11 Number of Hopping Channels

11.1 Standard Applicable

According to 15.247(b)(1), for frequency hopping systems, operating in the 2400-2483.5MHz band employing at least 75 hopping channels

11.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set EUT to hopping operating mode and set spectrum analyzer miximum to measure the number of hopping channels.

11.3 Measurement Equipment

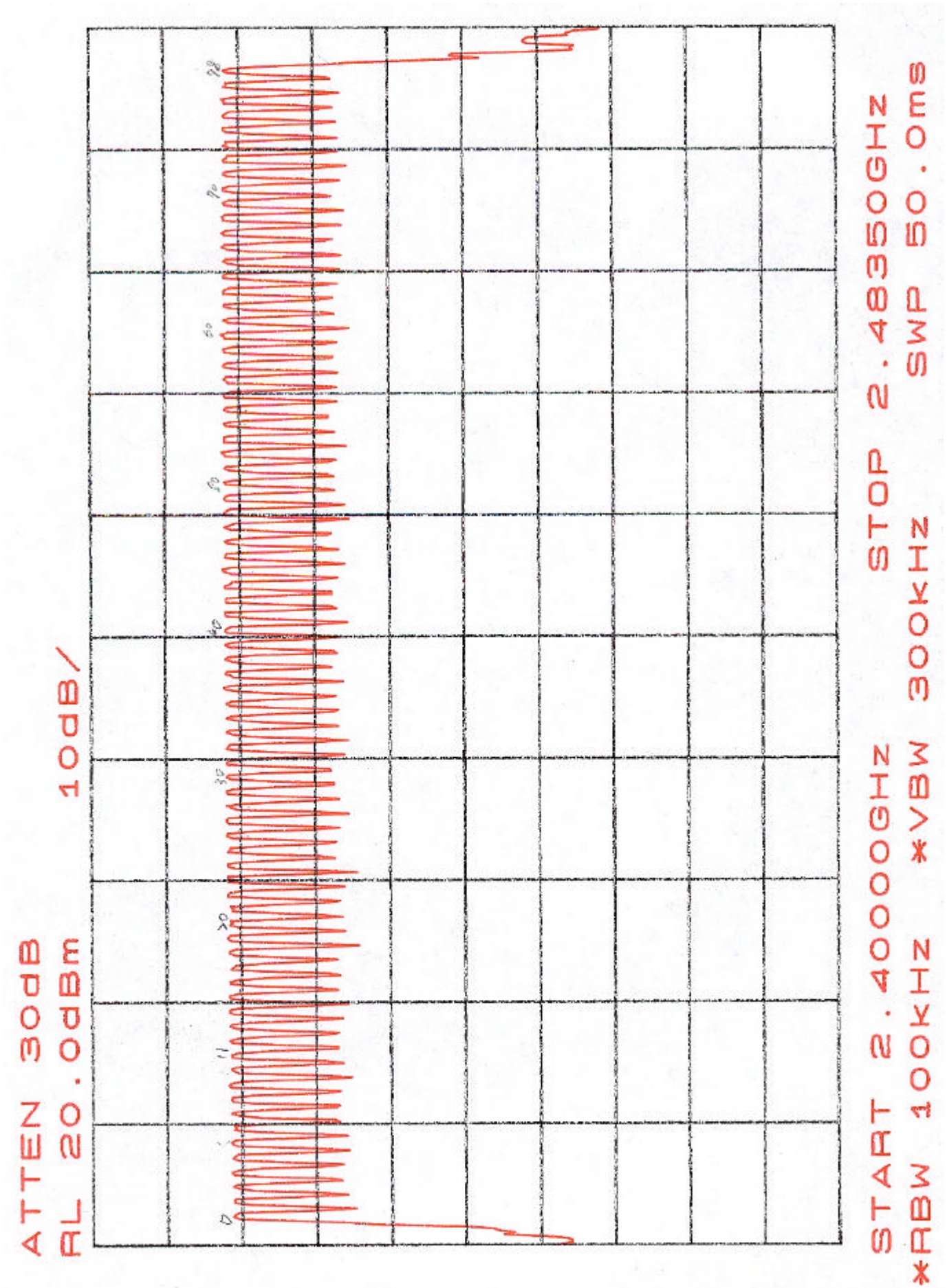
Equipment	Manufacturer	Model No.	Next Cal. Due
Plotter	Hewlett-Packard	7440A	N/A
Spectrum Analyzer	Hewlett-Packard	8564EC	09/10/2003

11.4 Measurement Data

Test Date : Mar. 26, 2003 Temperature : 22℃ Humidity: 60 %

Number of hopping channels = 79 channels

Note: Please see Appendix 4 for ploted datas


ATTEN 30dB
RL 20.0dBm
10dB/
START 2.4000GHz
*RBW 100KHz
STOP 2.4835GHz
*VBW 300KHz
SWP 50.0ms

12 Channel Carrier Frequencies Seperation

12.1 Standard Applicable

According to 15.247(a)(1), the frequency hopping system shall have hopping channel carrier frequencies seperated by minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is greater.

12.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measurement frequency within its operating ragne and make sure the instrument is operated in its linear range.
3. Set spectrum analyzer maximum hold to measure channel carrier frequency , then adjust channel carrier frequency to adjacent channel.
4. Repeat above procedure until all measured frequencies were complete.

