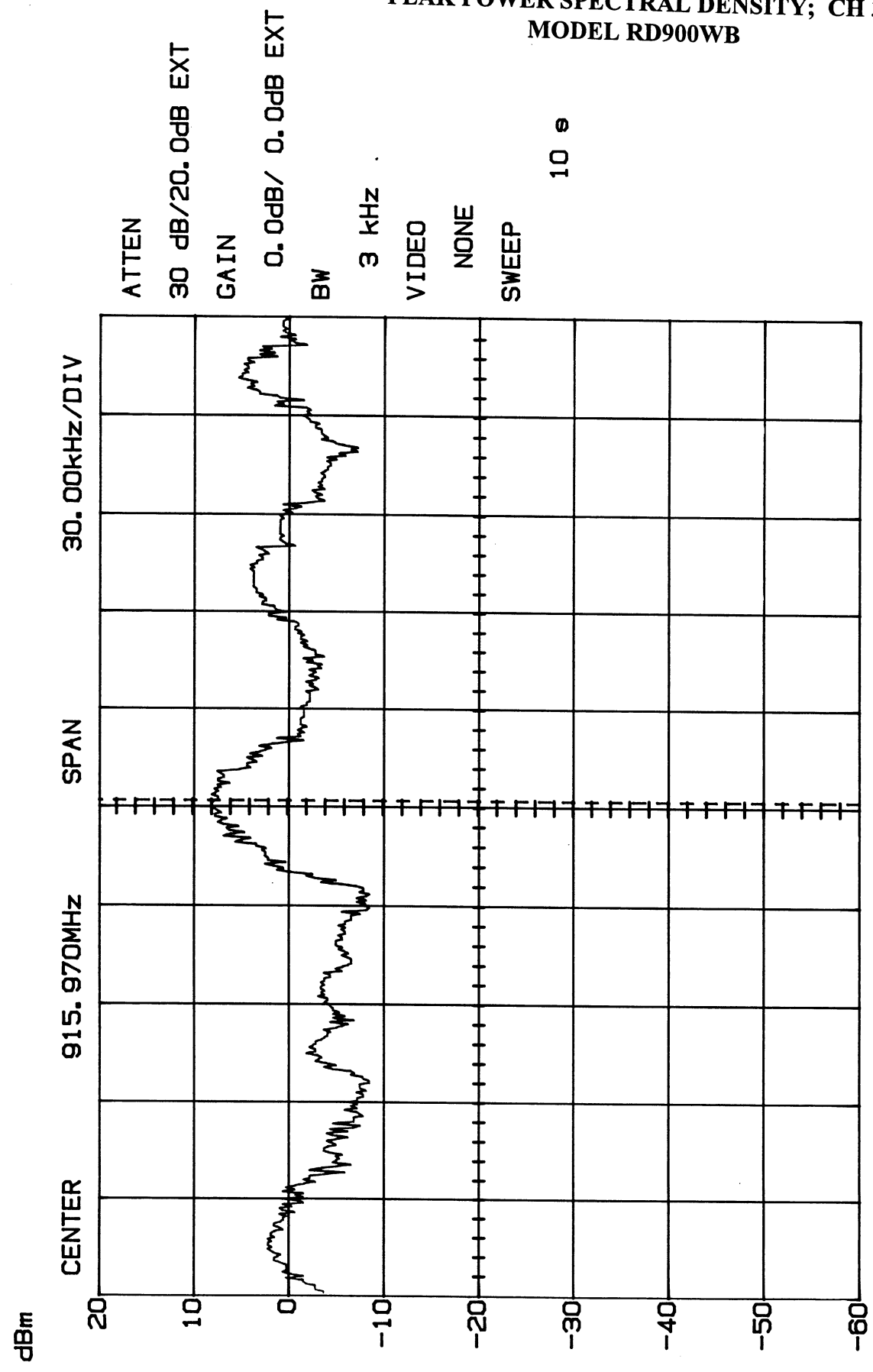
15:15:38 12-02-2002



