Interactive Technologies, Inc.
ELM 4-Button Keychain Touchpad
B4Z-760A-EFOB
Certification

TEST REPORT
EXHIBIT E

Interactive Technologies Inc

ELM 4-Button Keychain Touchpad
B4Z-760A-EFOB

6/15/1999

Interactive Technologies, Inc.
2266 North Second Street
North Saint Paul, MN 55109
(651) 777-2690

1. Introduction

This device is a security alarm transmitter for use in a wireless security system. The unit is self-contained and powered by a 12-Volt alkaline battery. The transmitter's frequency is crystal controlled and is not adjustable by the user. The device measures approximately 2 1/4″ in length, 1 7/8″ in width, and 1/2″ in depth. The unit weighs approximately 3 ounces.

We are requesting Certification under FCC Rules, Part 15, Subpart C, Paragraph 15.231.

This is our first electronic application. Please send comments on the format to jbergman@securitypro.com.

2. Statement of Compliance

§2.907 Certification

This is an application for certification

§2.911 Application

a) This is an application and has been filed electronically with form 731.
b) All information required has been supplied.
c) The application has been signed (electronically) by the applicant.
d) The technical data has been signed.
(See Radiated Emissions)
e) Applicant signature block on electronic form 731 completed by officer of the company.
f) The appropriate fee has been sent by priority mail as directed by web site instructions. Set for delivery on 6/16/99 to:

Federal Communications Commission
Equipment Approval Services
P.O. Box 358315
Pittsburgh, PA 15251-5315

§2.915 Grant

This application demonstrates that all applicable technical standards have been met and a grant of this application will serve the public interest.

§2.925 Label

Each piece of equipment for which authorization will be granted will be uniquely identified with "FCC ID: B4Z-760A-EFOB" embossed on the back chassis and the required statement will appear in the installation instructions as permitted for small devices. See Exhibit A, PDF file *id_label.pdf*

§2.947 Measurement Procedure

a) The measurement procedure follows ANSI C63.4 procedure. Procedural notes are contained in the laboratory report.

d) A list of test equipment used is contained in the laboratory report.

§2.948 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 December 5, 1993 in a letter received from the FCC.

The address of the test facility is:
TUV Product Service
19035 Wild Mountain Road
Taylors Falls, MN 55084-1758

Phone: 651-638-0297
Contact: Joel Schneider
Test Engineer in Charge

See Exhibit F, PDF file *test_pho.pdf* for sketch of measurement setup

§2.1033 Application for Certification

a) Form 732 has been electronically filed on 6/15/99. Items which did not apply were left blank.

b) This technical report contains the following information where applicable

1) Full name and mailing address of manufacturer and applicant for certification:

Interactive Technologies Inc
2266 North Second Street
North Saint Paul, MN 55109

2) FCC Identifier:

B4Z-760A-EFOB

3) Copy of installation instructions:
   See Exhibit G, PDF file: *user_man.pdf*
4) Brief Description of circuit functions and device operation:
   See Exhibit I, PDF file *op_desc.pdf*
   See Exhibit D, PDF file *schemat.pdf* for schematics (page 1) and parts placement (page 2) diagrams.
5) Block Diagram
   See Exhibit C, PDF file *block.pdf*.
6) Report of the measurements of radiation and conducted emissions:
   This document.
7) Photographs
   External:
   See Exhibit B, PDF file *extern.pdf*
   Internal:
   See Exhibit H, PDF file in*tern.pdf*
8) Peripheral or Accessory devices:
   This is not applicable since this device is stand-a-lone product.
9) Transition Rules
   This application is not pursuant to the transition rules of §15.37
10) Emergency Broadcast decoding:
    This is not applicable to device in this application.
11) Application for direct sequence spread spectrum devices...
    This is not applicable to device in this application.
12) Application for scanning receivers...
    This is not applicable to device in this application.

c) Composite Systems
This is not applicable to device in this application.

