

INTERACTIVE TECHNOLOGIES INCORPORATED

DESCRIPTION OF MEASUREMENT FACILITIES

Measurements were performed at TUV Testing Services Open Test Site
A full description of the measurement facilities are kept on file
by the FCC. TUV's acceptance and approval is dated as June 5th,
5, 1996 in a letter received from the FCC.

TUV PRODUCT TESTING SERVICE
19035 WILD MOUNTAIN ROAD
TAYLORS FALLS, MN. 55084-1758

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

PART B

PREFACE

This device is a security transmitter. The device was placed on a .8 meter high platform, three meters from the receiving antenna. Peak emissions were found by varying the antenna height from one to four meters and rotating the device 360 degrees. Emissions were taken with both vertical and horizontal polarization's.

TEST NOTES

- 1) Bandwidth measurements were made in the peak mode, using a Hewlett Packard Spectrum Analyzer Model Number (70000).
- 2) Duty Cycle Correction Factors = $20 \log (t/T)$ Where t = Maximum time during any .1 second interval. T = .1 second
- 3) All emissions from 25 MHz were measured to the tenth harmonic were measured with an Hewlett Packard model 8566B Spectrum Analyzer.
- 4) Emissions below 1000MHz were measured with a 100 kHz bandwidth. Emissions above 1000MHz were measured with a 1MHz bandwidth.
- 5) Forbidden bands measurements were made at 1 meter distance.
- 6) Noise floor measurements. See AMBIENT LEVEL IN THE FORBIDDEN BANDS.

INTERACTIVE TECHNOLOGIES INCORPORATED

BANDWIDTH MEASUREMENT

15.205 (d) Bandwidth (see Test Notes). (.25% of Fundamental)

Spectrum Analyzer used: HP 70000

Spectrum analyzer skirt bandwidth (-20 dBm) 1KHz

FREQUENCY (MHz)	MEASURED BANDWIDTH @ -20dBm (KHz)	*ESTIMATED SIGNAL BANDWIDTH (KHz)	FCC BANDWIDTH LIMIT (KHz)
319.5	41.3	40.3	792