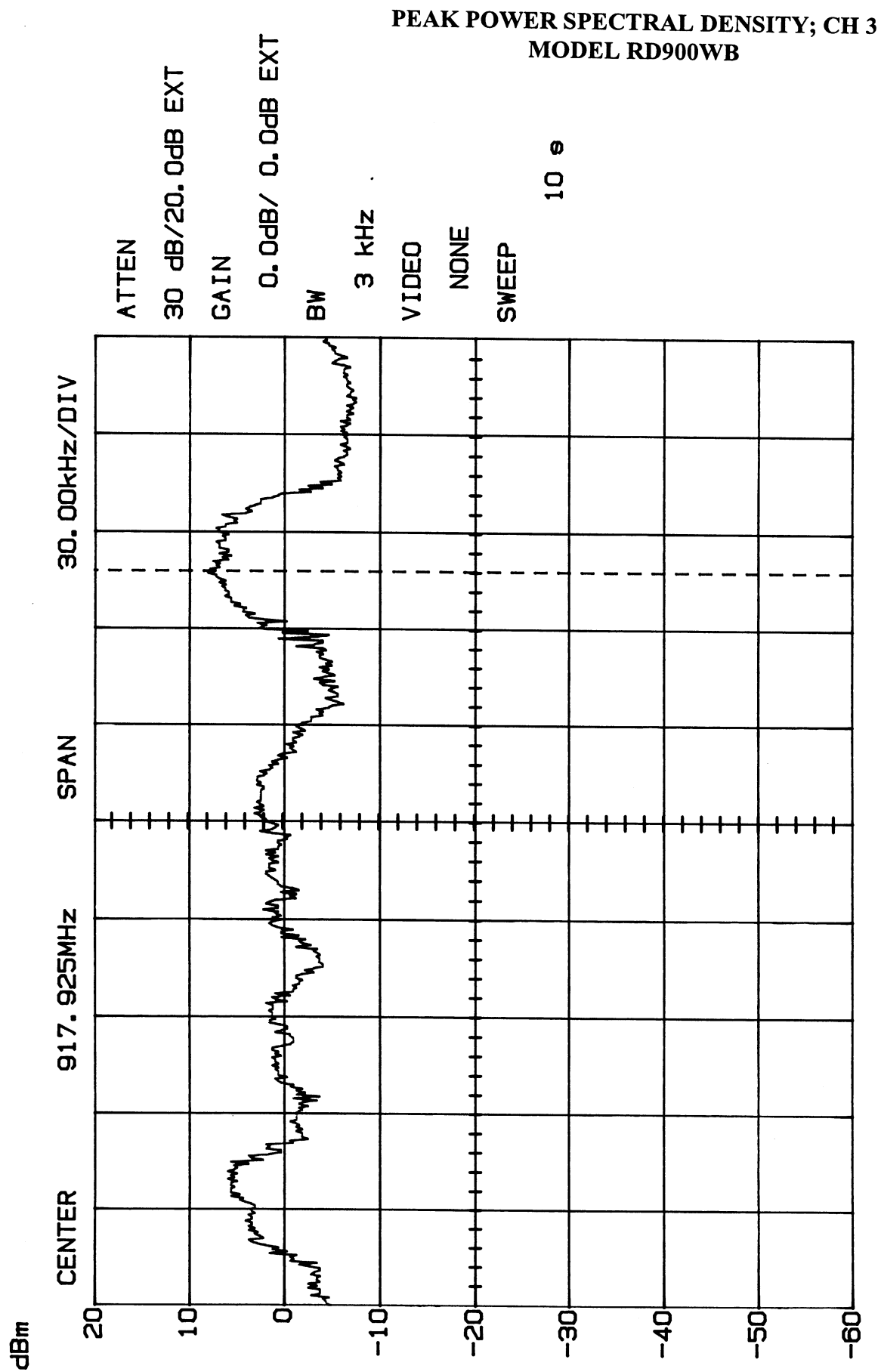
M1 6.87dB/ 906.261MHz

15:27:03 12-02-2002