3. Lab Measurements Discussion / Test Notes

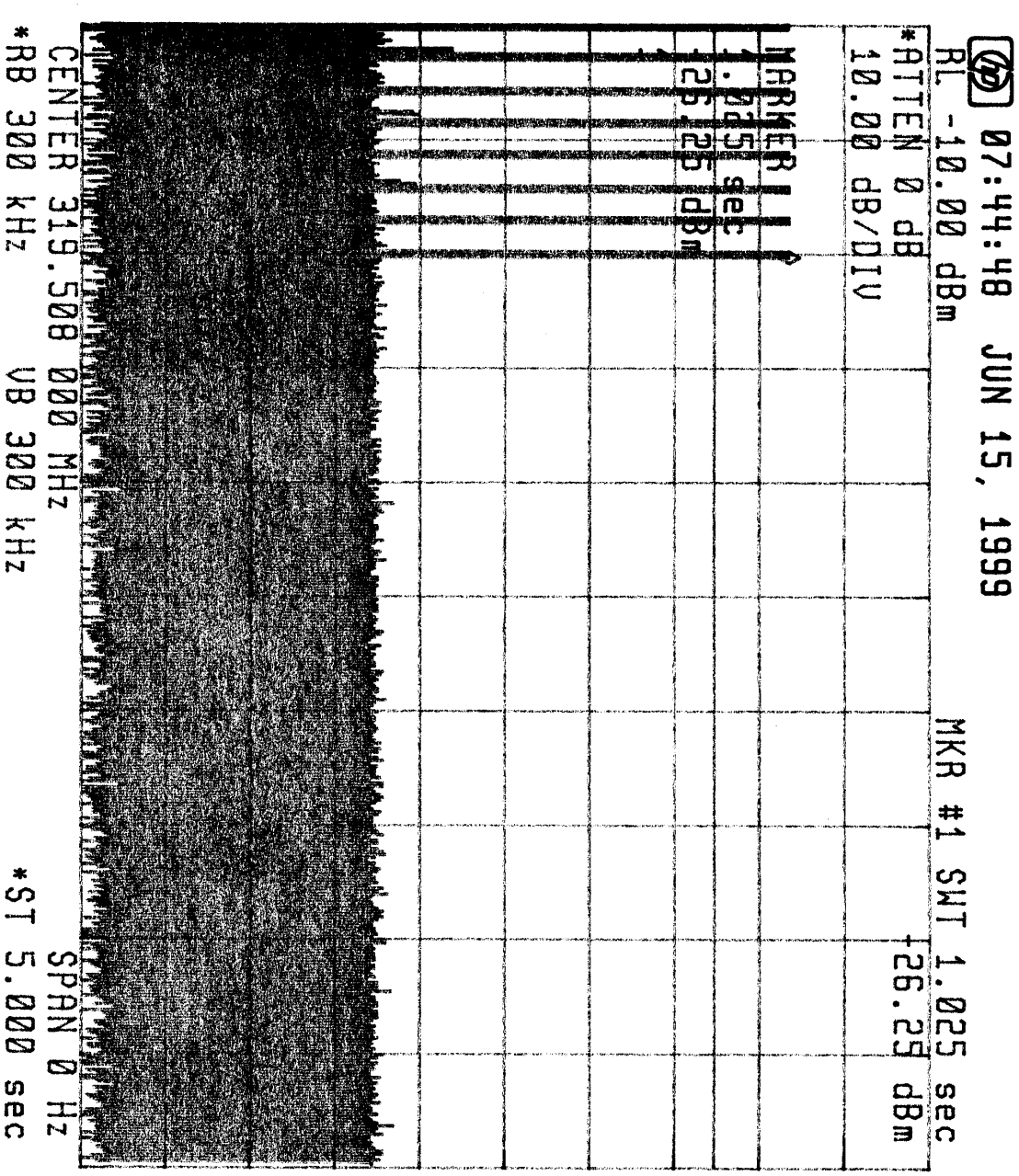
3.1 Test Notes

3.1.1 Transmissions shall cease within 5 seconds of activation [**§15.231(a)(2)**]

Typically two packets are sent when a key is depressed. In the case of a panic or emergency button press, 8 packets are sent in the transmission. The packet duration is 23.89 mS, see **Duty Cycle Correction Factor [§15.231(b)(2) and** §15.35(c)] The time between packets is about 120 mS so the length of the longest transmission is:

8*23.89mS + 7*120mS = 1.031 seconds.

The following plot shows an 8 packet transmission which concludes in 1.025 seconds.



B4Z-760A-EFOB

3.1.2 Supervisory Calculation [**§15.231(a)(3)**]

This device does not transmit supervisory signals

3.1.3 Duty Cycle Correction Factor [**§15.231(b)(2)** and **§15.35(c)**]

The transmitter employs amplitude modulation and transmits 80 bits. Each bit has an "ON" time of 122 μS. The total on time of a single packet is:

80 * 122 μS = 9.760 mS.

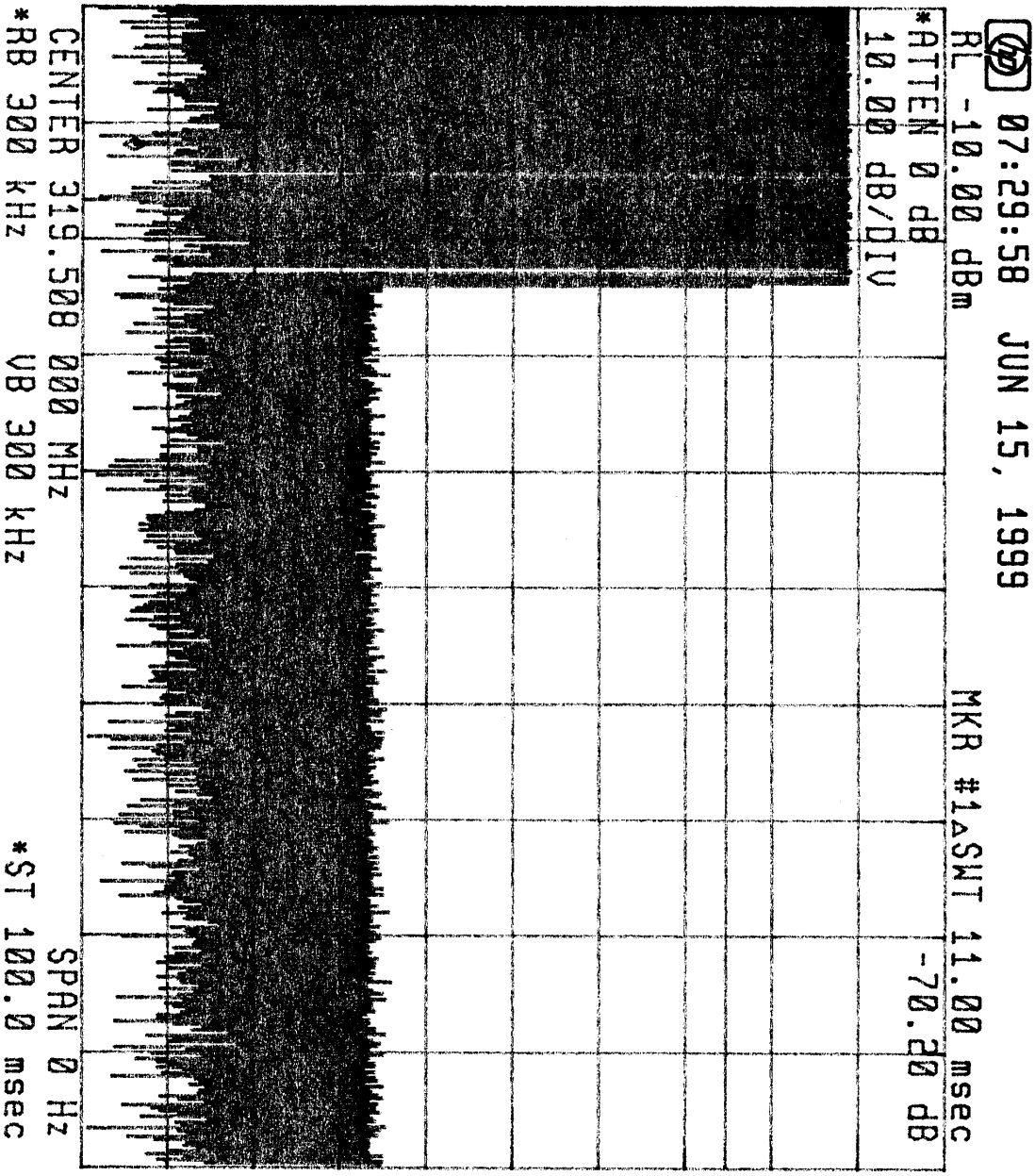
Only one packet is sent in any given 100 mS window for a duty cycle correction factor of:

20*LOG(9.76/100) = -20.21 dB

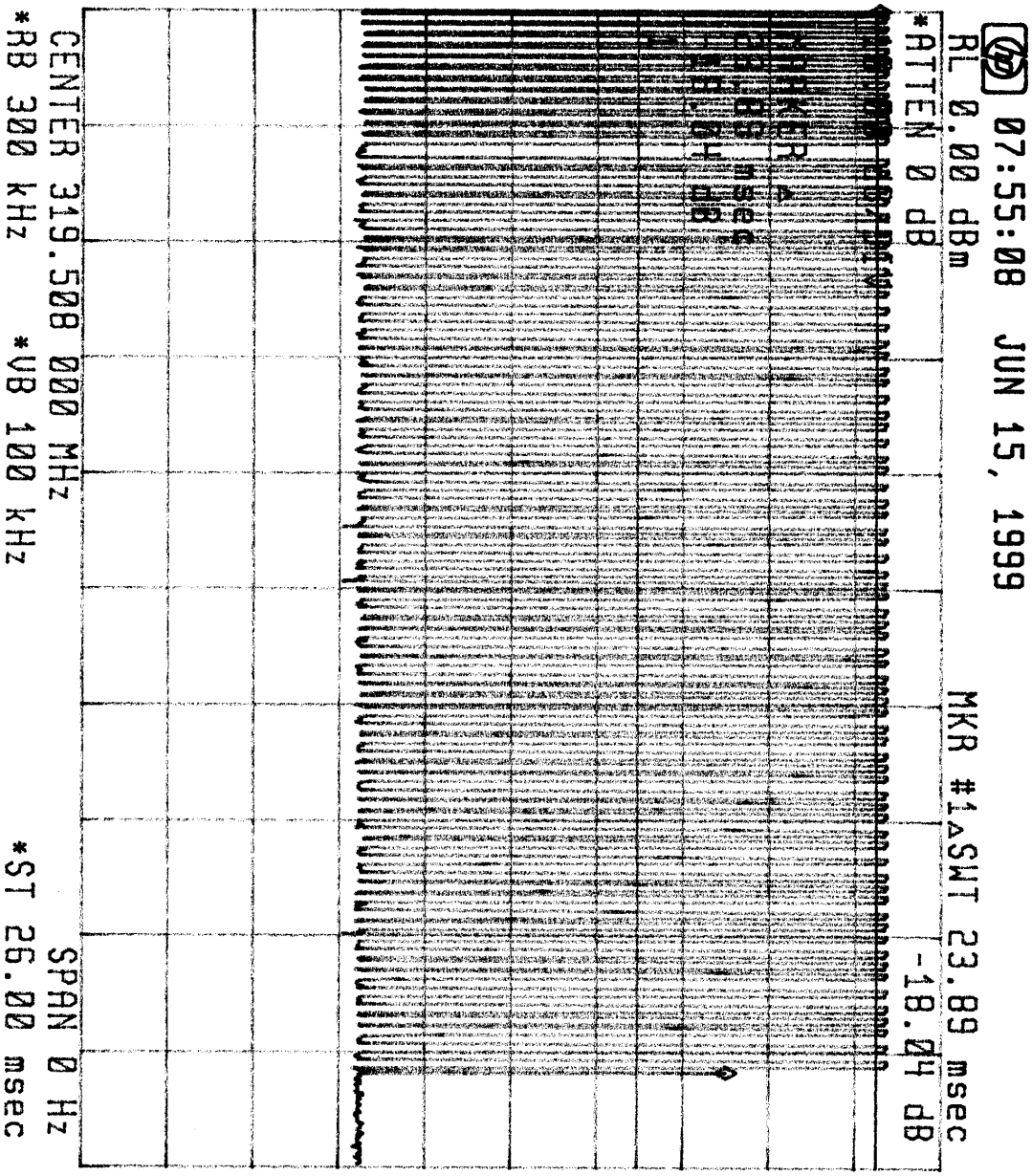
The maximum allowed correction factor is 20 dB.