* Estimated Bandwidth = Measured bandwidth minus analyzer bandwidth

BANDWIDTH MEASUREMENT

09:52:44 JUN 30, 1998

RL 0.00 dBm

MKR #3 Δ FRQ 1.4 kHz

ATTEN 10 dB

-20.21 dB

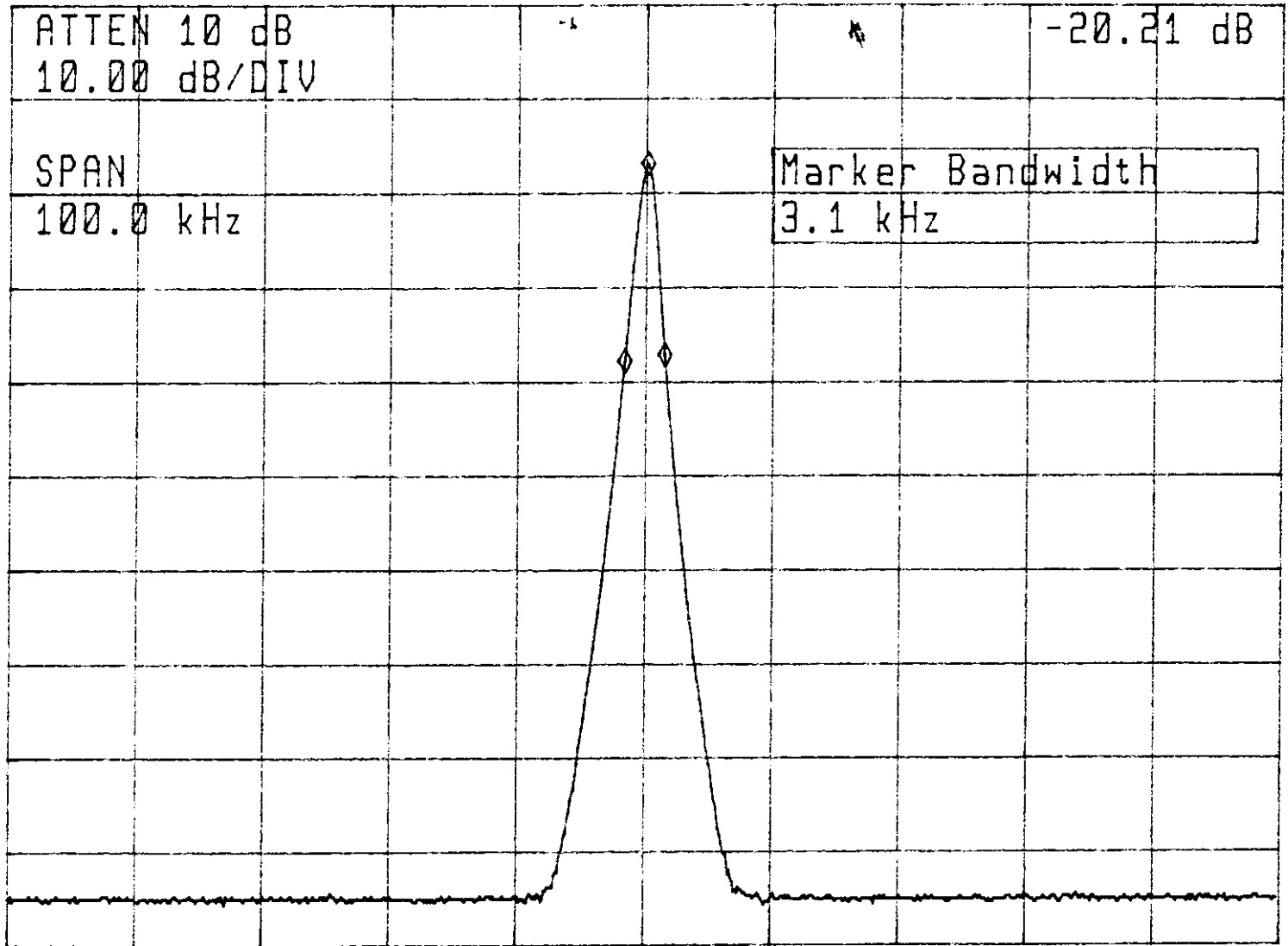
10.00 dB/DIV

SPAN

100.0 kHz

Marker Bandwidth

3.1 kHz



CENTER 319.588 1 MHz

SPAN 100.0 kHz

RB 1.00 kHz

VB 1.00 kHz

ST 305.0 msec

BANDWIDTH MEASUREMENT

09:49:42 JUN 30, 1998

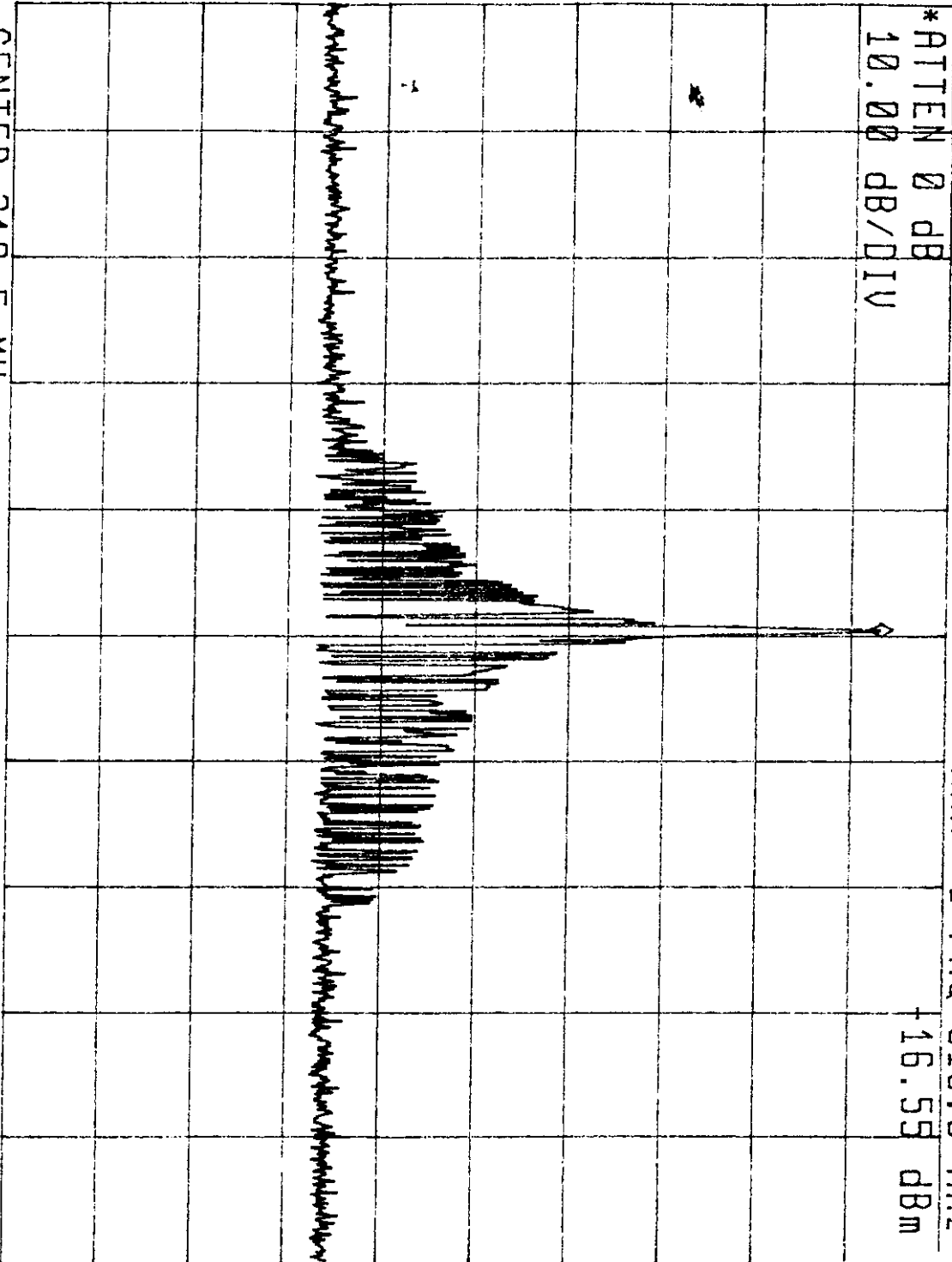
RL -10.00 dBm

MKR #1 FRQ 318.8 MHz

26

*ATTEN 0 dB
10.00 dB/DIV

+16.53 dBm



CENTER 319.5 MHz
RB 300 kHz VB 300 kHz

SPAN 200.0 MHz
ST 10.00 msec

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BANDWIDTH MEASUREMENT

09:46:52 JUN 30, 1998

RL 0.00 dBm

MKR #1 ΔFRQ 41.3 kHz

27

ATTEN 10 dB

-0.30 dB

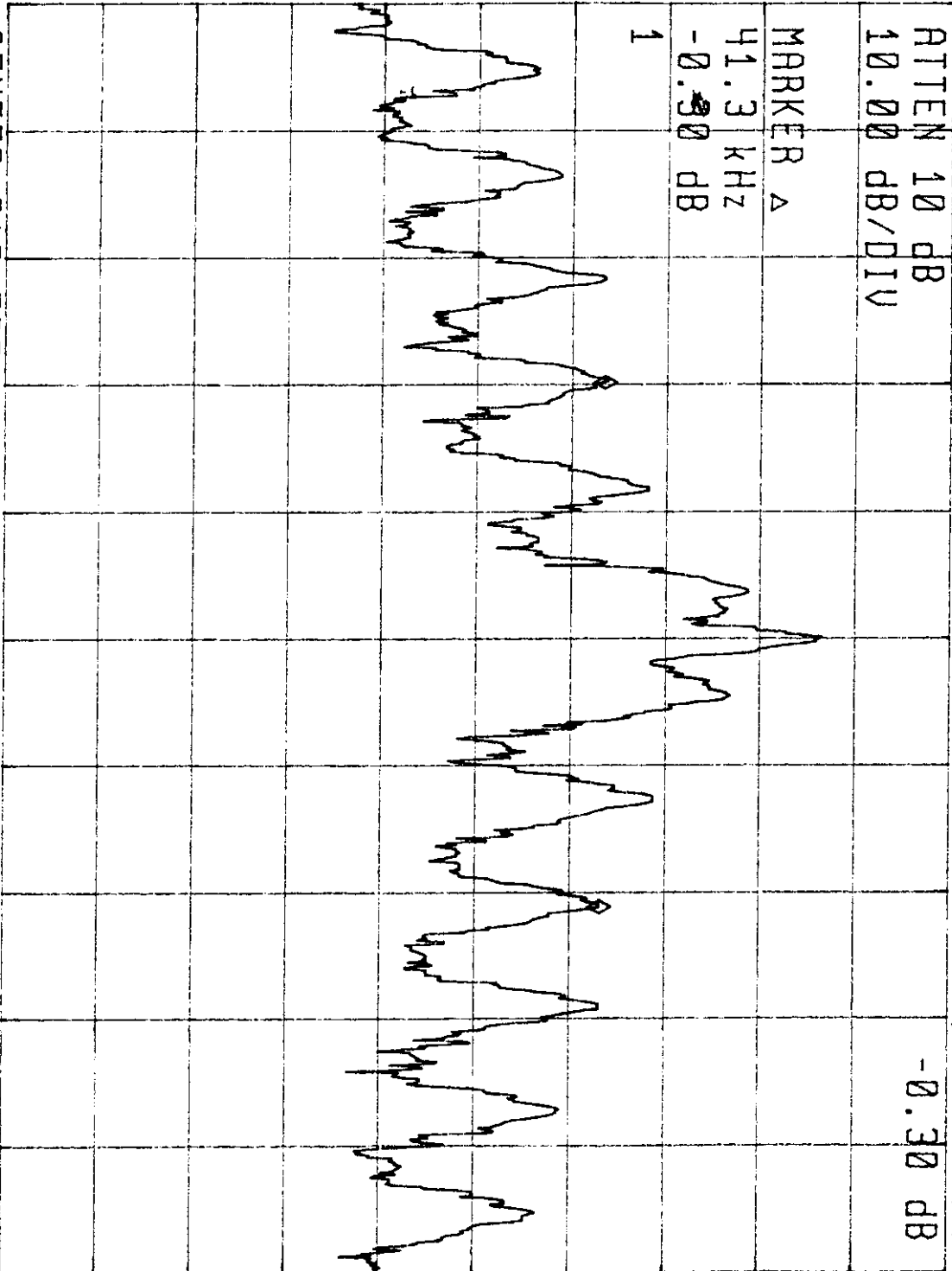
10.00 dB/DIV

MARKER Δ

41.3 kHz

-0.30 dB

1



CENTER 319.588 1 MHz
RB 1.00 kHz VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec

INTERACTIVE TECHNOLOGIES INCORPORATED

BANDWIDTH MEASUREMENT

15.205 (d) Bandwidth (see Test Notes). (.25% of Fundamental)