12.3 Measurement Equipment

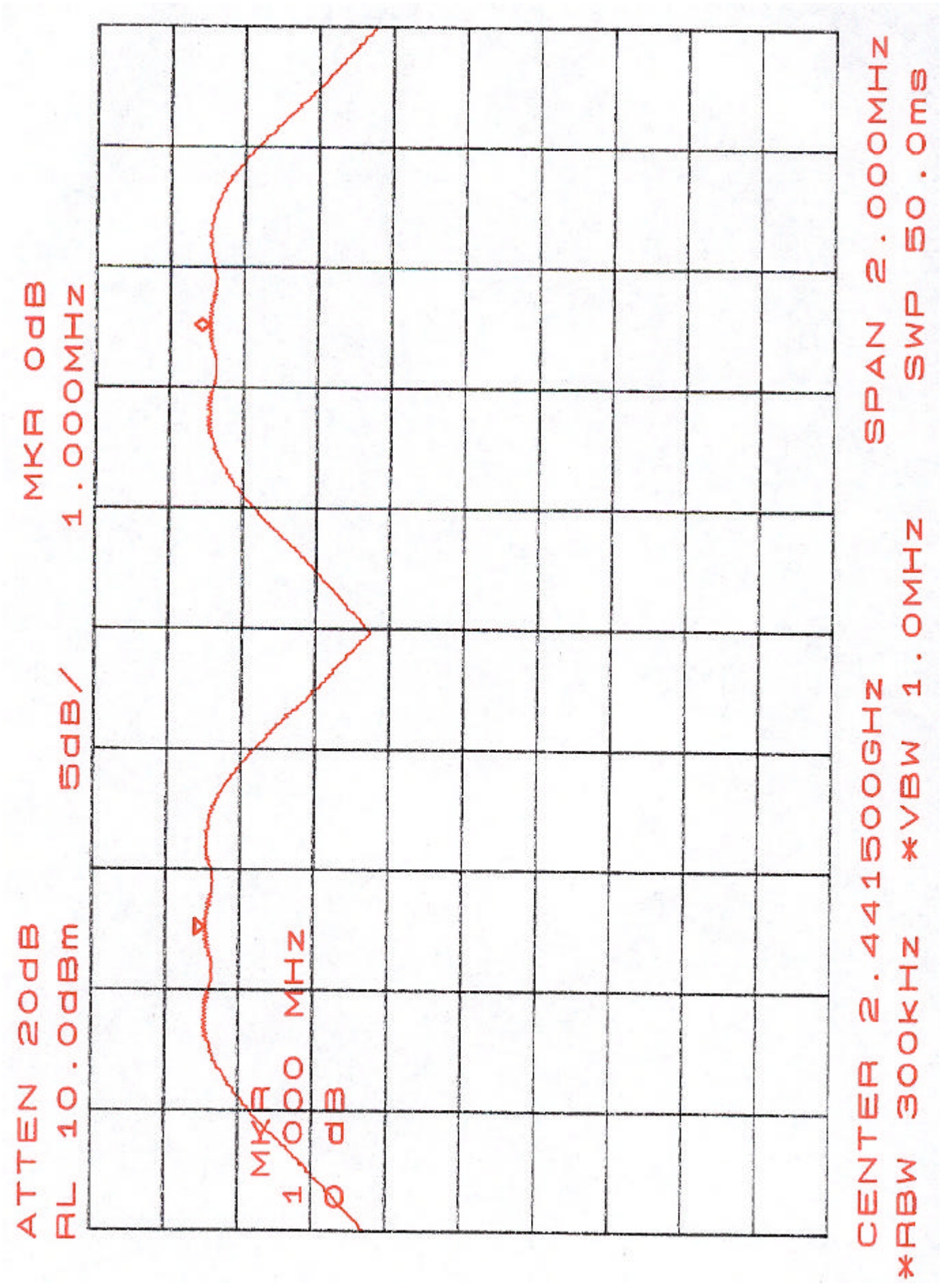
Equipment	Manufacturer	Model No.	Next Cal. Due
Plotter	Hewlett-Packard	7550A	N/A
Spectrum Analyzer	Hewlett-Packard	8564EC	09/10/2003

