



FCC Certification Test Report
for
Pelican Accessories
07X-SW-2

December 16, 2002

Prepared for:

Pelican Accessories
1840 East 27th Street
Vernon, CA 90058

Prepared By:

Washington Laboratories, Ltd.
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Gaithersburg, Maryland 20879



FCC Certification Test Program

FCC Certification Test Report for the Pelican Accessories D2028H (PL651) PS2 Wireless Controller Host (“Dongle”) 07X-SW-2

December 16, 2002

WLL JOB# 7300

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Abstract

This report has been prepared on behalf of Pelican Accessories to support the attached Application for Equipment Authorization. The test report and application are submitted for a Intentional Radiator under Part 15.249 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Pelican Accessories D2028H (PL651) PS2 Wireless Controller Host (“Dongle”).

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Pelican Accessories D2028H (PL651) PS2 Wireless Controller Host (“Dongle”) complies with the limits for a Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The Pelican Accessories D2028H (PL651) PS2 Wireless Controller Host (“Dongle”) complies with the limits for an Intentional Radiator device under Part 15.249 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated and conducted emissions were performed. All measurements were performed according to the 1992 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer: Pelican Accessories
1840 East 27th Street
Vernon, CA 90058

Quotation Number: 60403

1.4 Test Dates

Testing was performed from October 2, 2002 to October 28, 2002.

1.5 Test and Support Personnel

Washington Laboratories, LTD

James Ritter

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
amb	Ambient emissions
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
cm	centimeter
CW	Continuous Wave
dB	decibel
dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
k	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
m	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The Pelican Accessories D2028H (PL651) PS2 Wireless Controller Host (“Dongle”) is part of the wireless controller system for the Sony™ PlayStation 2® video game system. The D2028H (PL651) is installed at the game controller port, and transmits and receives play commands to/from the Pelican system to the D2028P controller pad (separate certification).

The D2028H (PL651) Host is only transmits “Rumble” data to the controller pad when initiated by the game play. Main use of the D2028H (PL651) Host is for receiving commands from the controller pad for game play. For this reason the D2028H (PL651) Host is referred to as only a receiver in the user’s manual.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Pelican Accessories
FCC ID Number	07X-SW-2
EUT Name:	PS2 Wireless Controller Host (“Dongle”)
Model:	D2028H (PL651)
FCC Rule Parts:	§15.249
Frequency Range:	906 MHz to 926.5 MHz: CH1 ~906M, CH2 ~926.5M, CH3 ~920M and CH4 ~913MHz
Maximum Output Power:	<1 mW
Modulation:	FSK
Bandwidth:	322 kHz
Keying:	Automatic
Type of Information:	Control
Number of Channels:	4
Power Output Level	Fixed
Antenna Type	Fixed/Integral
Interface Cables:	None
Power Source & Voltage:	120Vac from the video game console

2.2 Test Configuration

The D2028H (PL651) was configured with a Sony PlayStation 2 game console, a television set, and a Pelican D2028P wireless controller pad (separate certification).

2.3 Testing Algorithm

The D2028H (PL651) was setup to continuously transmit rumble data. This is different than in normal use since the game will only occasionally call for rumble data to be transmitted.

Worst case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Land Mobile FM or PM Communications Equipment Measurement and Performance Standards (ANSI/TIA/EIA-603-93)

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ± 2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5 (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Manufacturer & Model	Description	Serial Number	Property Number	Calibration Due Date
A.H. Systems SAS-200/518	Log Periodic Antenna	117	00001	3/1/03
Antenna Research Associates DRG-118/A	Horn Antenna	1010	00004	10/20/03
Antenna Research Associates LPB-2520	Biconilog Antenna Site 2	1044	00007	6/19/03
Hewlett Packard 8449B	Pre-Amplifier	3008A00729	00066	1/31/03
Hewlett Packard 8564E	Spectrum Analyzer	3643A00657	00067	4/18/03
Hewlett Packard 85650A	Q.P. Adapter (Site 2)	2811A01283	00068	7/05/03
Hewlett Packard 85685A	RF Preselector (Site 2)	3221A01395	00071	5/17/03
Hewlett Packard 8568B	Spectrum Analyzer (Site 2)	2928A04750	00072	7/03/03
Solar Electronics 8012-50-R-24-BNC	LISN	8379493	00124	7/05/03

4 Test Results

4.1 Duty Cycle Correction

Measurements may be adjusted where pulsed RF is utilized to find the average level associated with a quantity. This calculation is applied to limits for pulsed licensed and unlicensed devices.

On time = $N_1L_1 + N_2L_2 + \dots + N_{N-1}L_{N-1} + N_NL_N$, where N_1 is number of type 1 pulses, L_1 is length of type 1 pulses, etc.