Spectrum Analyzer used: HP 70000

Spectrum analyzer skirt bandwidth (-20 dBm) 1KHz

FREQUENCY (MHz)	MEASURED BANDWIDTH @ -20dBm (KHz)	*ESTIMATED SIGNAL BANDWIDTH (KHz)	FCC BANDWIDTH LIMIT (KHz)
433.95	41	40	792

* Estimated Bandwidth = Measured bandwidth minus analyzer bandwidth

BANDWIDTH MEASUREMENT

09:44:00 JUN 30, 1998

RL 10.00 dBm

MR #3 ΔFRQ 1.5 kHz

ATTEN 20 dB
10.00 dB/DIV

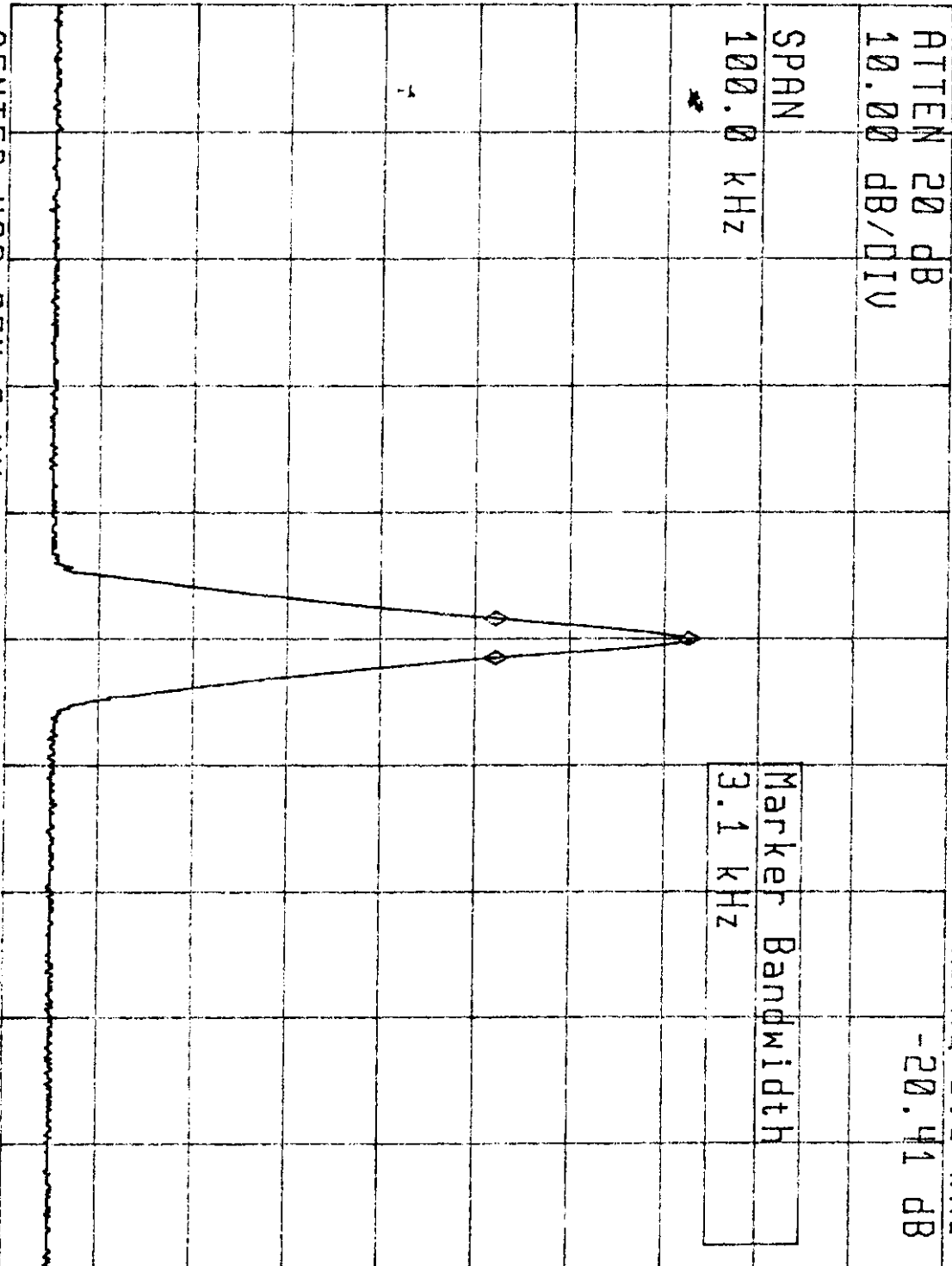
-20.41 dB

SPAN

100.0 kHz

Marker Bandwidth

3.1 kHz



CENTER 433.954 6 MHz
RB 1.00 kHz VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec

INTERACTIVE TECHNOLOGIES INCORPORATED

BANDWIDTH MEASUREMENT

09:35:40 JUN 30, 1998

RL 10.00 dBm

MR #1 ΔFRQ 41.0 kHz

ATTEN 20 dB

-0.56 dB

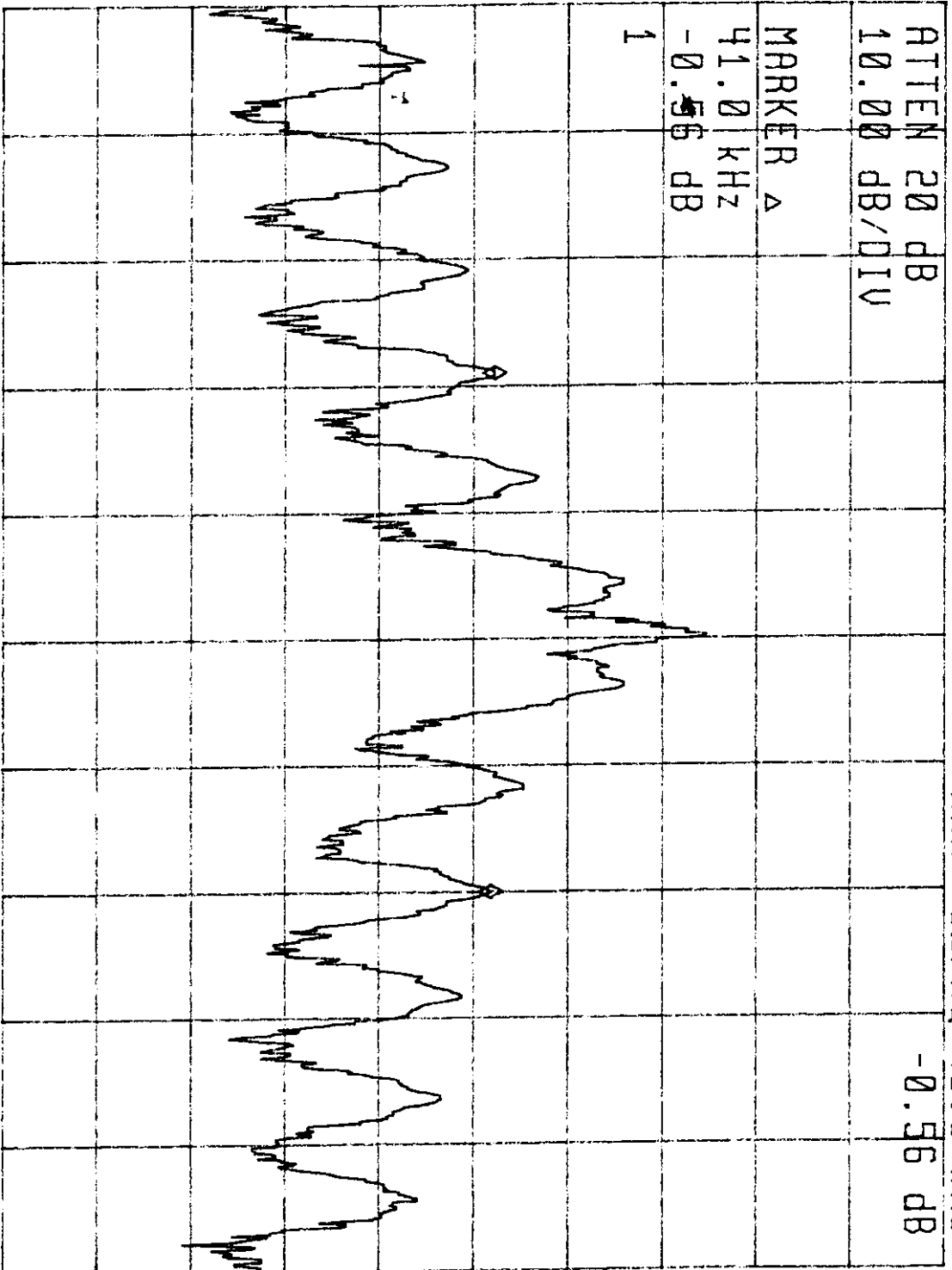
10.00 dB/DIV

MARKER Δ

41.0 kHz

-0.56 dB

1



CENTER 433.954 6 MHz
RB 1.00 kHz VB 1.00 kHz

SPAN 100.0 kHz
ST 305.0 msec

INTERACTIVE TECHNOLOGIES INCORPORATED

BANDWIDTH MEASUREMENT

09:38:29 JUN 30, 1998

RL 0.00 dBm

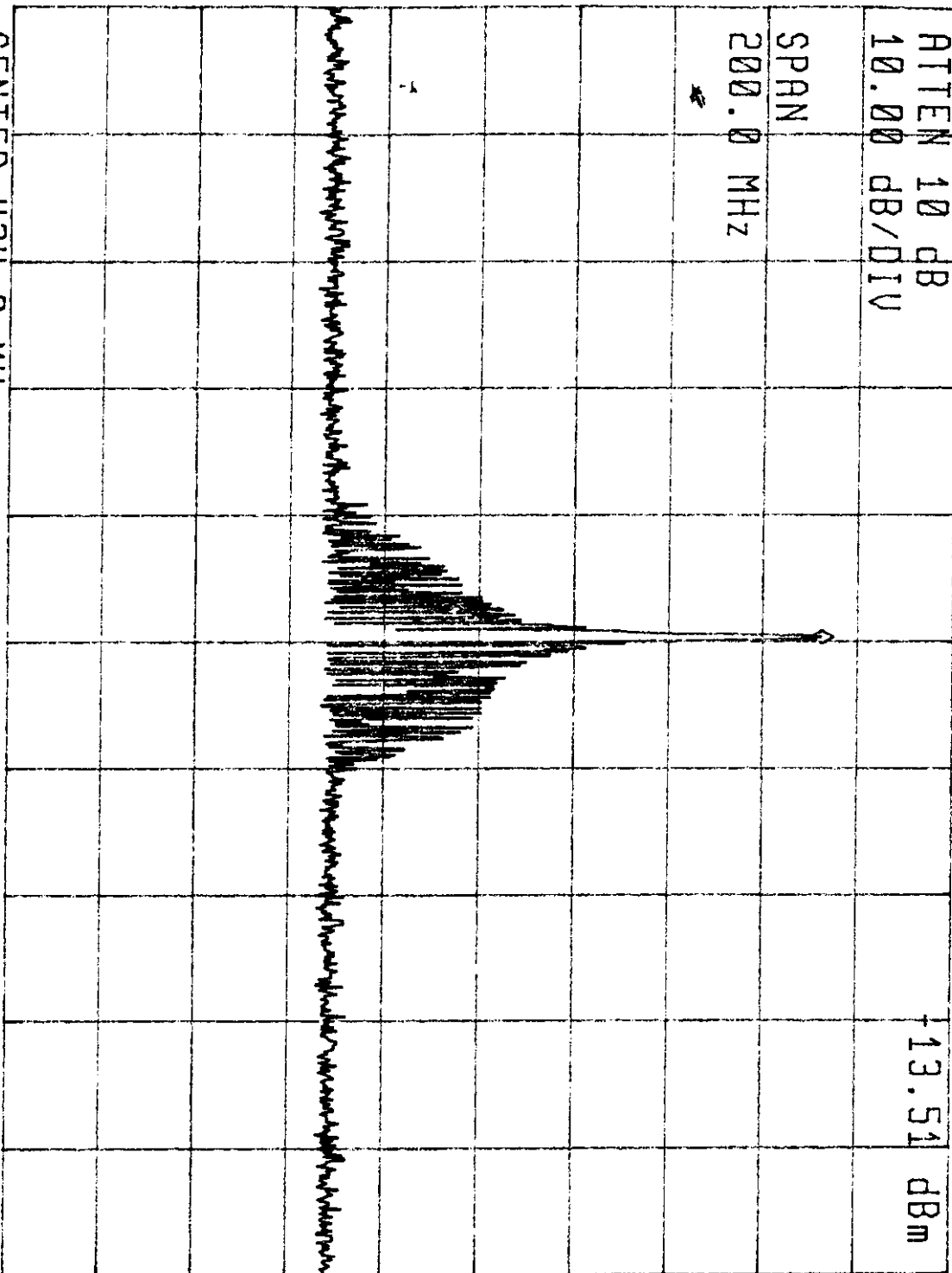
MKR #1 FRQ 433.5 MHz

ATTEN 10 dB
10.00 dB/DIV

+13.51 dBm

SPAN

200.0 MHz



CENTER 434.0 MHz
RB 300 kHz

VB 300 kHz

SPAN 200.0 MHz
ST 10.00 msec

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DUTY CYCLE CALCULATION

The Learnmode format transmission time varies from 18.1 milliseconds to 21.8 milliseconds. The maximum on time is 8.662 milliseconds. The interval between packets will vary in a pseudo-random manner from about 99 milliseconds to 458 milliseconds.

If an hour elapses without a data transmission, the chip will trigger itself and send a group of three supervisory data packets. The actual supervisory interval will vary in a pseudo-random manner from about 64 to 68 minutes..

SUPERVISORY CALCULATION

The supervisory signal consists of three packet transmissions. Therefore, the maximum supervisory duration is 981.4 milliseconds in duration. $21.9 \text{ milliseconds} \times 3 = 65.4 \text{ milliseconds} + 2 \times 458 \text{ millisecond interval time in between packets} = 981.4 \text{ milliseconds maximum time.}$

The calculation for the “ Duty Cycle Correction Factor “ is as follows:

DATA FORMATON TIME

1-976uSec AGC Pulse	976uSec ON
12-244uSec Sync Pulses	1.464mSec ON
1-366uSec Start Pulse	122uSec ON
42-366uSec Data Pulses	5.124mSec ON
366uSec Old Stop Bit	366uSec ON
366uSec One	122uSec ON
3-366uSec MSB	366uSec ON
244uSec New Stop Bit	122uSec ON

21.716mSec Total Time 8.662mSec Total On Time

$$8.662\text{mSec TOTAL ON TIME} / 100\text{mSec} = .08662 \text{ (LOG) } \times 20 = -21.25\text{dB}$$