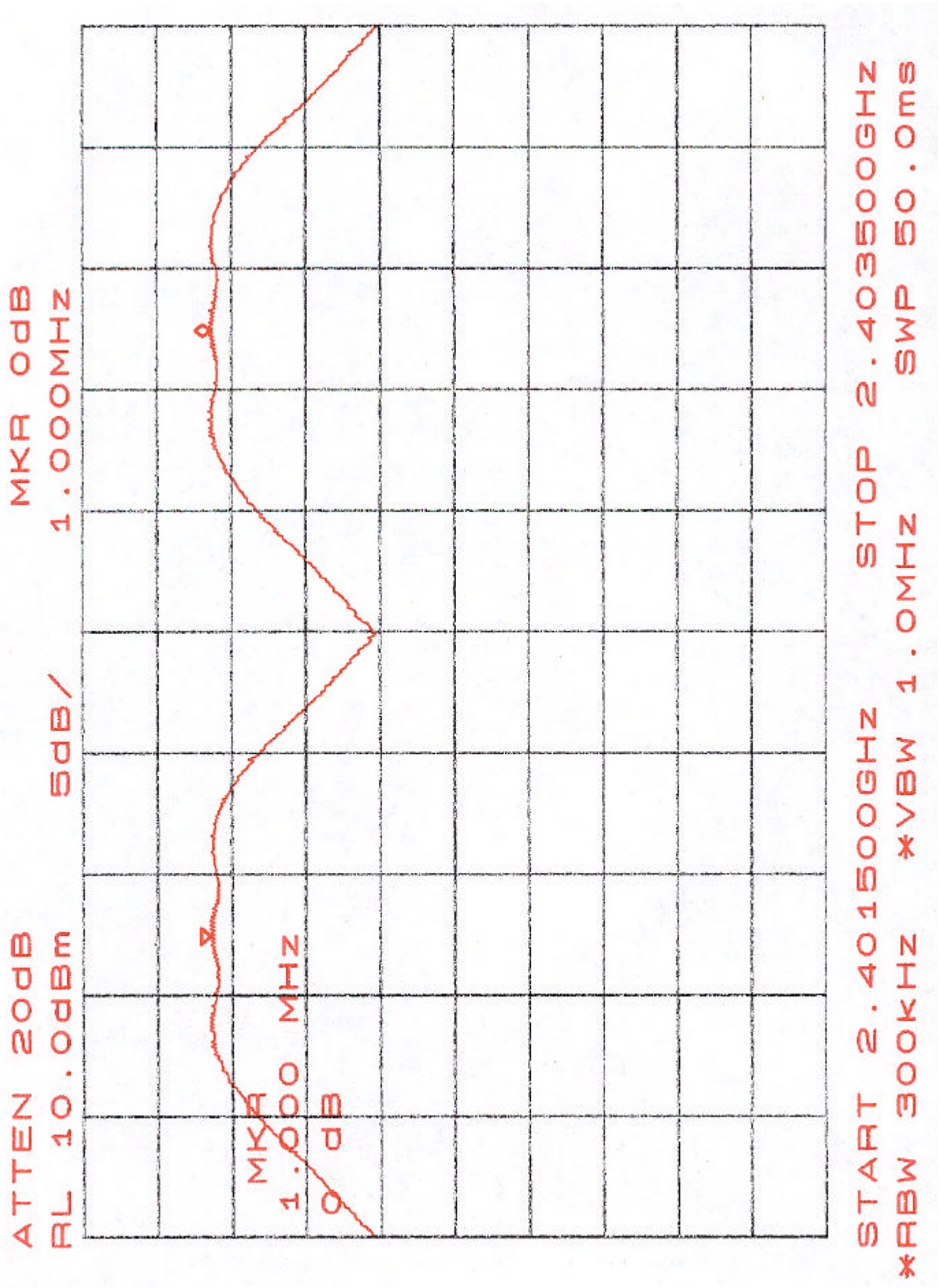
12.4 Measurement Data

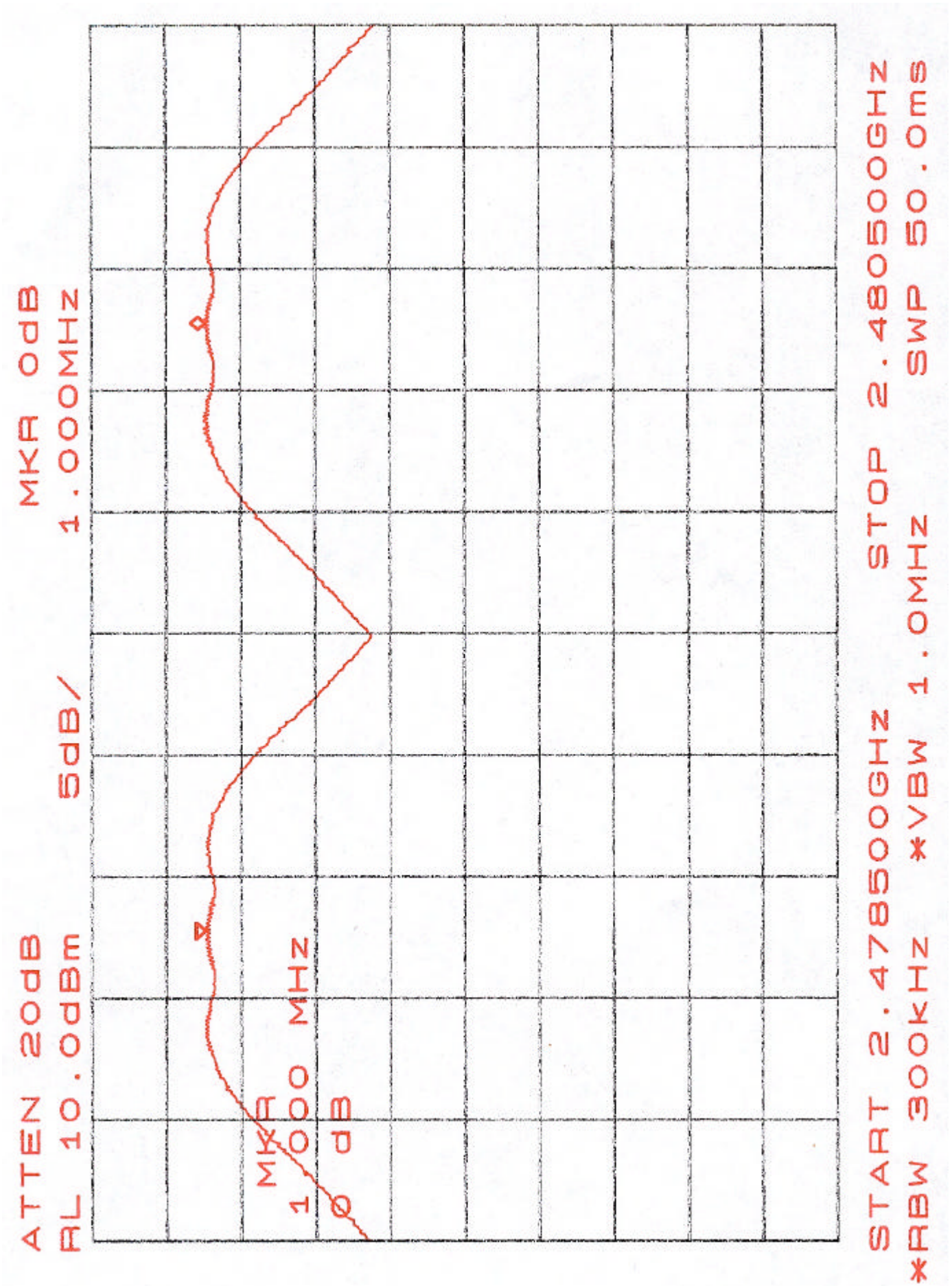
Test Date : Mar. 26, 2003 Temperature : 22℃ Humidity: 60 %

a) 2402MHz channel seperation is 1MHz
b) 2441MHz channel seperation is 1MHz
c) 2480MHz channel seperation is 1MHz