The following plots show:

1. Single packet in 100 mS window.
2. Maximum Packet Duration of 23.89mS



B4Z-760A-EFOB



B4Z-760A-EFOB

Bandwidth Measurement [§15.231(c)]

Bandwidth Measurements were made in peak mode, using a Hewlett Packard Spectrum Analyzer, model number 70000.

The spectrum analyzer 20 dB skirt bandwidth is 1 KHz.

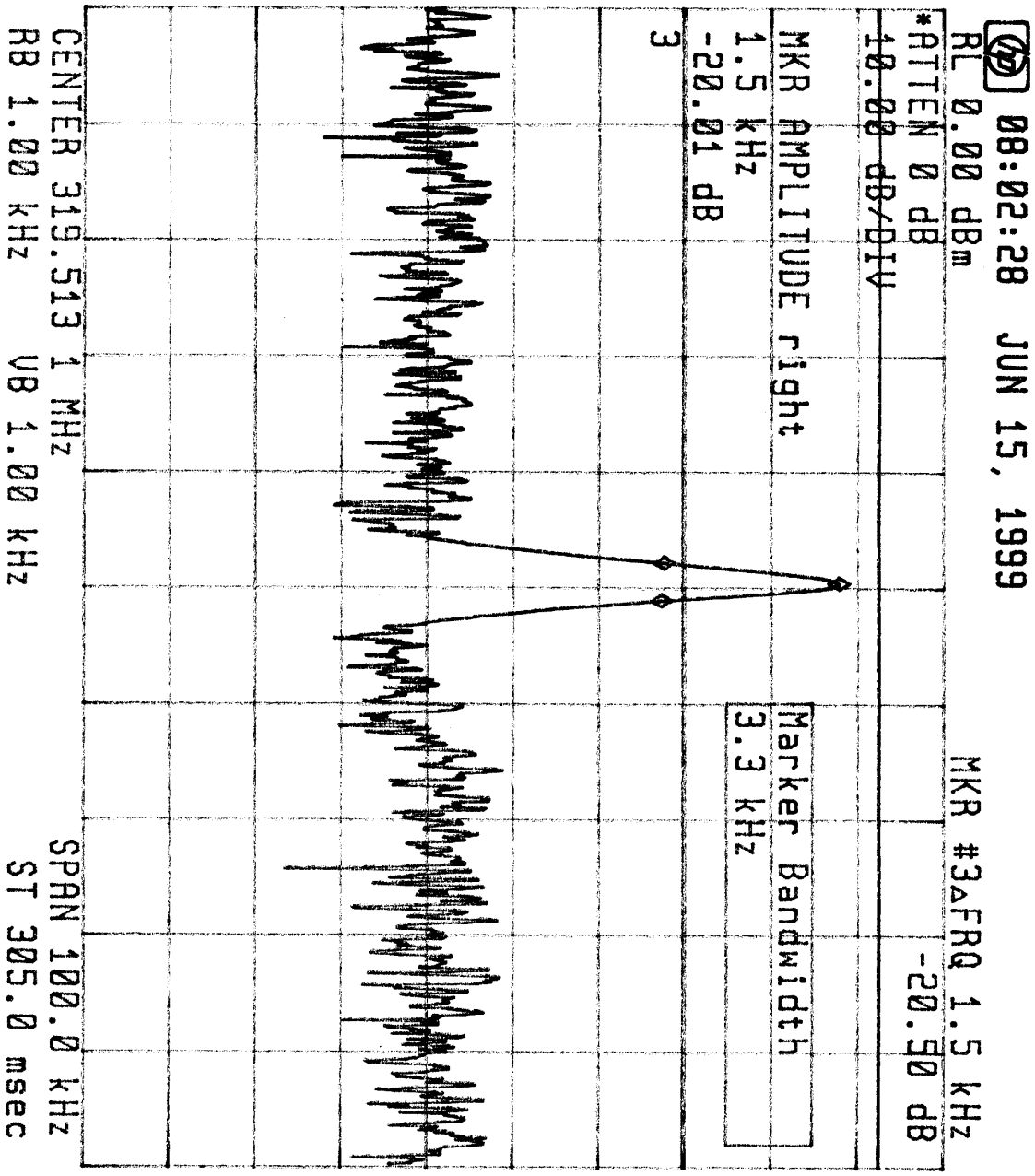
The allowed 20 dB bandwidth is 0.25% of center frequency.

Estimated signal bandwidth = Measured signal bandwidth - analyzer bandwidth.