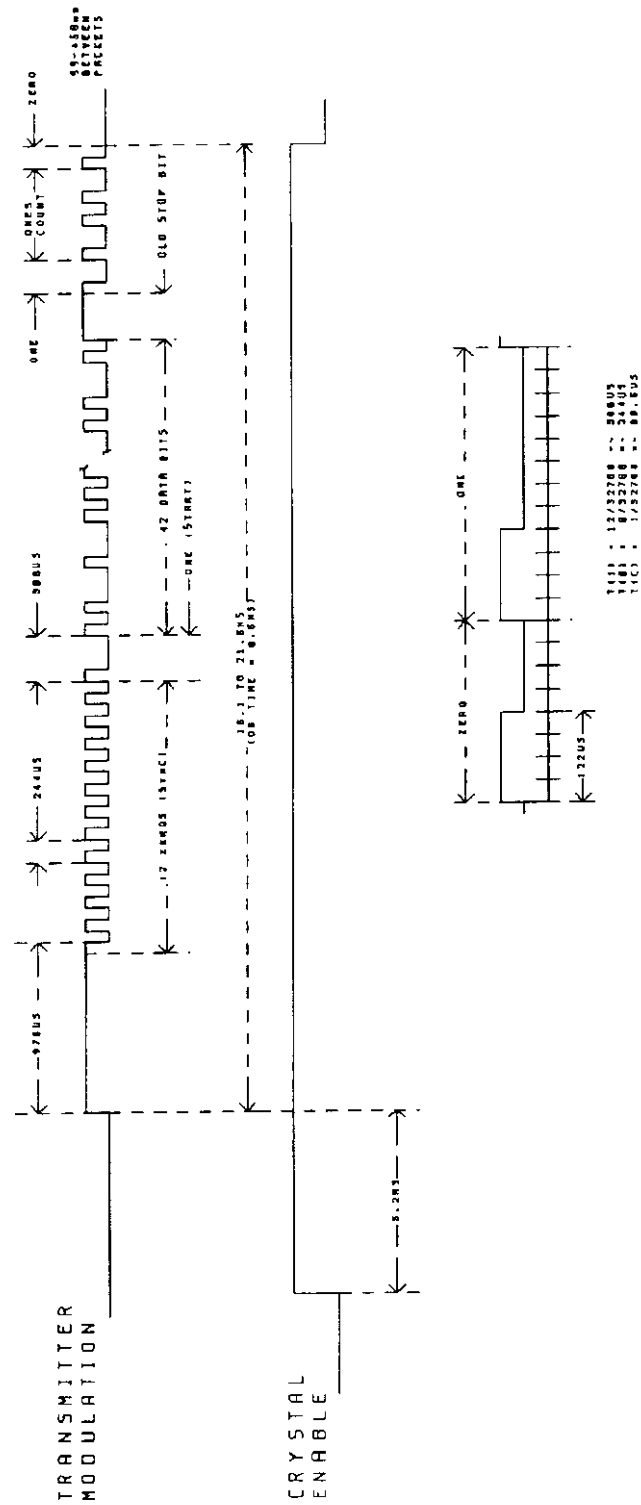
NOTE: 20dB is the maximum allowable DUTY CYCLE CORRECTION FACTOR

The following data transmission plots are “ ALARM “ condition data packets.

Page 34 shows a plot of a single packet transmission over a period of 100 milliseconds.

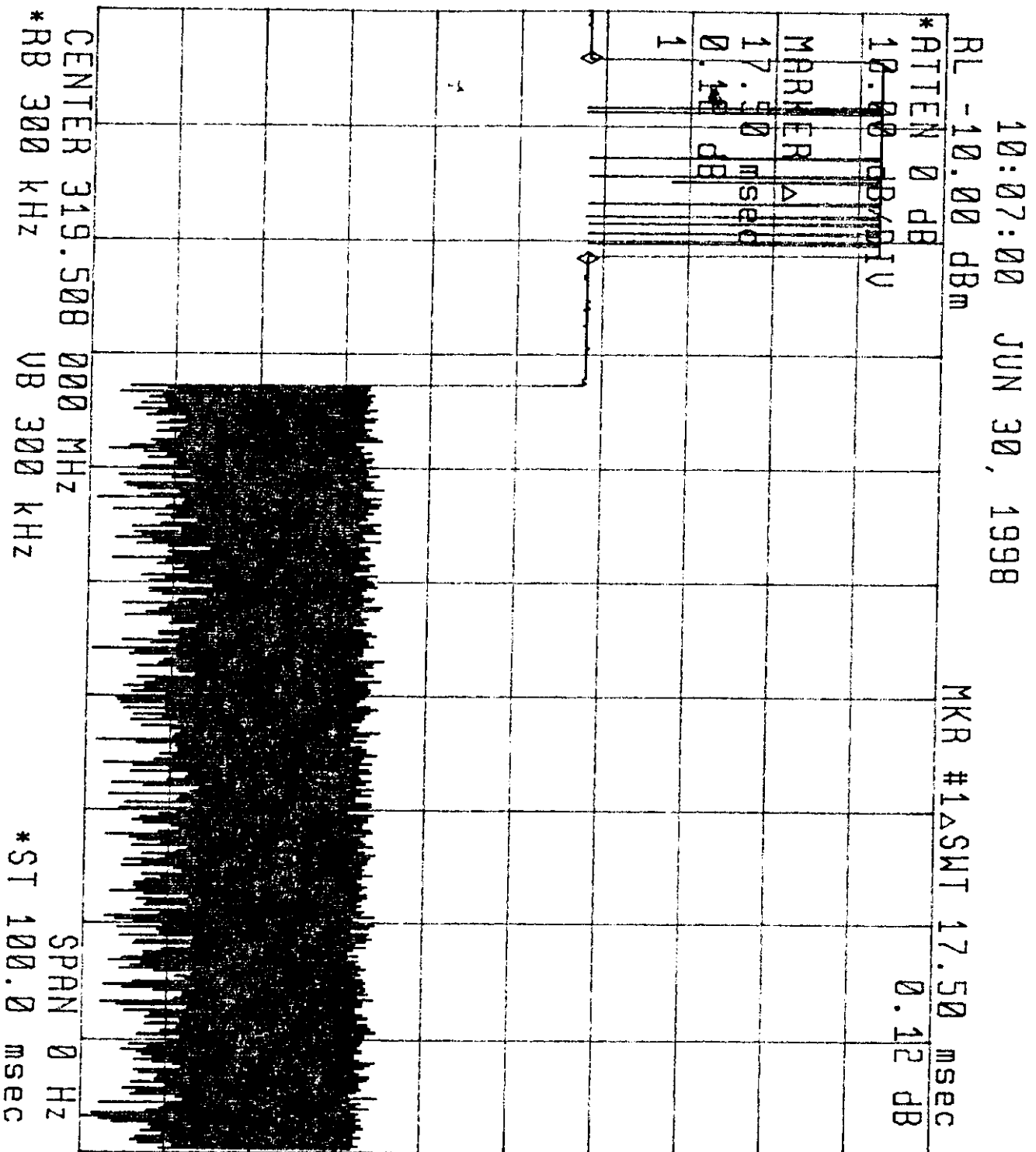
Page 35 shows a plot of a single packet

Page 36 shows a plot of an “ Alarm “ data transmission.