Note: Please see Appendix 5 for ploted datas


ATTEN 20dB
RL 10.0dBm
5dB/
MKR 0dB
1.000MHz
MKR
1.000 MHz
0 dB
CENTER 2.441500GHz
*RBW 300KHz
*VBW 1.0MHz
SPAN 2.000MHz
SWP 50.0ms


ATTEN 20dB
RL 10.0dBm
5dB/
MKR 0dB
1.000MHz
MKR 1.000 MHz
0 dB
START 2.401500GHz
*RBW 300KHz
STOP 2.403500GHz
*VBW 1.0MHz
SWP 50.0ms


ATTEN 20dB
RL 10.0dBm
5dB/
MKR 0dB
1.000MHz
MKR 1.000 MHz
1.0 dB
START 2.478500GHz
*RBW 300kHz
STOP 2.480500GHz
*VBW 1.0MHz
SWP 50.0ms

13 Dwell Time

13.1 Standard Applicable

According to 15.247(a)(1)(iii), frequency hopping system in the 2400-2483.5MHz band employing at least 15 non-overlapping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 second multiplied by the number of hopping channels employed.

13.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in figure 5.

13.3 Measurement Equipment

Equipment	Manufacturer	Model No.	Next Cal. Due
Plotter	Hewlett-Packard	7550A	N/A
Spectrum Analyzer	Hewlett-Packard	8564EC	09/10/2003

13.4 Measurement Data

Test Date : Mar. 26, 2003 Temperature : 22℃ Humidity: 60 %

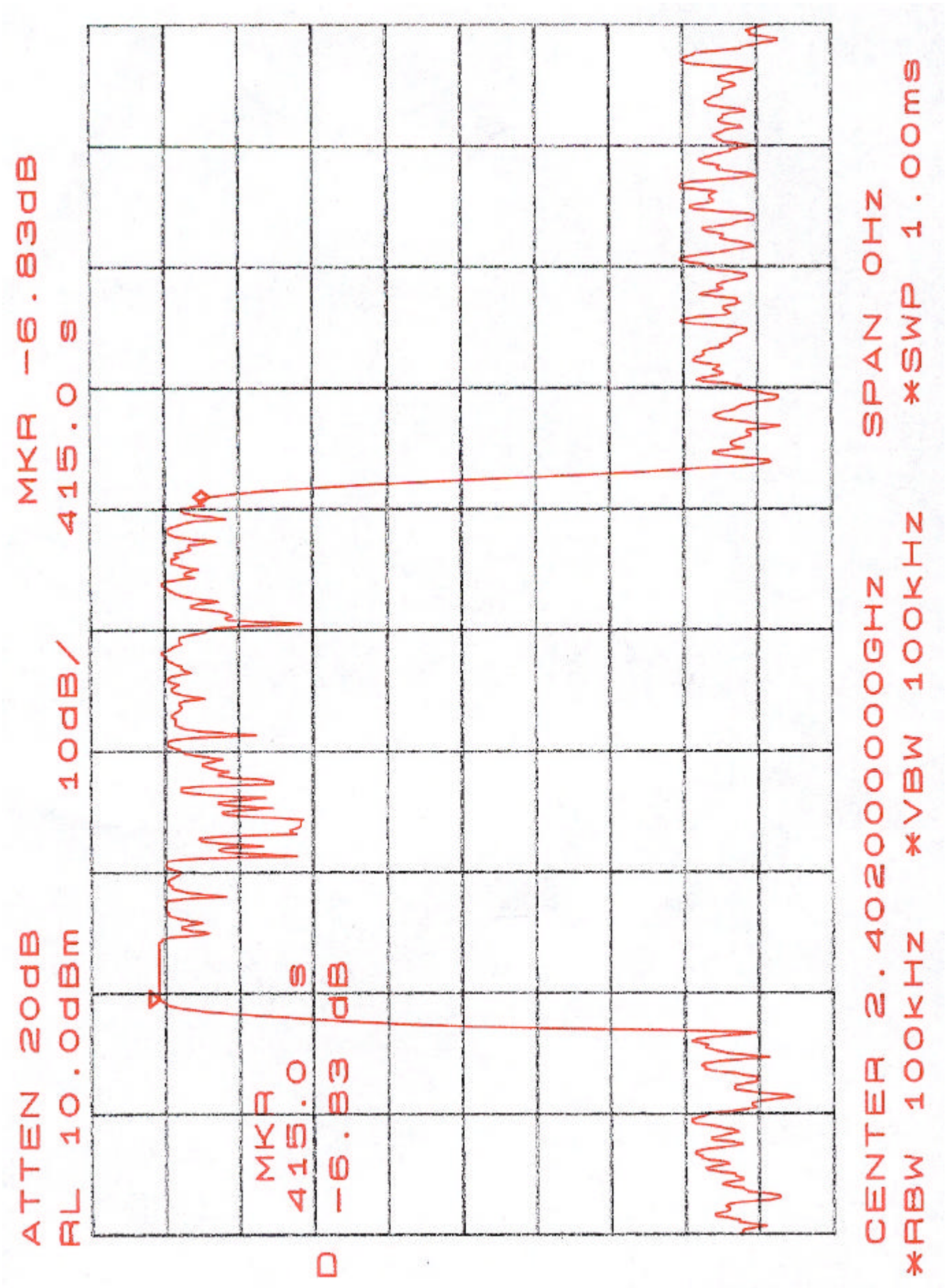
Test period=0.4(second/channel)$\times$ 79 channel=31.6sec