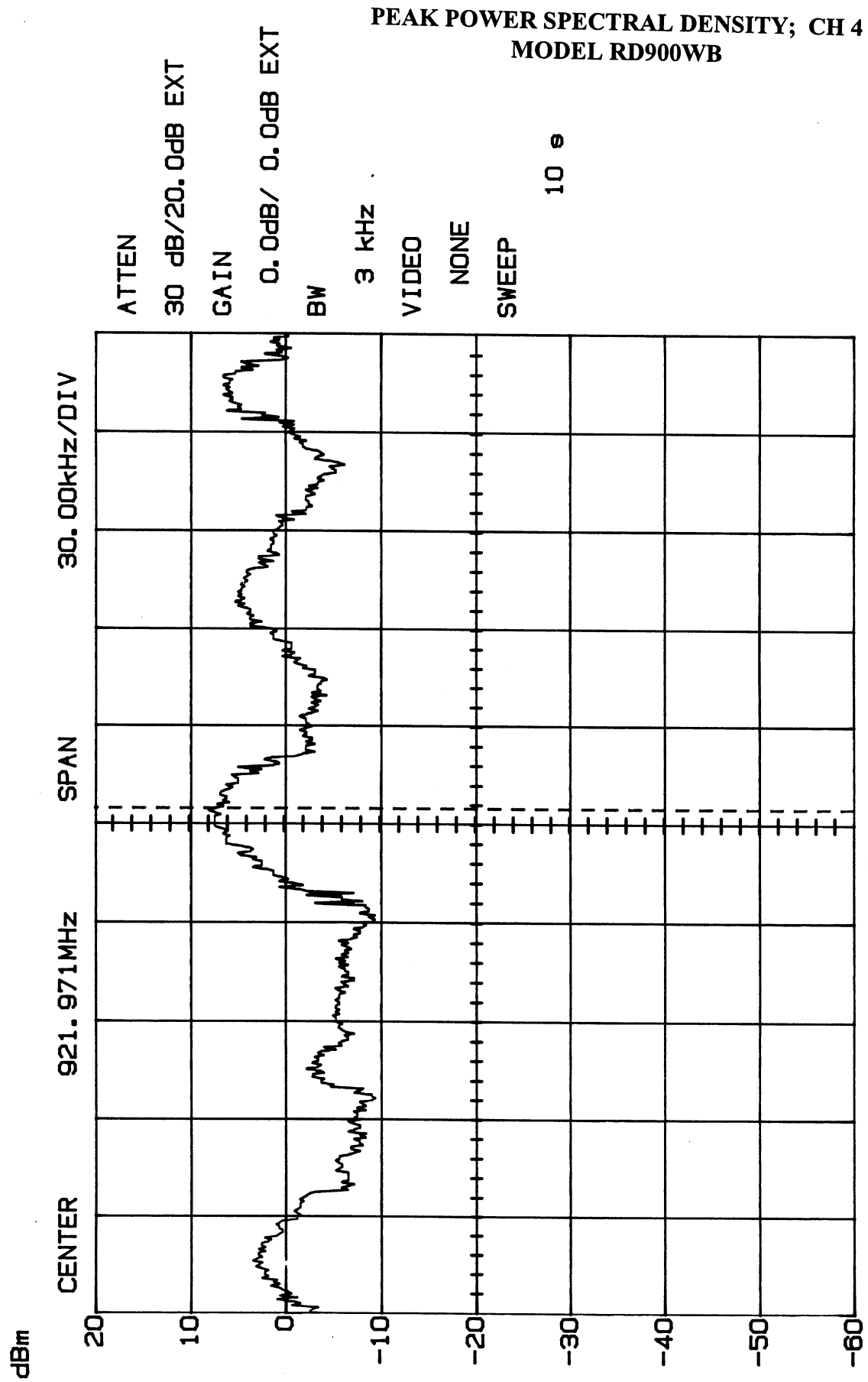
PEAK POWER SPECTRAL DENSITY; CH 3
MODEL RD900WB