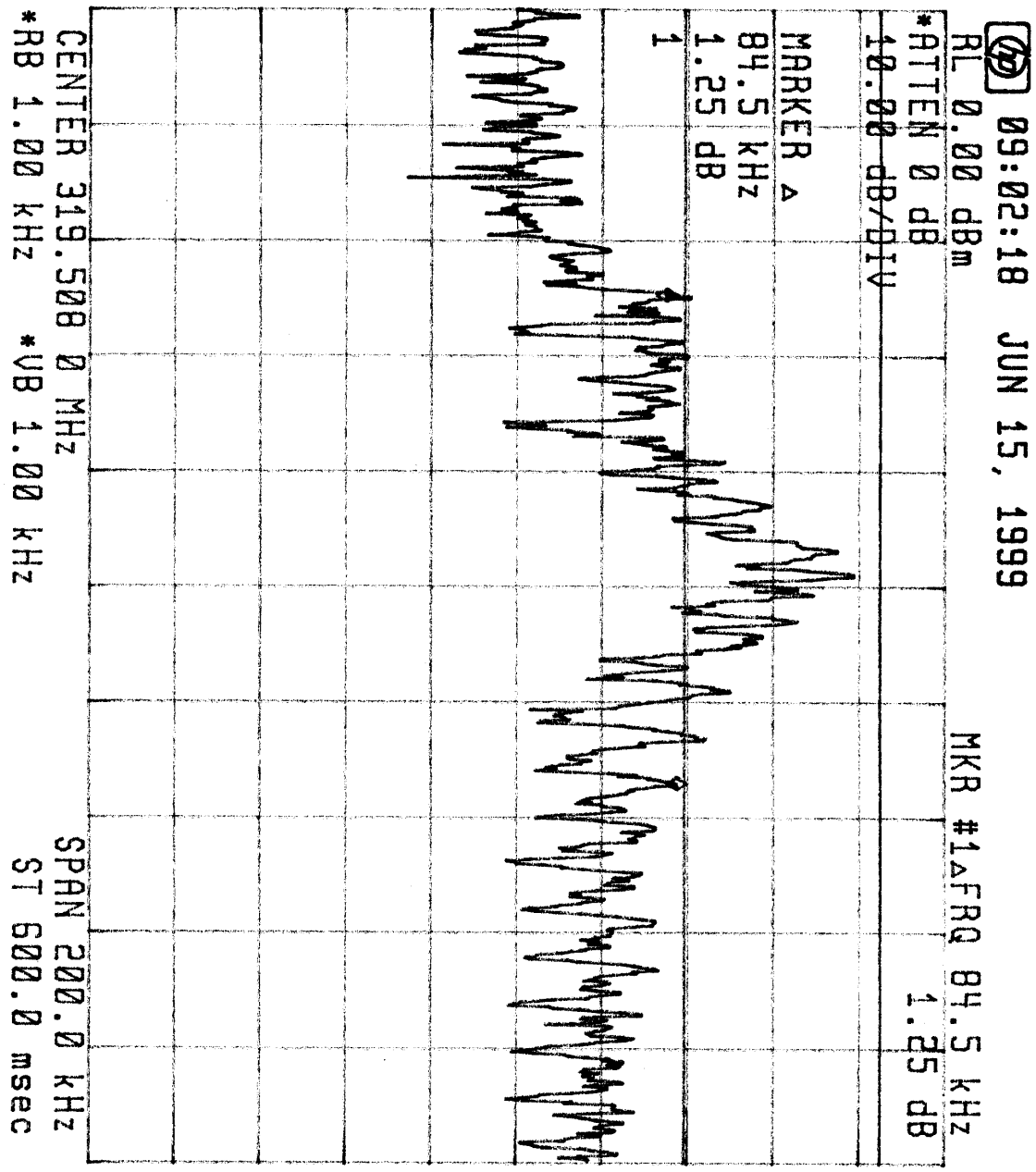
Center Frequency MHz	Measured 20 dB Bandwidth in KHz	Estimated 20 dB signal Bandwidth in KHz	FCC allowed 20 dB Bandwidth in KHz
319.5	84.5	83.5	799

The following three plots show:

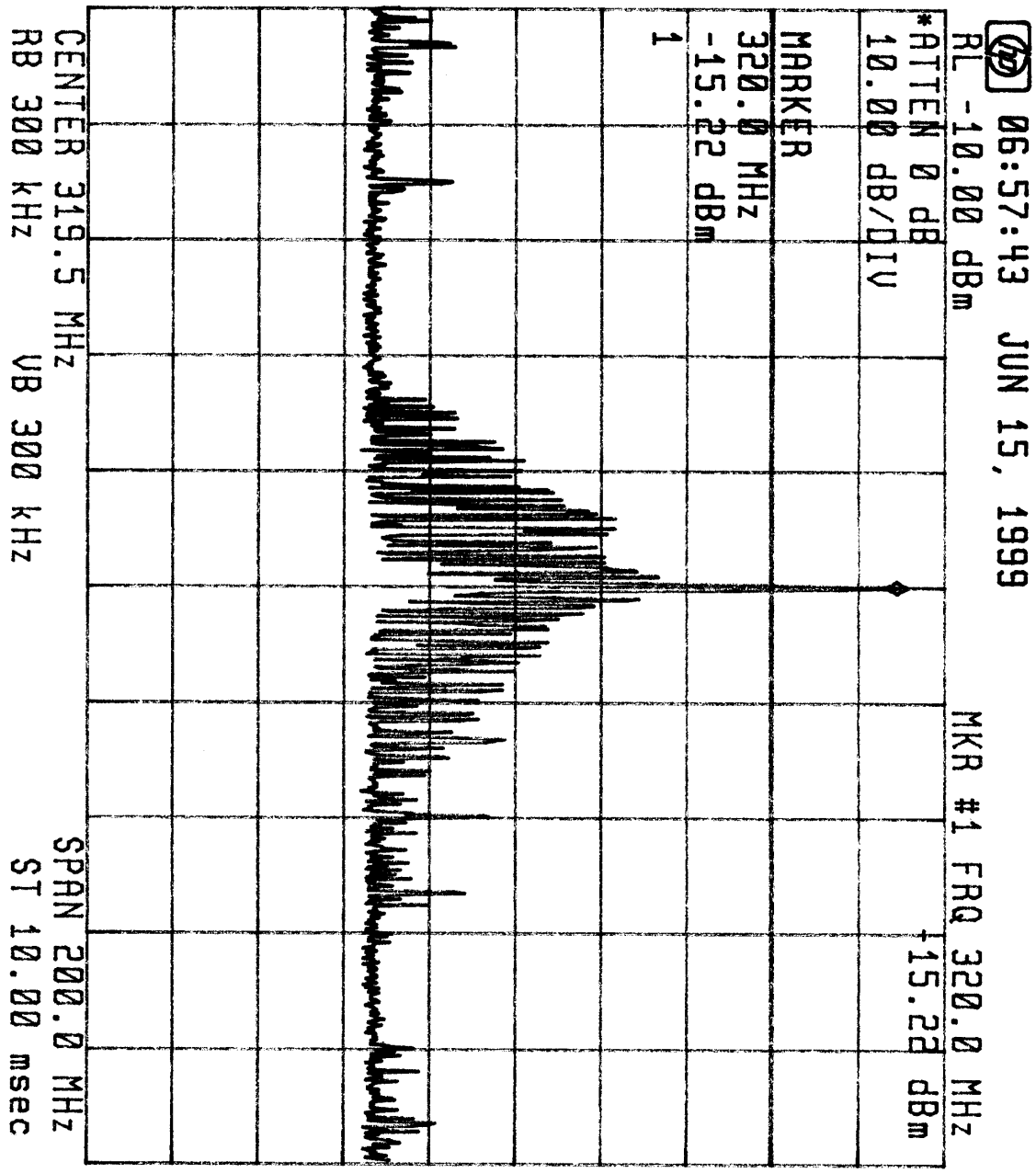
1. Bandwidth of carrier without modulation
2. Bandwidth of signal with modulation, 200 KHz span
3. Bandwidth of signal with modulation, 200 MHz span