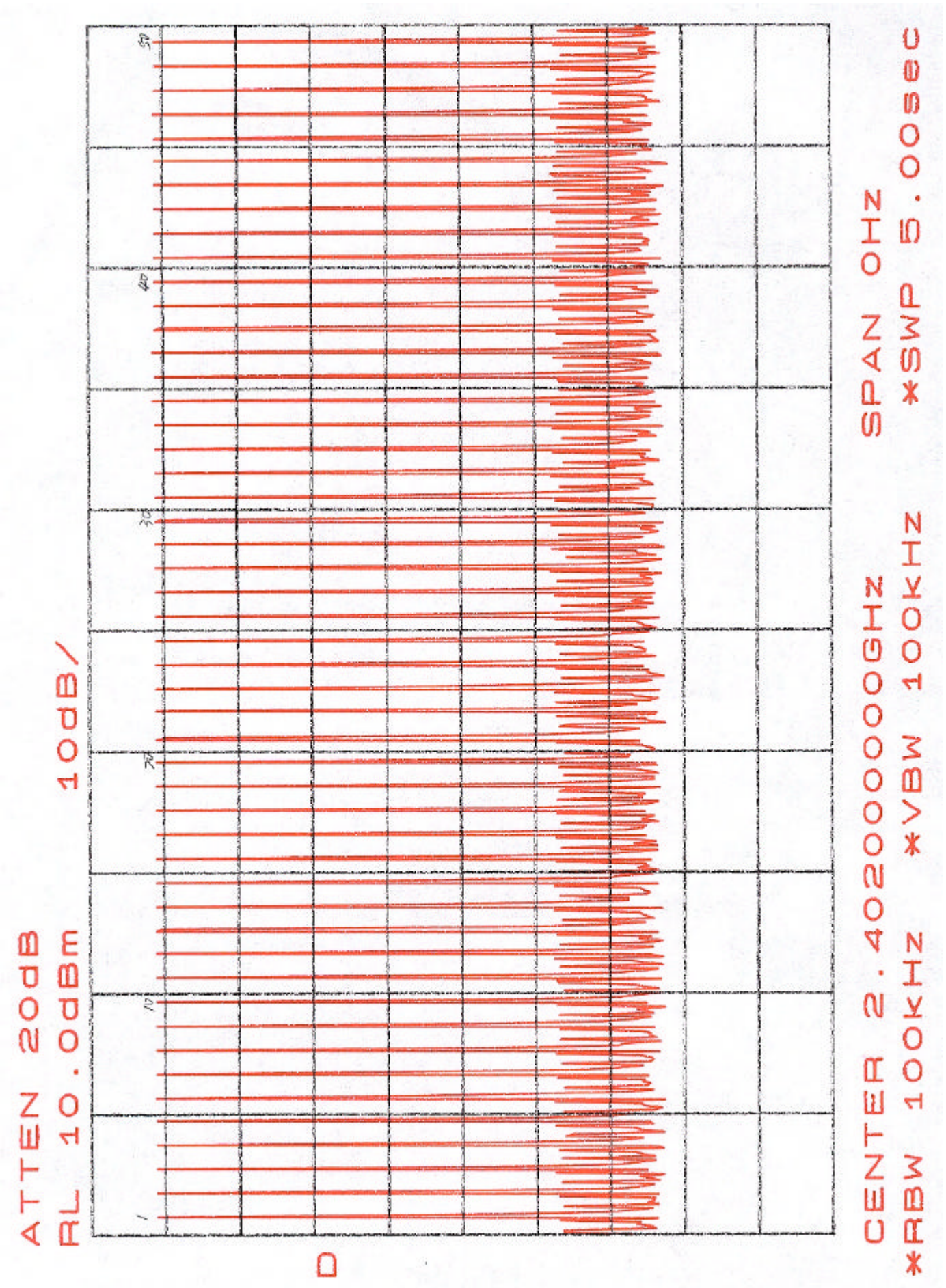
a) 2402MHz dwell time= $0.4150\text{ms}\times\frac{50}{5}\times 31.6 = 131.14\text{ms}$