M1 7.81dB/ 915.972MHz

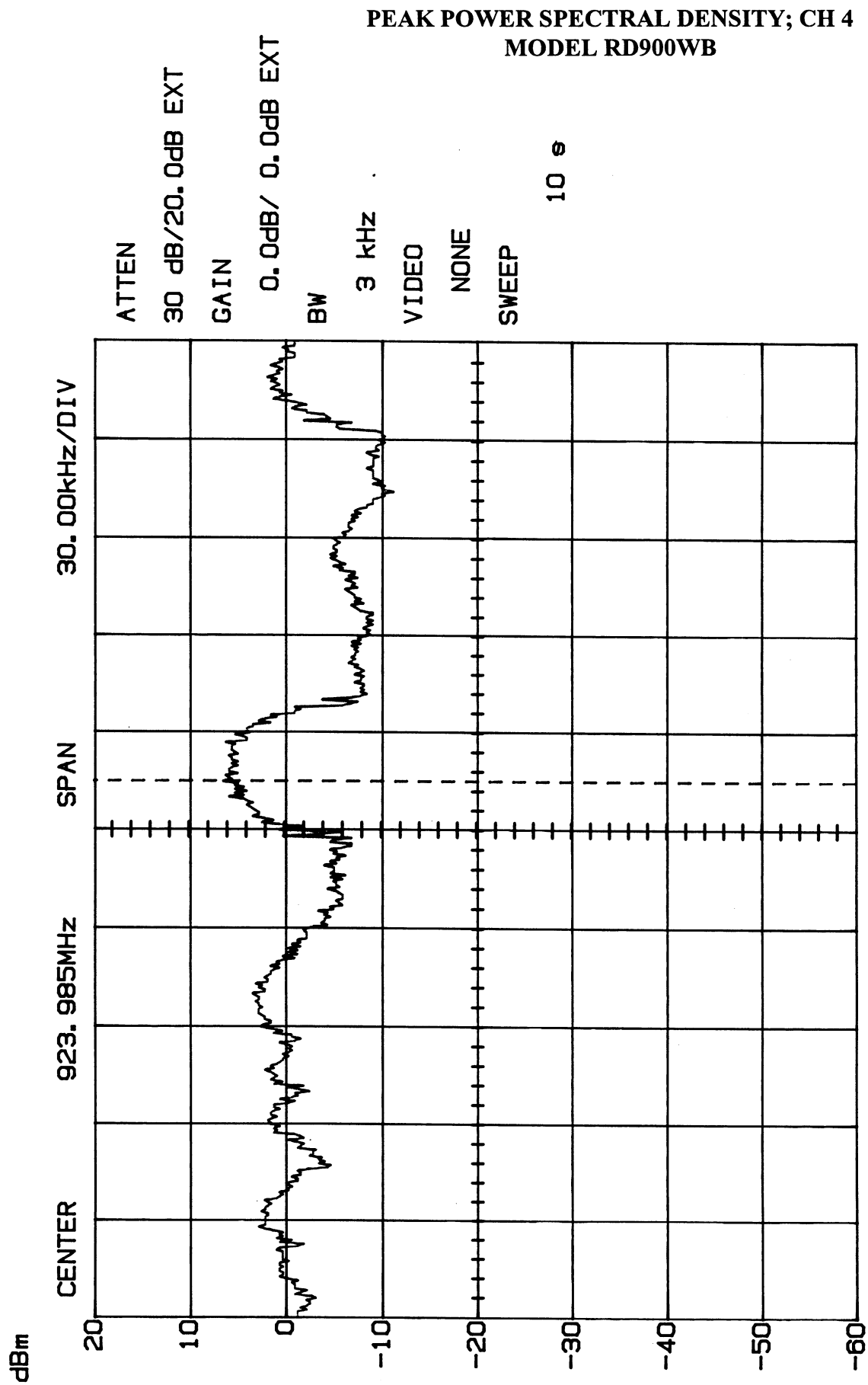


15:52:12 12-02-2002



M1 7.50dB/ 921.976MHz

15:59:18 12-02-2002



M1 6.56dB/ 924.000MHz

16:09:32 12-02-2002

15.247(c) BANDWIDTH OF BAND EDGE MEASUREMENT

Requirements:

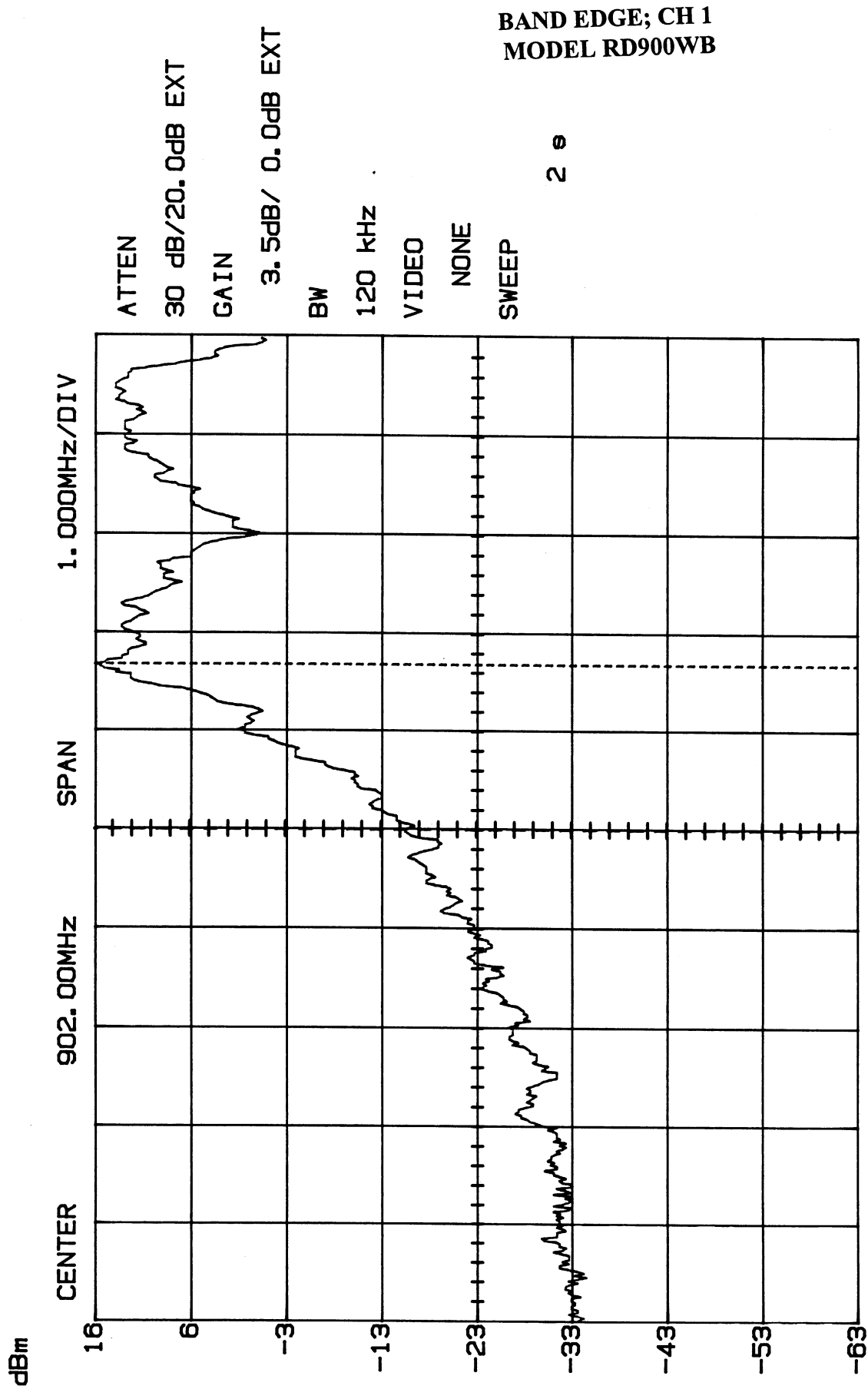
In any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Measurement Procedure