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SINGLE PACKET 100 MILLISECOND PLOT



INTERACTIVE TECHNOLOGIES INCORPORATED

SINGLE PACKET

MAXIMUM PACKET DURATION IS 21.8 MILLISECONDS

10:10:28 JUN 30, 1998

RL -10.00 dBm

MKR #1 ΔSMT 17.38 msec

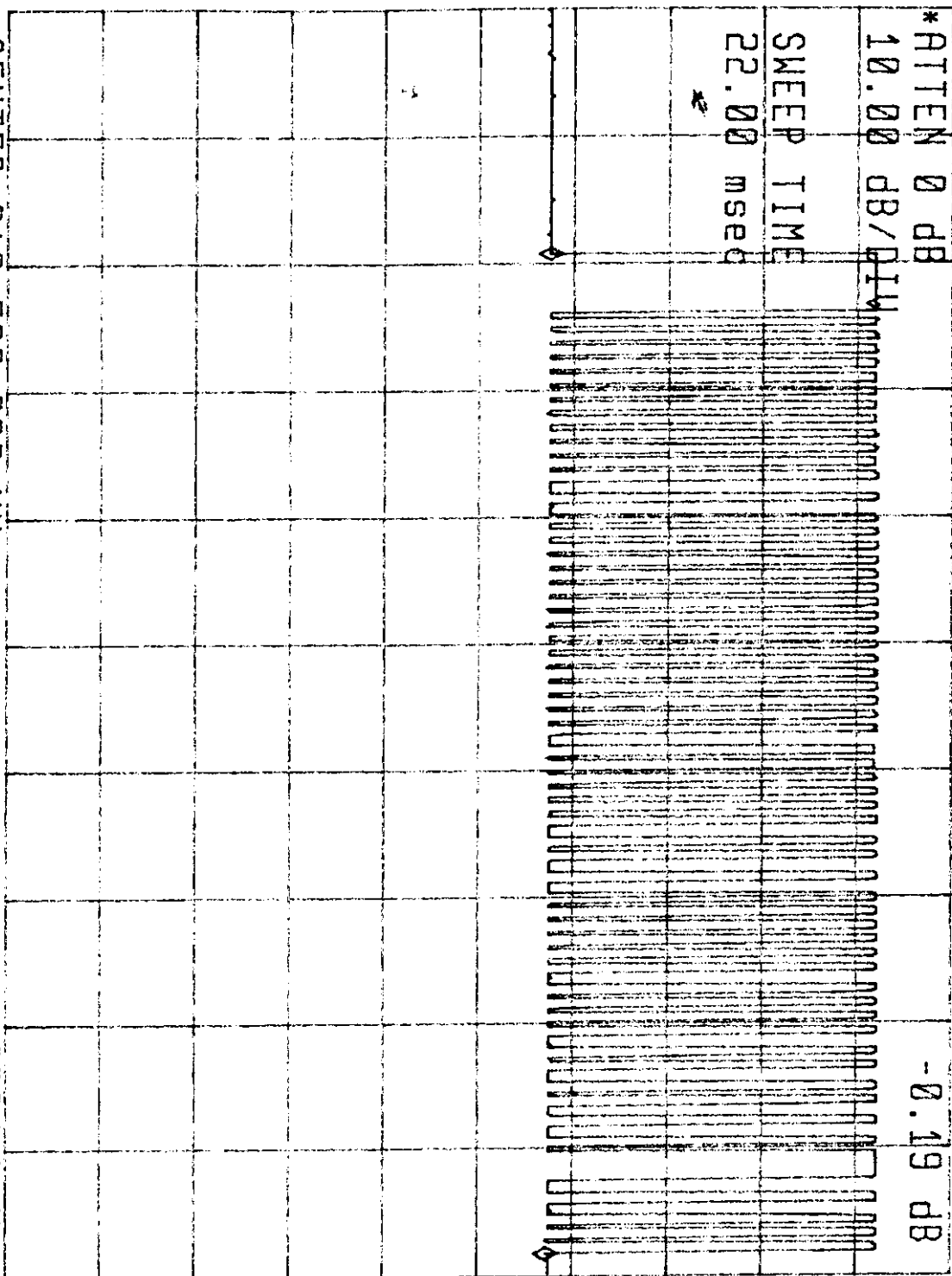
*ATTEN 0 dB

-0.19 dB

10.00 dB/DIV

SLEEP TIME

22.00 msec



35

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A COMPLETE TRANSMISSION OF EIGHT INDIVIDUAL ALARM PACKETS

1) **INTER MESSAGE TIME DELAY** - Measured from the leading edge of one message packet to a leading edge of the following message packet. This time will vary from 99 to 458 milliseconds in a pseudo-random manner. The transmission duration will never exceed 3.424 seconds in accordance with 15.201 (d).

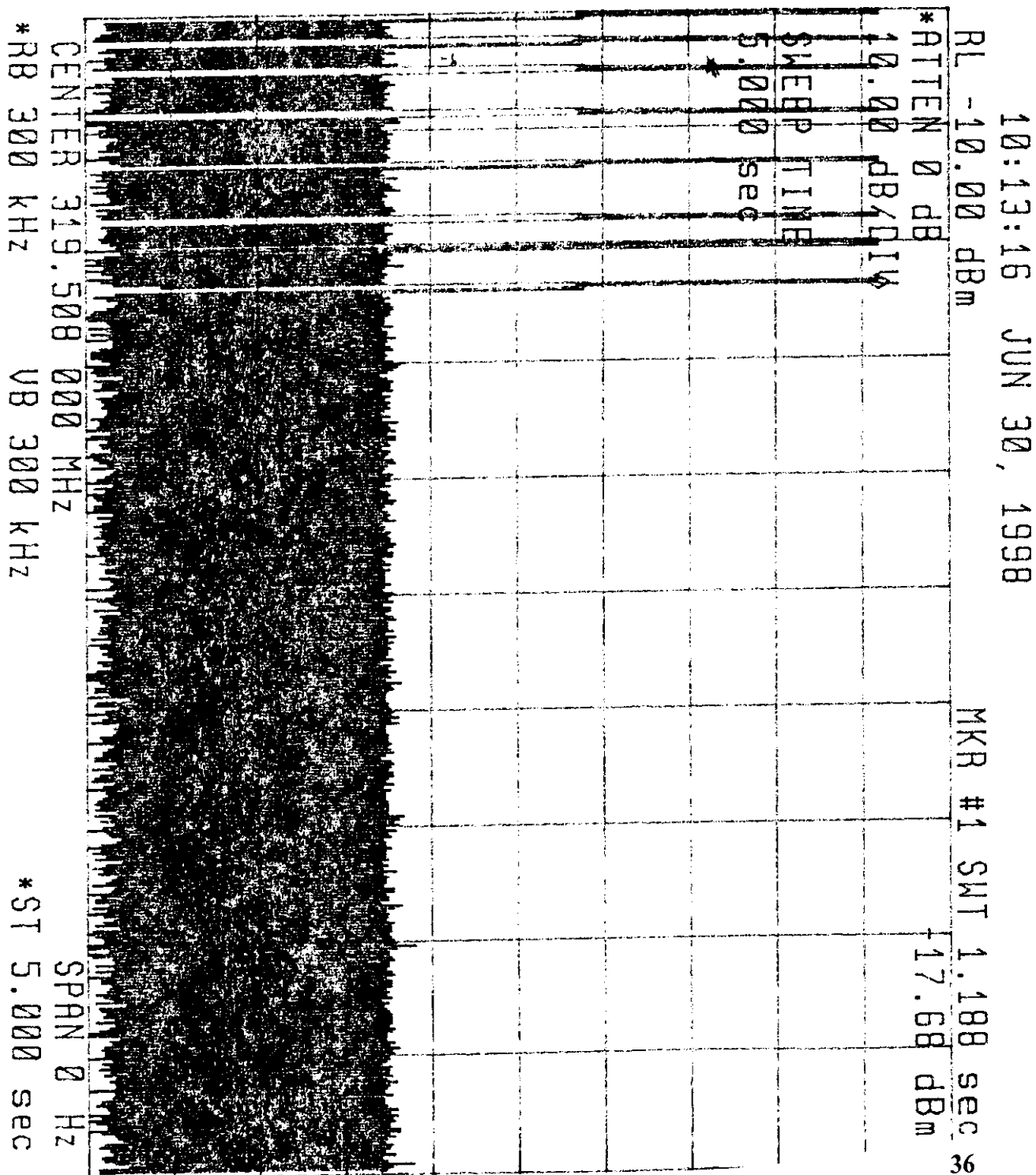
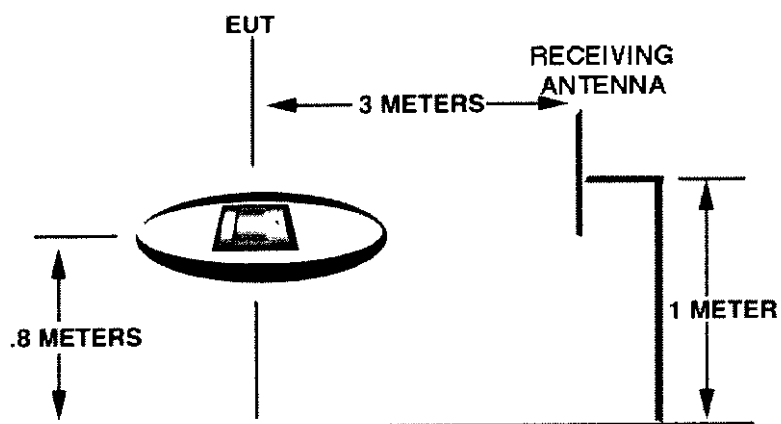