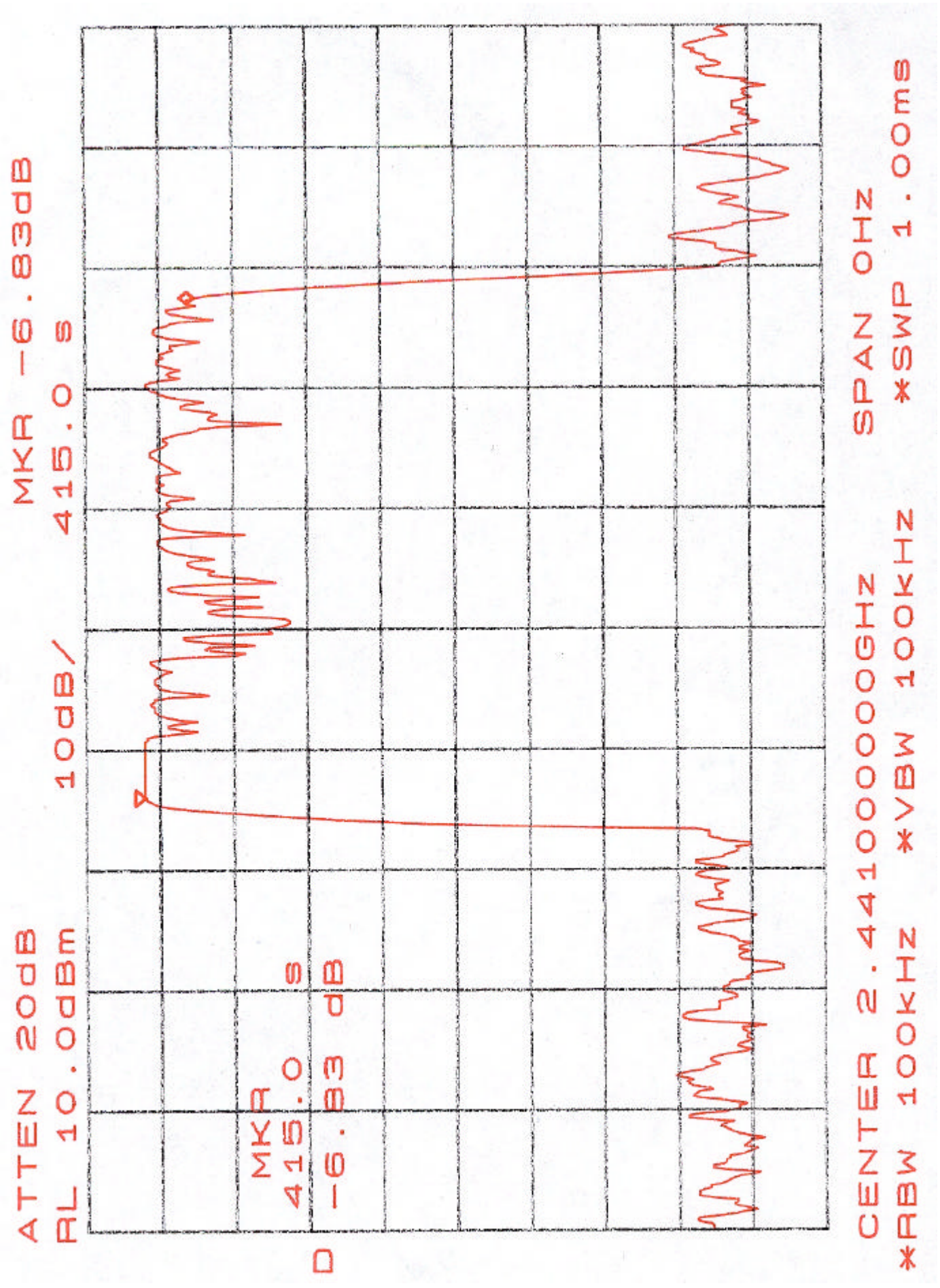
b) 2441MHz dwell time= $0.4150\text{ms}\times\frac{51}{5}\times 31.6 = 133.76\text{ms}$

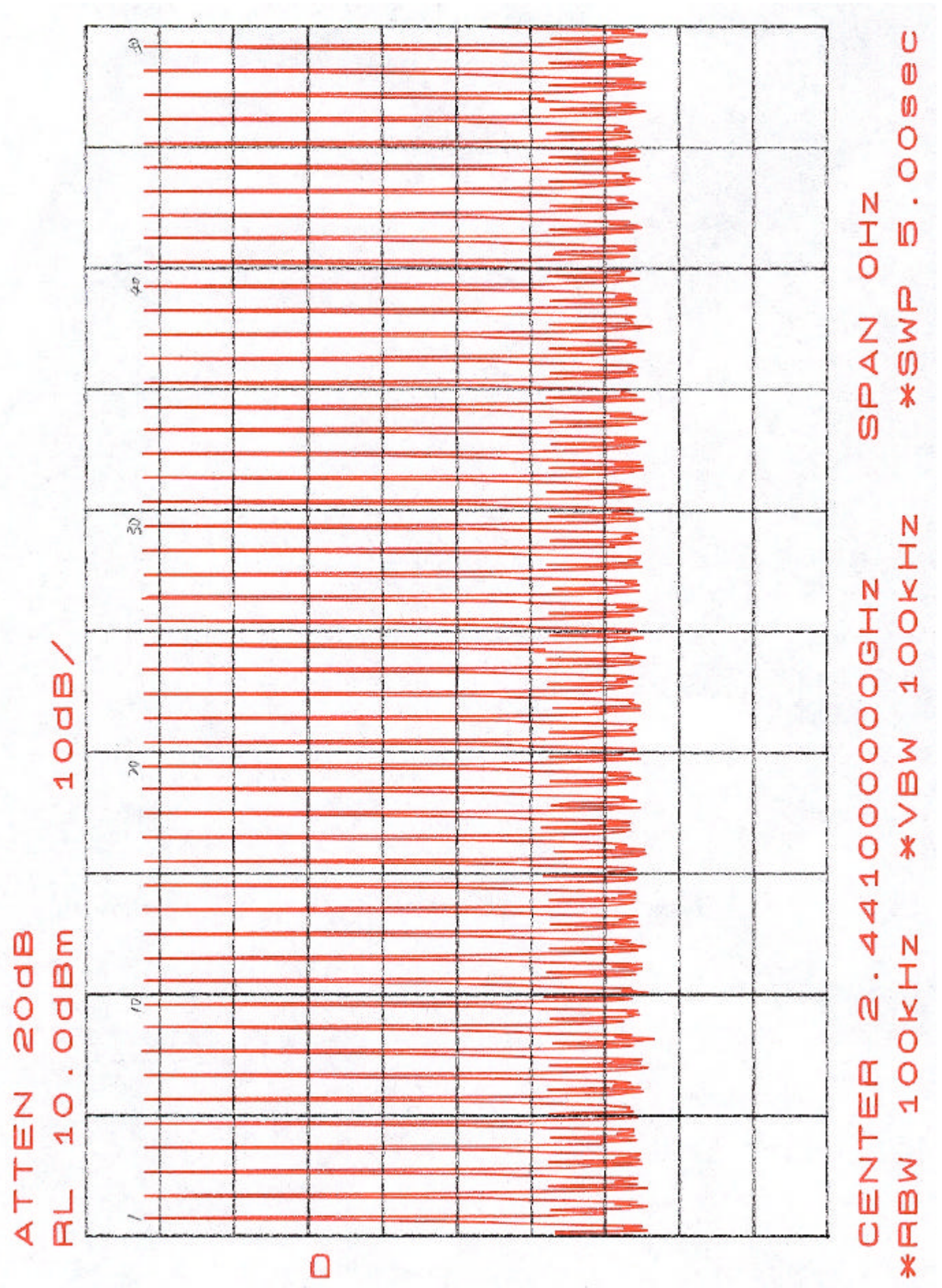
c) 2480MHz dwell time= $0.4150\text{ms}\times\frac{50}{5}\times 31.6 = 131.14\text{ms}$