1. Position the EUT without connection to Spectrum Analyzer (SA). Turn on the EUT and connect its antenna terminal to SA via a low loss cable and set it to any one measured frequency within its operating range and ensure that the SA is operated in its linear range.
2. Set RBW to 120 kHz and frequency span to 1000 kHz; VBW = none.
3. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency
4. Repeat the above procedures until all frequencies measured were complete.

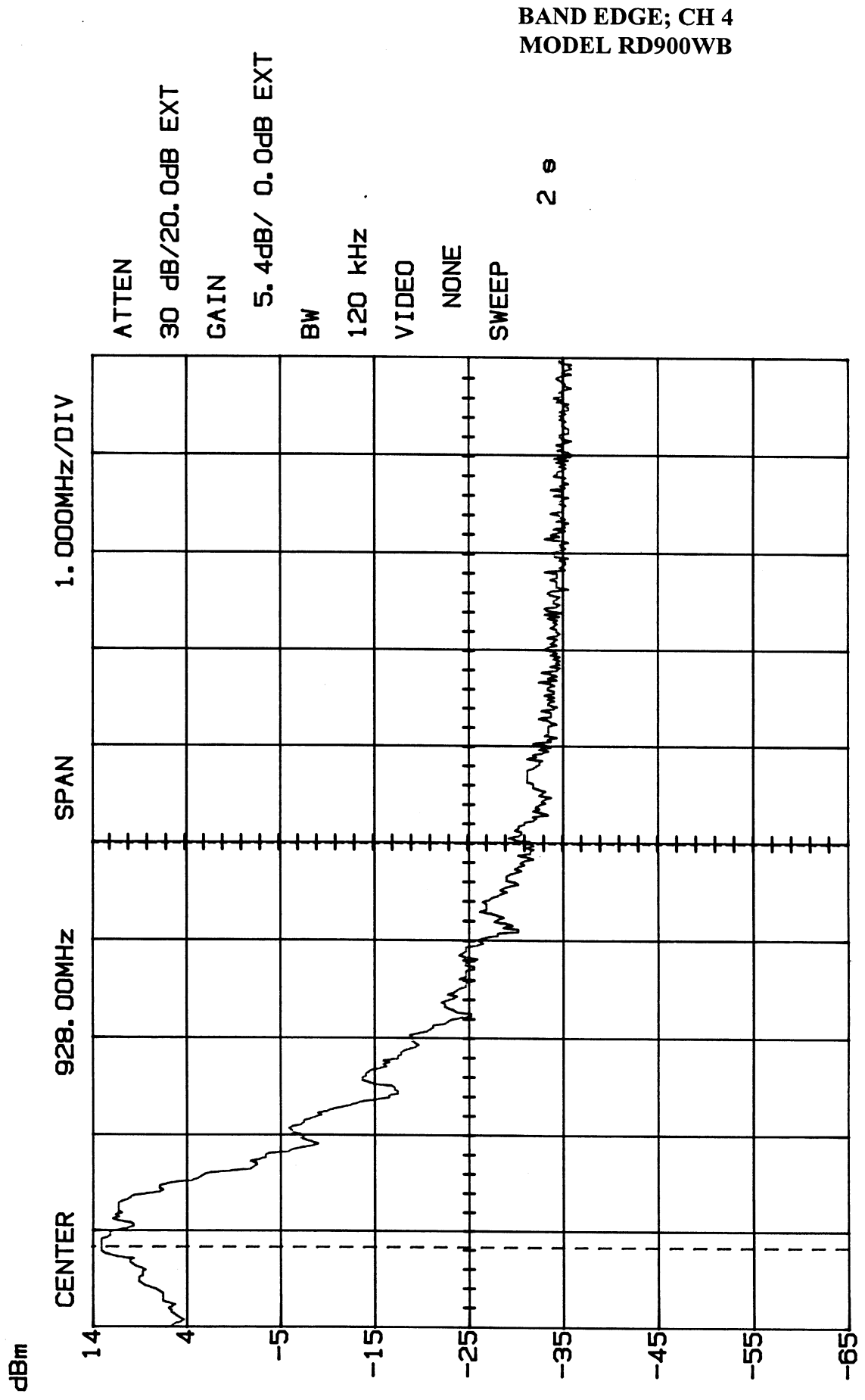
Measurement Data - Refer Exhibit D(1)-21 to -22 for plotted data