EXHIBIT 4

LABORATORY MEASUREMENT SKETCHES

RADIATED EMISSIONS



INTERACTIVE TECHNOLOGIES INCORPORATED

The PIR DETECTOR TRANSMITTER passes FCC Rules Part 15, Subpart C, Paragraph 15.231. The highest fundamental radiated emission measurement was 5.34dB below the FCC limit at 319.5MHz. The highest spurious emission measurement was 7.24dB below the FCC limit at 958.5MHz. The highest forbidden band emission was 20.18dB below the FCC limit at 1597.5MHz.

The highest fundamental radiated emission measurement was 7.48dB below the FCC limit at 433.95MHz. The highest spurious emission measurement was 14.38dB below the FCC limit at 867.8MHz. The highest forbidden band emission was 27.13dB below the FCC limit at 1301.8MHz.

INTERACTIVE TECHNOLOGIES INCORPORATED

FCC EMISSIONS CALCULATION

TERMS:

ANALYZER READING (AR) (dBuV)
TOTAL LOSS FACTOR (TLF) (dB) = (ANTENNA FACTOR (AF) + CABLE LOSS (CL))
DUTY CYCLE CORRECTION (DC) (dB) = AVERAGE ON TIME OF DATA

EXAMPLE:

ANALYZER READING = 70dBuV
ANTENNA FACTOR = 18.4dB
CABLE LOSS = 4.1dB
DUTY CYCLE CORRECTION = 20dB

$(AR + TLF (AF + CL)) - DC = \text{dBuV} / M \quad (70\text{dBuV} + 22.5) - 20 = 72.5\text{dBuV} / M$

$\text{INVERSE LOG} (\text{dBuV}/M / 20) = \text{uV} / M \quad (72.5\text{dBuV}/M / 20) = 4217\text{uV} / M$

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

RADIATED EMISSIONS

PRODUCT DESCRIPTION: PIR DETECTOR

MODEL NUMBER: B4Z-692-PIR

FUNDAMENTAL 319.5MHz

POLARIZATION: HORIZONTAL & VERTICAL

The highest fundamental emission along with, the three highest spurious and restricted band emissions are listed below as per ANSI C63.4 paragraph 10.1.8.2.

Emissions from .009MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, paragraph 15.33 (a).

FREQUENCY MHz	ANALYZER READING dBuV	20*LOG DUTY CYCLE -dB	ANTENNA FACTOR dB	FIELD STRENGTH dBm	FIELD STRENGTH uV/m	FCC LIMIT uV/M
319.5	74.25	20	17.4	71.7	3823.8	6229.5
213	51.3	20	13.6	44.9	175.8	623
639	40.5	20	22.4	42.9	139.6	623
1810.5	27.8	20	32.8	40.6	107.2	623
1704	25.35	20	31.8	37.2	72	500
1597.5	24.6	20	31.2	35.8	61.7	500
2769	17.75	20	36.6	34.4	52.2	500

INTERACTIVE TECHNOLOGIES INCORPORATED

LABORATORY MEASUREMENTS

RADIATED EMISSIONS

PRODUCT DESCRIPTION: PIR DETECTOR

MODEL NUMBER: B4Z-692-PIR

FUNDAMENTAL 433.95MHz

POLARIZATION: HORIZONTAL & VERTICAL

The highest fundamental emission along with, the three highest spurious and restricted band emissions are listed below as per ANSI C63.4 paragraph 10.1.8.2.

Emissions from .009MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, paragraph 15.33 (a).

FREQUENCY MHz	ANALYZER READING dBuV	20*LOG DUTY CYCLE -dB	ANTENNA FACTOR dB	FIELD STRENGTH dBm	FIELD STRENGTH uV/m	FCC LIMIT uV/M
319.5	74.25	20	17.4	71.7	3823.8	6229.5
213	51.3	20	13.6	44.9	175.8	623
639	40.5	20	22.4	42.9	139.6	623
1810.5	27.8	20	32.8	40.6	107.2	623
1704	25.35	20	31.8	37.2	72	500
1597.5	24.6	20	31.2	35.8	61.7	500
2769	17.75	20	36.6	34.4	52.2	500

INTERACTIVE TECHNOLOGIES INCORPORATED

AMBIENT LEVEL IN FORBIDDEN BANDS

Noise floor of spectrum analyzer with antenna factors and duty cycle correction converted to uV/M at approximately one meter.

All measurements were taken with an HP 8566B Spectrum Analyzer. The bandwidth was 100kHz for measurements below 100MHz. The bandwidth was 1MHz for measurements above 1000MHz. The video filter was off. 15.205(a) All forbidden band information is listed below.*Calculated based on 2400/F (kHz) x 300.(See Rule 15.209.)

FREQUENCY MHz	NOISE FLOOR READING dBuV	20 LOG Sheet1			
		DUTY CYCLE dB	LOSS FACTOR dB	FIELD STRENGTH uV/M	FCC LIMIT uV/M
.09-.11	N.A.	N.A.	N.A.	N.A.	*
.49-.51	N.A.	N.A.	N.A.	N.A.	*
2.1735-2.1905	N.A.	N.A.	N.A.	N.A.	300
8.362-8.366	N.A.	N.A.	N.A.	N.A.	300
13.36-13.41	N.A.	N.A.	N.A.	N.A.	300
25.5-25.67	N.A.	N.A.	N.A.	N.A.	300
37.5-38.25	N.A.	N.A.	N.A.	N.A.	300
73-75.4	N.A.	N.A.	N.A.	N.A.	300
108-121.94	N.A.	N.A.	N.A.	N.A.	450
123-138	N.A.	N.A.	N.A.	N.A.	450
149.9-150.05	N.A.	N.A.	N.A.	N.A.	450
156.7-156.9	N.A.	N.A.	N.A.	N.A.	450
162.0125-167.17	N.A.	N.A.	N.A.	N.A.	450
167.72-173.2	N.A.	N.A.	N.A.	N.A.	450
240-285	4.9	-20	22	2.2	600
322-335.4	4.7	-20	23.8	2.7	600
399.9-410	4.7	-20	22.1	2.2	600
608-614	5.8	-20	24.6	3.3	600
960-999	5.8	-20	33.4	9.1	600
999-1240	4.7	-20	26	3.4	1500
1300-1427	4.7	-20	28	4.3	1500
1435-1626.5	4.7	-20	28	4.3	1500
1660-1710	4.7	-20	28	4.3	1500
1717.8-1722.2	4.7	-20	28	4.3	1500
2200-2300	6.4	-20	32	8.3	1500
2310-2390	6.4	-20	32	8.3	1500
2483.5-2500	6.4	-20	32	8.3	1500
2655-2900	6.4	-20	34	10.5	1500
3260-3267	NA	NA	NA	NA	1500
3332-3339	NA	NA	NA	NA	1500
3345.8-3358	NA	NA	NA	NA	1500
3600-4400	NA	NA	NA	NA	1500