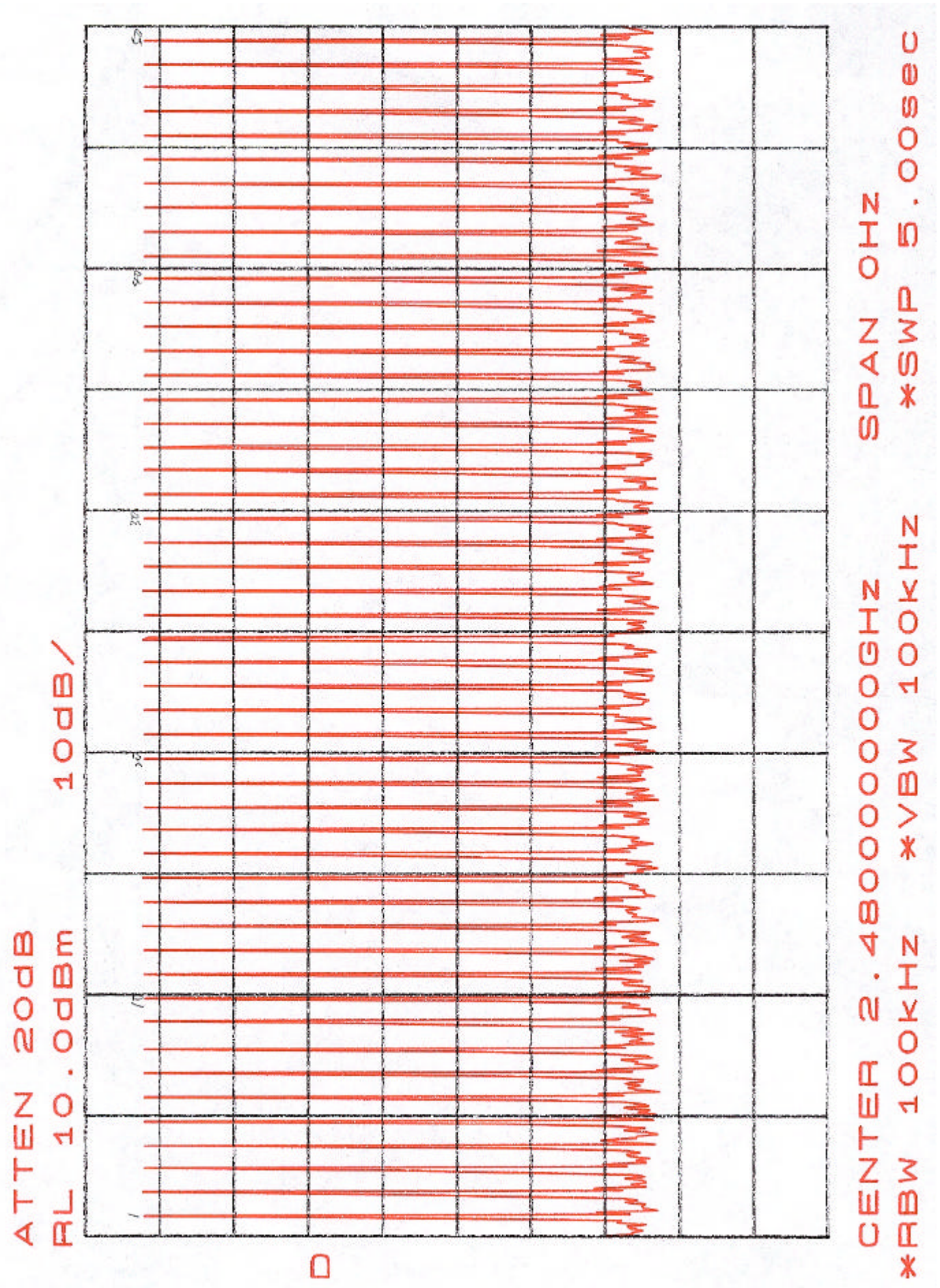
Note: Please see Appendix 6 for ploted datas