B4Z-760A-EFOB



B4Z-760A-EFOB



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3.1.3.1 Radiated Emissions Summary

The ELM 4-Button Keychain touchpad passes FCC Rules Part 15, Subpart C, Paragraph 15.231. The highest fundamental radiated emission was 4.5 dB below the FCC limit at 319.5 MHz. The highest spurious emission measurement was 11.6 dB below the FCC limit at 852.03 MHz. The highest forbidden band emission was 15.6 dB below the FCC limit at 1704.1 MHz.

3.1.3.2 FCC Emissions Calculation

3.1.3.2.1 Terms

Term	Abbreviation	Units	Description
Analyzer Reading	AR	dBµV	The power reading read directly from the analyzer without any correction for cabling or receive antenna.
Duty Cycle Correction	DC	dB	Correction for averaging measurement, see **Duty Cycle Correction Factor [§15.231(b)(2) and** §15.35(c)]
Antenna Factor	AF	dB	Calibration factor for measurement antenna which converts from dBµV measured with antenna to the field strength received by the antenna in dBµV/M.
Cable Loss	CL	dB	Amount of power lost in cable (and connectors, if any) between antenna and analyzer

3.1.3.2.2 Example Calculation

AR = 70 dBµV
AF = 18.4 dB
CL = 4.1 dB
DC = 20 dB

The field strength for comparison to FCC limits is found to be:

AR + AF + CL -DC = 70 + 18.4 + 4.1 -20 = 72.5 dBµV/M

Alternatively, the AR + AF +CL is compared to the FCC limit + DC. This number is often written to the right of measurement data on the test results. For example, the FCC limit for ITI transmitters at 319.5 MHz is approximately 95.8 dBµV/M. The limit from

§15.231(b) with linear interpolation yields a limit, without consideration for duty cycle, of approximately 75.8 dBµV/M.

To convert to µV/M the following equation is used:

µV/M = INVLOG(dBµV/M / 20)

For the above example, 72.5 dBµV/M is 4,216.965µV/M

3.1.3.3 Radiated Emissions

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 0.009 MHz to the tenth harmonic were measured as per FCC Rules Part 15, Subpart C, Paragraph 15.33(a). Emission limits were derived from §15.231(b).

Frequency	Analyzer Reading	Duty Cycle Correction	Antenna Factor	Cable Loss	Field Strength	Field Strength	FCC Limit
MHz	dBuV	dB	dB	dB	dBuV/M	uV/M	uV/M
319.46	74.15	20	15.5	1.6	71.25	3,652	6,229
426.01	42.90	20	17.0	1.9	41.80	123	623
852.03	38.50	20	22.9	2.9	44.30	164	623
958.53	35.15	20	24.5	3.1	42.75	137	623

3.1.3.4 Forbidden Bands

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

All measurements were taken with an HP 8566B Spectrum Analyzer. The bandwidth was 100 KHz for measurements below 1000 MHz. The bandwidth was 1 MHz for measurements above 1000 MHz. The video filter was off.
The noise floor measurements are summarized in the table below. See also the test data included in this report.