**TEST FACILITY DATA SHEETS
NOISE FLOOR MEASUREMENTS**

INTERACTIVE TECHNOLOGIES INCORPORATED

TUV PRODUCT SERVICE

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
ITI SAW TRANSMITTER 55-692
Notes:

Report W8281 Run 2
Date 06-17-98 Page 1
Engineer _____
Tech: TKS _____
Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta	Delta
MAXED ANTENNA AND ROTATED 360 DEGREES								
NO PREAMP								
319.59	66.05	15.8	1.6	83.4	--	V --		
319.59	73.15	15.8	1.6	90.5	--	H --		
639.17	39.45	20.1	2.3	61.8	--	H --		
639.17	40.1	20.1	2.3	62.4	--	V --		
958.75	41.15	24.6	2.9	68.6	--	V --		
958.75	36.35	24.6	2.9	63.8	--	H --		
WITH PREAMP								
1278.3	19.5	25.9	3.4	48.8	--	H --		
1278.3	18.65	25.9	3.4	47.9	--	V --		
1597.9	22.6	27.3	3.9	53.7	--	V --		
1597.9	17.3	27.3	3.9	48.4	--	H --		
1917.5	11.55	28.9	4.9	45.4	--	H --		
1917.5	9.1	28.9	4.9	42.9	--	V --		
2237.1	8.95	29.9	12	50.8	--	V --		
2237.1	11.4	29.9	12	53.3	--	H --		
2556.6	13.35	30.7	7.5	51.5	--	H --		
2556.6	10.6	30.7	7.5	48.8	--	V --		
2876.2	2.4	31.1	5.4	39	--	V --		
2876.2	6	31.1	5.4	42.6	--	H --		
3195.8	6.5	31.9	5.4	43.8	--	H --		
3195.8	5.3	31.9	5.4	42.6	--	V --		

INTERACTIVE TECHNOLOGIES INCORPORATED

TUV PRODUCT SERVICE

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
ITI SAW TRANSMITTER 55-692
Notes:

Report W8281 Run 2
Date 06-17-98 Page 2
Engineer _____
Tech: TKS _____
Requester _____

Frequency	Level	Factor	Cable	Final	Az	Polar\	Delta	Delta
MHz	dBuV	dB	dB	dBuV/m	deg	Height		

NOISE FLOOR MEASUREMENTS

3000	4.9	31.3	5.4	41.6	--	--
2000	6.4	29.3	6.1	41.8	--	--
1000	4.7	25.4	3	33.1	--	--
500	5.8	18.8	2	26.6	--	--
300	4.7	15	1.5	21.2	--	--
210	4.9	12.4	1.3	18.6	--	--

INTERACTIVE TECHNOLOGIES INCORPORATED

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
ITI SAW TRANSMITTER 55-692
Notes:

Report W8281 Run 2
Date 06-17-98 Page 3
Engineer _____
Tech: TKS _____
Requester _____

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height	Delta	Delta
433.95	74.5	17	1.8	93.3	--	V --		
433.95	74.55	17	1.8	93.4	--	H --		
867.90	40.55	23.2	2.7	66.5	--	H --		
867.90	43.3	23.2	2.7	69.2	--	V --		
1301.8	17.45	26	3.4	46.9	--	V --		
1301.8	12.6	26	3.4	42	--	H --		
1735.8	19.5	28	4.1	51.6	--	H --		
1735.8	19.5	28	4.1	51.6	--	V --		
2169.7	8.2	29.7	10.7	48.7	--	V --		
2169.7	10.65	29.7	10.7	51.1	--	H --		
2603.7	16.7	30.7	7	54.4	--	H --		
2603.7	12.45	30.7	7	50.2	--	V --		
3037.6	5.35	31.4	5.3	42.1	--	V --		
3037.6	4.15	31.4	5.3	40.9	--	H --		
3471.6	7.15	32.7	5.6	45.5	--	H --		
3471.6	4.35	32.7	5.6	42.7	--	V --		
3905.5	5.45	34.2	6.3	45.9	--	V --		
3905.5	6.05	34.2	6.3	46.5	--	H --		
4339.5	6.25	33.7	6.3	46.3	--	H --		
4339.5	6.15	33.7	6.3	46.2	--	V --		

INTERACTIVE TECHNOLOGIES INCORPORATED

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

Large Test Site
3 Meter Antenna Distance
Equipment Under Test:
ITI
ITI SAW TRANSMITTER 55-692
Notes:

Figure _____

Report W8281 Run 2
Date 06-17-98 Page 4
Engineer _____
Tech: TKS _____
Requester _____

Measurement Summary

Frequency MHz	----- Final dBuV/m	----- uV/m	Azimuth deg	Polar\ Height	Delta	Delta
210	18.6	8.5113	--	--		
300	21.2	11.481	--	--		
319.59	90.5	33496.	--	H --		
433.95	93.4	46773.	--	H --		
500	26.6	21.379	--	--		
639.17	62.4	1318.2	--	V --		
867.90	69.2	2884.0	--	V --		
958.75	68.6	2691.5	--	V --		
1000	33.1	45.185	--	--		
1278.3	48.8	275.42	--	H --		
1301.8	46.9	221.30	--	V --		
1597.9	53.7	484.17	--	V --		
1735.8	51.6	380.18	--	H --		
1917.5	45.4	186.20	--	H --		
2000	41.8	123.02	--	--		
2169.7	51.1	358.92	--	H --		
2237.1	53.3	462.38	--	H --		
2556.6	51.5	375.83	--	H --		
2603.7	54.4	524.80	--	H --		
2876.2	42.6	134.89	--	H --		
3000	41.6	120.22	--	--		
3037.6	42.1	127.35	--	V --		
3195.8	43.8	154.88	--	H --		
3471.6	45.5	188.36	--	H --		
3905.5	46.5	211.34	--	H --		
4339.5	46.3	206.53	--	H --		

File W8281 Run 2

INTERACTIVE TECHNOLOGIES INCORPORATED

GENERAL DESCRIPTION EM 6617 MICROCONTROLLER

GENERAL DESCRIPTION

The 15-219 part consists of the EM Microelectronics 6617 microcontroller chip coupled with custom software developed by ITI to detect human body motion utilizing an infrared detector. This part also provides the serial digital data streams which communicate via RF to our panels. The chip features low voltage operation, low current operation, serial data transmission utilizing Pulse Width Modulation, pseudo-random inter-packet timing, an external 32,768 Hz crystal based clock, and 32 bytes of EEPROM to store transmission information and motion detection criteria. The chip also contains a low battery detection circuit and two eight bit digital conversion circuits which are used to sample the infrared detection circuitry and to measure the room temperature to provide temperature compensated motion detection.

PACKAGING

The chip is packaged in a plastic 28 pin plastic SMT. The pins are defined as follows:

<u>PIN</u>	<u>FUNCTION</u>
1	Not used
2	RF modulation output
3	Not used
4	Tamper Switch output
5	RF crystal enable output
6	Tamper Switch input
7	Tester control input
8	Sensitivity Switch input
9	Not used
10	Sensitivity Switch output
11	Not used
12	Not used
13	ADC Reference pull down output
14	Thermistor circuit pull down output
15	LED enable output
16	Tester control output
17	Master reset input
18	Test input
19	Unused
20	VCC
21	Analog Ground input
22	32 KHz input
23	32 KHz output
24	Ground
25	Analog input
26	Thermistor Analog input
27	ADC Reference input
28	ADC Reference output