- Channel 1: All emissions in this 100 kHz bandwidth are attenuated more than 28 dB from the carrier.
- Channel 4: All emissions in this 100 kHz bandwidth are attenuated more than 43 dB from the carrier.



M2 16.00dB/ 903.69MHz Δ32.00dB/ 1.69MHz

16:24:59 12-02-2002



M2 -31.96dB/ 928.00MHz Δ45.62dB/ 4.16MHz

15.247(c) SPURIOUS RF CONDUCTED EMISSIONS**ANTENNA CONDUCTED SPURIOUS EMISSIONS**

Frequency MHz		dBc		Frequency MHz		dBc	
Transmitter							
Channel 1				Channel 4			
906.30		0		924.3		0	
1812.60		-30		1848.6		-30	
2718.90		-31		2772.9		-33	
3625.20		-67		3697.2		-55	
4531.60		-55		4621.5		-54	
5437.80		-58		5545.8		-56	
6344.10		-53		6470.1		-52	
7250.40		-64		7394.4		-74	
8156.70		-73		8318.7		-72	
9063.00		-77		9243		-73	
Channel 3							
918.10		0					
1836.20		-29					
2754.30		-31					
3672.40		-59					
4590.50		-47					
5508.60		-53					
6426.70		-50					
7344.80		-70					
8262.90		-70					
9181.00		-75					

15.105 and 15.247(c) SPURIOUS RF RADIATED EMISSIONS

Requirements:

In any 100 kHz bandwidth outside these frequency bands, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

Measurement Procedure:

1. The EUT was placed on a wooden table mounted on a turntable and was operating normally.
2. The search antenna was located 3 metres from the EUT.
3. The search antenna height (1-4 metres) and turntable (360°) were adjusted to all possible positions until the emission at each frequency was maximized.
4. The readings were noted and correction factor was added.

Measurement Data:

The closest spurious emission to the limit was 51.26 dB μ V/M @ 2754.30 MHz
[refer to Exhibit D(1)-26]

RADIATED EMISSION RESULTS**Model RD900WB (Transmitter)****(Channel 1)**

Frequency Band MHz	Meter Reading (Peak) @3m dBμV/M	Meter Reading (Average) @3m dBμV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBμV/M	Average F. S. dBuV/M	FCC Limit	Margin dB
906.3	75.6	71.8	RT4 V	33.25	108.85	---	---	
1812.6	45	24	Horn V	33.46	78.46	---	88.85	-10.39
2718.9	37	17	Horn V	34.26	71.26	51.26	54	-2.74
3625.2	21	5	Horn V	35.76	56.76	40.76	54	-13.24
4531.6	22	10	Horn V	37.58	59.58	47.58	54	-6.42
5437.8	19	5	Horn V	39.65	58.65	44.65	54	-9.35
6344.1	21	7	Horn V	41.69	62.69	---	88.85	-26.16
7250.4	16	3	Horn V	43.76	59.76	46.76	54	-7.24
8156.7	14	2	Horn V	45.68	59.68	47.68	54	-6.32
9063	---							