Frequency Range									
Low Limit	High Limit	Noise Floor Reading	Duty Cycle Corr	Ant Factor	Cable Loss	Field Strength	Field Strength	FCC Limit @ 3M	FCC Limit @ 1M
MHz	MHz	dBuV	dB	dB	dB	dBuV/M	uV/M	uV/M	uV/M
0.09000	0.11000	N/A	20	N/A	N/A	N/A	N/A	2400/F	
0.49500	0.50500	N/A	20	N/A	N/A	N/A	N/A	2400/F	
2.13750	2.19050	N/A	20	N/A	N/A	N/A	N/A	30	90
4.12500	4.12800	N/A	20	N/A	N/A	N/A	N/A	30	90
4.17725	4.17775	N/A	20	N/A	N/A	N/A	N/A	30	90
4.20725	4.20775	N/A	20	N/A	N/A	N/A	N/A	30	90
6.21500	6.21800	N/A	20	N/A	N/A	N/A	N/A	30	90
6.26775	6.26825	N/A	20	N/A	N/A	N/A	N/A	30	90
6.31175	6.31225	N/A	20	N/A	N/A	N/A	N/A	30	90
8.29100	8.29400	N/A	20	N/A	N/A	N/A	N/A	30	90
8.36200	8.36600	N/A	20	N/A	N/A	N/A	N/A	30	90
8.37625	8.38675	N/A	20	N/A	N/A	N/A	N/A	30	90
8.41425	8.41475	N/A	20	N/A	N/A	N/A	N/A	30	90
12.29000	12.29300	N/A	20	N/A	N/A	N/A	N/A	30	90
12.51975	12.52025	N/A	20	N/A	N/A	N/A	N/A	30	90
12.57675	12.57725	N/A	20	N/A	N/A	N/A	N/A	30	90
13.36000	13.41000	N/A	20	N/A	N/A	N/A	N/A	30	90
16.42000	16.42300	N/A	20	N/A	N/A	N/A	N/A	30	90
16.69475	16.69525	N/A	20	N/A	N/A	N/A	N/A	30	90
16.80425	16.80475	N/A	20	N/A	N/A	N/A	N/A	30	90
25.50000	25.67000	N/A	20	N/A	N/A	N/A	N/A	30	90
37.50000	38.25000	2.85	20	9.5	0.9	-6.8	0.5	100	300
73.00000	74.60000	2.85	20	9.5	0.9	-6.8	0.5	100	300
74.80000	75.20000	2.85	20	9.5	0.9	-6.8	0.5	100	300
108.00000	121.94000	2.85	20	9.5	0.9	-6.8	0.5	150	450
123.00000	138.00000	2.85	20	9.5	0.9	-6.8	0.5	150	450
149.90000	150.05000	2.85	20	9.5	0.9	-6.8	0.5	150	450
156.52475	156.52525	2.85	20	9.5	0.9	-6.8	0.5	150	450
156.70000	156.90000	2.85	20	9.5	0.9	-6.8	0.5	150	450
162.01250	167.17000	2.85	20	9.5	0.9	-6.8	0.5	150	450
167.72000	173.20000	2.85	20	9.5	0.9	-6.8	0.5	150	450
240.0	285.0	2.15	20	12.9	1.4	-3.6	0.7	200	600
322.0	335.4	2.15	20	12.9	1.4	-3.6	0.7	200	600
399.9	410.0	2.70	20	21.7	2.7	7.1	2.3	200	600
608.0	614.0	2.70	20	21.7	2.7	7.1	2.3	200	600
960.0	1240.0	2.75	20	25.1	3.1	11.0	3.5	500	1500
1300.0	1427.0	2.75	20	25.1	3.1	11.0	3.5	500	1500
1435.0	1626.5	2.75	20	25.1	3.1	11.0	3.5	500	1500
1645.5	1646.5	2.75	20	25.1	3.1	11.0	3.5	500	1500
1660.0	1710.0	2.75	20	25.1	3.1	11.0	3.5	500	1500
1718.8	1722.2	2.75	20	25.1	3.1	11.0	3.5	500	1500
2200.0	2300.0	4.95	20	29.4	4.7	19.1	9.0	500	1500
2310.0	2390.0	4.95	20	29.4	4.7	19.1	9.0	500	1500
2483.5	2500.0	4.95	20	29.4	4.7	19.1	9.0	500	1500
2655.0	2900.0	5.85	20	30.1	5.3	21.3	11.5	500	1500
3260.0	3267.0	5.00	20	31.2	5.9	22.1	12.7	500	1500
3332.0	3339.0	5.00	20	31.2	5.9	22.1	12.7	500	1500
3345.8	3358.0	5.00	20	31.2	5.9	22.1	12.7	500	1500
3600.0	4400.0	5.00	20	31.2	5.9	22.1	12.7	500	1500

The test data follows on the next 4 pages:

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
ENCRYPTED FOB TRANSMITTER
Notes:

Report W9297 Run 2
Date 06/11/99 Page 1
Engineer _____
Tech: RMJ _____
Requester HH

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height		Delta	Delta
ALL READINGS MAXIMIZED IN PEAK.									
319.46	61.55	15.5	1.6	78.7	--	V	--	75.8 assuming 20dB relaxation LIMIT	
319.46	74.15	15.5	1.6	91.3	--	H	--	95.8	
426.01	42.9	17	1.9	61.8	--	H	--	75.8	
532.51	29.15	18.9	2.2	50.2	--	H	--		
639.01	30.95	20.5	2.4	53.9	--	H	--		
745.51	31.85	21.7	2.7	56.2	--	H	--		
852.03	38.5	22.9	2.9	64.2	--	H	--		
958.53	35.15	24.5	3.1	62.7	--	H	--		
NOISE FLOOR MEASUREMENT.									
250	2.15	12.9	1.4	16.5	--	H	--		
400	2.8	16.5	1.9	21.2	--	H	--		
750	2.7	21.7	2.7	27.1	--	H	--		
1000	2.75	25.1	3.1	31	--	H	--		
1065.0	15.15	24.7	3.3	43.1	--	H	--	74	
1171.6	19	25.2	3.4	47.6	--	H	--		
1278.1	24.05	25.7	3.6	53.3	--	H	--	75.8	
1384.6	26.9	26.2	3.8	56.8	--	H	--	74	
1491.1	14.05	26.7	3.9	44.7	--	H	--		
1597.6	23.95	27.2	4.1	55.3	--	H	--		
1704.1	26.3	27.8	4.3	58.4	--	H	--		
1810.6	12.2	28.4	4.4	45	--	H	--	75.8	
1917.1	18.15	29	4.5	51.6	--	H	--		