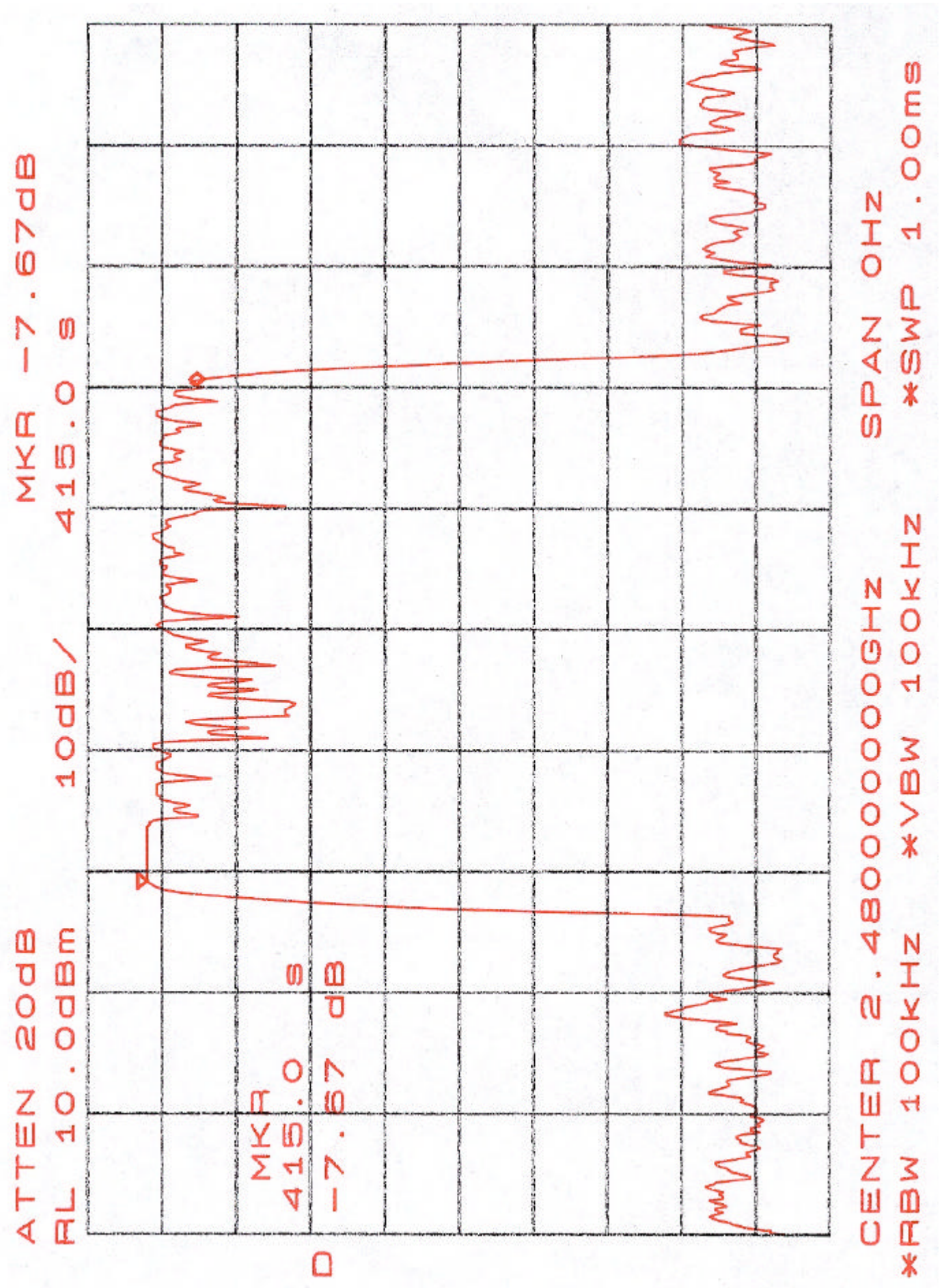

ATTEN 20dB
RL 10.0dBm
10dB/
MKR -6.83dB
415.0 s
MKR
415.0 s
-6.83 dB
CENTER 2.402000000GHz
*RBW 100KHz
*VBW 100KHz
SPAN 0Hz
*SWP 1.00ms


ATTEN 20dB
RL 10.0dBm
10dB/
CENTER 2.402000000GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 5.00sec
D


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -6.83dB
415.0 s
MKR
415.0 s
-6.83 dB
CENTER 2.441000000GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 1.00ms


ATTEN 20dB
RL 10.0dBm
10dB/
CENTER 2.441000000GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 5.00sec


ATTEN 20dB
RL 10.0dBm
10dB/
CENTER 2.480000GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 5.00sec


ATTEN 20dB
RL 10.0dBm
10dB/
MKR -7.67dB
415.0 s
MKR
415.0 s
-7.67 dB
D
CENTER 2.480000000GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 1.00ms

14 RF Exposure Evaluation

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency radiation as specified in 1.1307(b) LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density(nW/cm^2)	Average Time (Minutes)
(A) Limits for Occupational/control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/Uncontrolled Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	1	30

F=Frequency in MHz

14.1 Friis Formula

Friis transmission formula: $Pd=(Pout*G)/(4*pi*r^2)$

Where
Pd=power density in mW/cm^2
Pout=output power to antenna in mW
G=gain of antenna in linear scale
Pi=3.1416
R=distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm^2. If we know the maximum gain of the antenna and the total power input to the antenn, through the calculation, we will know the distance where the MPE limit is reached.

14.2 EUT Operation condition

A software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

14.3 Test Result of RF Exposure Evaluation

Test Date : Mar. 26, 2003 Temperature : 22℃ Humidity: 60 %

Product: Epox Bluetooth Printer Adapter

Test Item: RF Exposure Evaluation Data

Test site: No. 2 chamber

Test Mode: Normal Operation

14.3.1 Antenna Gain

Antenna Gain: The maximum Gain is 1.5 dBi.

14.3.2 Output Power Into Antenna & RF Exposure Evaluation Distance

Channel	Channel Frequency (MHz)	Output Power to Antenna (dBm)	Minimum allowable Distance ®From Skin(cm)
01	2402	+1.00	0.37
40	2441	+0.00	0.36
79	2480	+0.00	0.29

The distance r (4th column) calculated from the Friis transmission formula is far shorter than 20 cm separation requirement. So, RF exposure limit warning or SAR test are not required.