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

RADIATED EMISSION RESULTS**Model RD900WB (Transmitter)****(Channel 3)**

Frequency Band MHz	Meter Reading (Peak) @3m dBμV/M	Meter Reading (Average) @3m dBμV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBμV/M	Average F. S. dBuV/M	FCC Limit	Margin dB
918.1	77	72.9	RT4 V	33.34	110.34	---	---	
1836.2	42	23	Horn V	33.46	75.46	---	90.34	-14
2754.3	37	17	Horn V	34.26	71.26	51.26	54	-2.74
3672.4	25	12	Horn V	35.76	60.76	47.76	54	-6.24
4590.5	24	12	Horn V	37.81	61.81	49.81	54	-4.19
5508.6	22	9	Horn V	39.88	61.88	---	90.34	-28.46
6426.7	29	15	Horn V	41.92	70.92	---	90.34	-19.42
7344.8	21	7	Horn V	43.99	64.99	50.99	54	-3.01
8262.9	13	2	Horn V	45.75	58.75	47.75	54	-6.25
9181	12	1	Horn V	46.44	58.44	47.44	54	-6.56

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

RADIATED EMISSION RESULTS**Model RD900WB (Transmitter)****(Channel 4)**

Frequency Band MHz	Meter Reading (Peak) @3m dBμV/M	Meter Reading (Average) @3m dBμV/M	Antenna and Polarization	Cable & Antenna Factor	Peak F. S. dBμV/M	Average F. S. dBuV/M	FCC Limit	Margin dB
924.3	76	71.2	RT4 V	33.4	109.4	---	---	
1848.6	38	19	Horn V	33.46	71.46	---	89.4	-17.94
2772.9	31	12	Horn V	34.26	65.26	46.26	54	-7.74
3697.2	21	7	Horn V	35.92	56.92	42.92	54	-11.08
4621.5	23	11	Horn V	37.81	60.81	48.81	54	-5.19
5545.8	19	5	Horn V	39.88	58.88	---	89.4	-30.52
6470.1	24	11	Horn V	41.92	65.92	---	89.4	-23.48
7394.4	17	3	Horn V	44.22	61.22	47.22	54	-6.78
8318.7	11	-1	Horn V	45.83	56.83	44.83	54	-9.17
9243	---	---						

1. If the peak meets the average limit, nothing further is required.
2. If the peak exceeds the average limit, then an average measurement is required (may be calculated) and must be below the average limit and also:
3. The peak measurement cannot exceed the average limit +20dB.

FCC RF EXPOSURE REQUIREMENTS

General Information

FCC ID: G95-RD900WB

Device Category:

EUT: Mobile per Part 2.1091

Environment: General Population/Uncontrolled Exposure

Operating Configurations and Exposure Conditions:

The EUT is normally operated at least 20 cm away from the human body.

Maximum Permissible Exposure Calculation: EUT

The minimum separation distance, for compliance with the limit, is calculated as follows:

$$E(V/m) = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power density: } P_d(mW/cm^2) = \frac{E^2}{3770}$$

The limit for general population/uncontrolled exposure environment above 928 MHz is 0.62 mW/cm²

Separation Distance	Antenna Gain (dBi)	
	Integral	
Power EiRP (mW)	(in)	(cm)
30	0.8	2

RF Exposure Calculations

1. The limit for general population/uncontrolled environment at 928 MHz is 0.62 mW/cm².
2. The Field Strength $E \text{ V/M} = \sqrt{0.62 \times 3770} = 48.3$
3. The distance d to achieve the 0.62 mW/cm² power density is as follows

$$d = \frac{\sqrt{30 \times P \times G}}{E}$$
$$d = \frac{\sqrt{30 \times 0.030 \text{ W} \times 1}}{48.3} = \frac{0.9487}{48.3} = 1.96 = 2 \text{ cm}$$

Conclusion:

The device complies with the MPE requirements by providing a safe separation distance between the antenna, including any radiating structure, and any persons (human body excluding hands, wrists, ankles, and feet).

Proposed RF Exposure Safety Information to Include in User's Manual:

WARNING: For compliance with the RF exposure requirements regulated by the FCC (Federal Communications Commission), the transmitter's antennae are contained within the EUT enclosure, and an additional separation distance of more than eight inches (20 cm) shall be maintained between the transmitter base enclosure and any part of the user's body.