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
ENCRYPTED FOB TRANSMITTER
Notes:

Report W9297 Run 2
Date 06/11/99 Page 2
Engineer _____
Tech: RMJ
Requester

Frequency MHz	Level dBuV	Factor dB	Cable dB	Final dBuV/m	Az deg	Polar\ Height		Delta	Delta
2023.6	11.8	29.4	4.7	45.9	--	H	--		
2130.1	10.25	29.6	4.8	44.7	--	H	--		
2236.6	10.15	29.7	5	44.8	--	H	--		
2343.1	6.6	29.9	5.1	41.6	--	H	--		
2449.6	6.8	30	5.2	42	--	H	--		
2556.1	5.9	30.2	5.3	41.5	--	H	--		
2662.6	6.85	30.5	5.5	42.8	--	H	--		
2769.1	5.7	30.7	5.6	42	--	H	--		
2875.6	6.4	30.9	5.7	43	--	H	--		
2982.1	6.45	31.2	5.8	43.4	--	H	--		
3088.6	5.35	31.7	5.9	43	--	H	--		
3195.1	4.8	32.2	6.1	43.1	--	H	--		
NOISE FLOOR MEASUREMENTS.									
2000	4.95	29.4	4.7	39	--	H	--		
2500	5.85	30.1	5.3	41.2	--	H	--		
3000	5	31.2	5.9	42.1	--	H	--		
106.50	25.3	9.3	.9	35.5	--	H	--		
NOISE FLOOR MEASUREMENT.									
108.36	2.85	9.5	.9	13.2	--	H	--		

END OF SCAN.

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
ENCRYPTED FOB TRANSMITTER
Notes:

Figure____

Report W9297 Run 2
Date 06/11/99 Page 3
Engineer _____
Tech: RMJ_____
Requester_____

Measurement Summary

Frequency MHz	Final dBuV/m	Final uV/m	Azimuth deg	Polar\ Height	Delta	Delta
106.50	35.5	59.566	--	H --		
108.36	13.2	4.5708	--	H --		
250	16.5	6.6834	--	H --		
319.46	91.3	36728.	--	H --	Fundamental	
400	21.2	11.481	--	H --		
426.01	61.8	1230.2	--	H --		
532.51	50.2	323.59	--	H --		
639.01	53.9	495.45	--	H --		
745.51	56.2	645.65	--	H --		
750	27.1	22.646	--	H --		
852.03	64.2	1621.8	--	H --		
958.53	62.7	1364.5	--	H --		
1000	31	35.481	--	H --		
F 1065.0	43.1	142.88	--	H --		
F 1171.6	47.6	239.88	--	H --		
1278.1	53.3	462.38	--	H --		
F 1384.6	56.8	691.83	--	H --		
F 1491.1	44.7	171.79	--	H --		
F 1597.6	55.3	582.10	--	H --		
F 1704.1	58.4	831.76	--	H --		
1810.6	45	177.82	--	H --		
1917.1	51.6	380.18	--	H --		
2000	39	89.125	--	H --		
2023.6	45.9	197.24	--	H --		
2130.1	44.7	171.79	--	H --		
F 2236.6	44.8	173.78	--	H --		
F 2343.1	41.6	120.22	--	H --		
2449.6	42	125.89	--	H --		
2500	41.2	114.81	--	H --		
2556.1	41.5	118.85	--	H --		
F 2662.6	42.8	138.03	--	H --		
F 2769.1	42	125.89	--	H --		
F 2875.6	43	141.25	--	H --		
2982.1	43.4	147.91	--	H --		
3000	42.1	127.35	--	H --		
3088.6	43	141.25	--	H --		
3195.1	43.1	142.88	--	H --		

File W9297 Run 2

TUV PRODUCT SERVICE

EMC SERVICE ORDER

Wild River Lab
18333 Wild Mountain Rd
Taylors Falls MN 55084-1786
Phone no: 651 638 0297
Fax: 651 638 0298

Acknowledgement Copy - Invoice to follow

Project Number: WC1G829701

Customer P.O. Number: BPO 80306

Page 1 of 1 P.O. Amt:

Bill To: INT04

Accounts Payable
Interactive Technologies Inc
2266 North 2nd Street
N. St Paul MN 55109

Contact: 612 779 2690 Ext.

Gray Greg
Interactive Technologies Inc
2266 N 2nd St
N St Paul MN 55109-2900

EUT:

PLEASE FILL-IN EQUIPMENT TESTED

CONDUCTED EXPENSES

Condition of Equipment upon Receipt:

☒ Equipment appears to be in good working condition

☐ Equipment appears to be abnormal

Date Equip Rec:

Description of Abnormalities

Date	Site/Shift	Description of test	Start/Stop/Lunch	Qty	UOM	Unit Price	Contract Disc	Total
6/11/99	LTS-1	Intentional Radiator:		2	block	$1,000.00	$0.00	2000.00
6/11/99	LTS-1	Report: W9297 To Be Inv When Done		2	each	$400.00	$0.00	

Total: 2000.00

Customer's Acknowledgement: date: 6/11/99

TUV's Acknowledgement: date: 6/11/99