- For Licensed Transmitters basic formula can be stated as $20\log[\text{Duty Cycle}]$
- For Unlicensed Intentional Radiators under 47CFR Part 15, all duty cycle measurements compared to a 100 millisecond period
- i.e. duty cycle = on time/100 milliseconds or period, whichever is less
- Restating the basic formula:
 - o Duty cycle = $(N_1L_1 + N_2L_2 + \dots + N_{N-1}L_{N-1} + N_NL_N)/100$ or T, whichever is less

Where T is the period of the pulse train.

The following Figures show the plots of the modulated carrier. The spectrum analyzer was set to Zero Span and the video triggered to collect the pulse train of the modulation. Calculations of the duty cycle correction factor were obtained from time data provided by the plots.

To obtain the maximum possible repetition rate of transmit for the Dongle, it was necessary to have the Controller Pad nearby communicating to the Dongle. This situation caused the emissions from the controller pad to appear in the plots for the duty cycle.

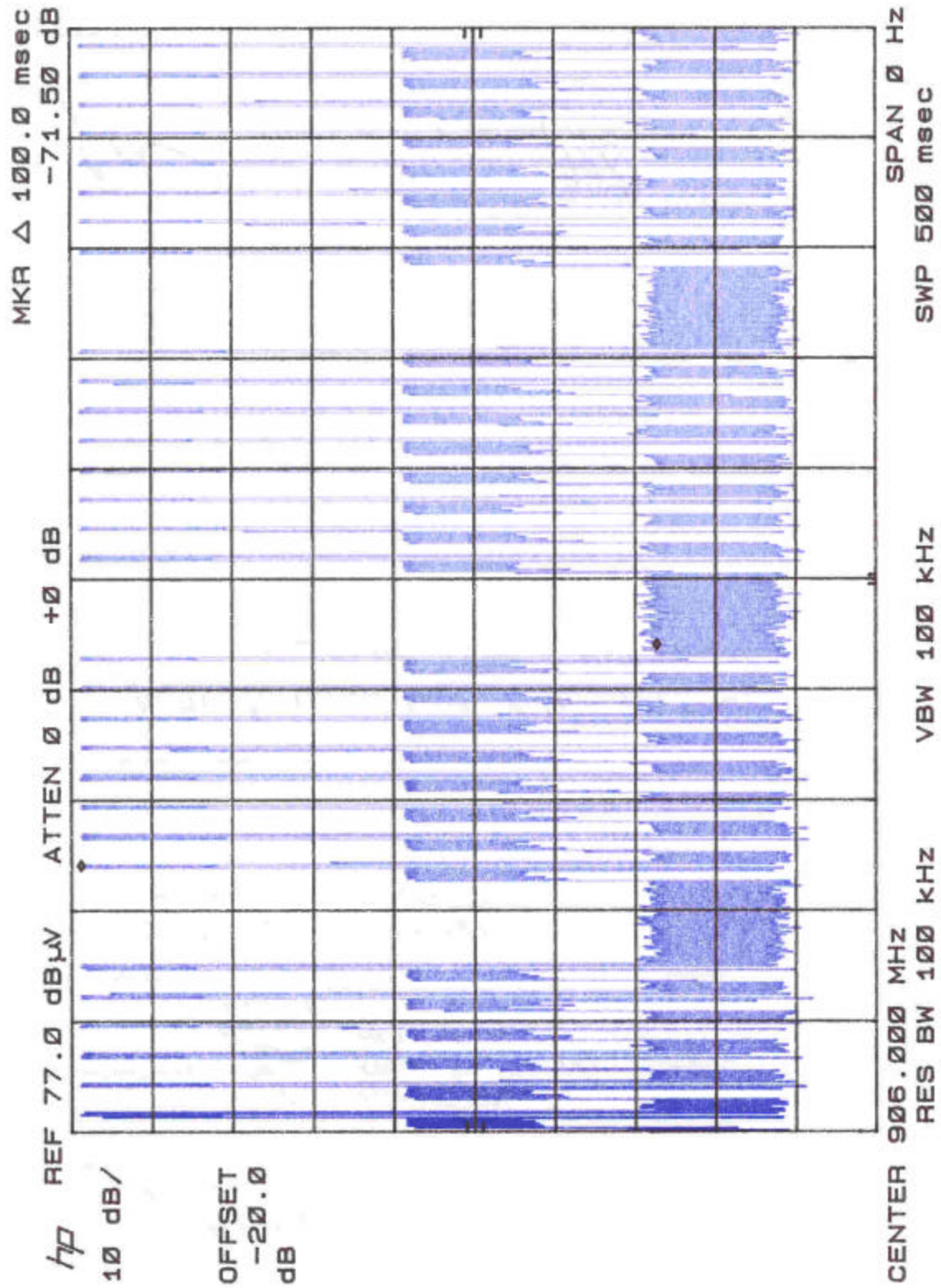


Figure 1. Worst Case Pulse Repetition Rate

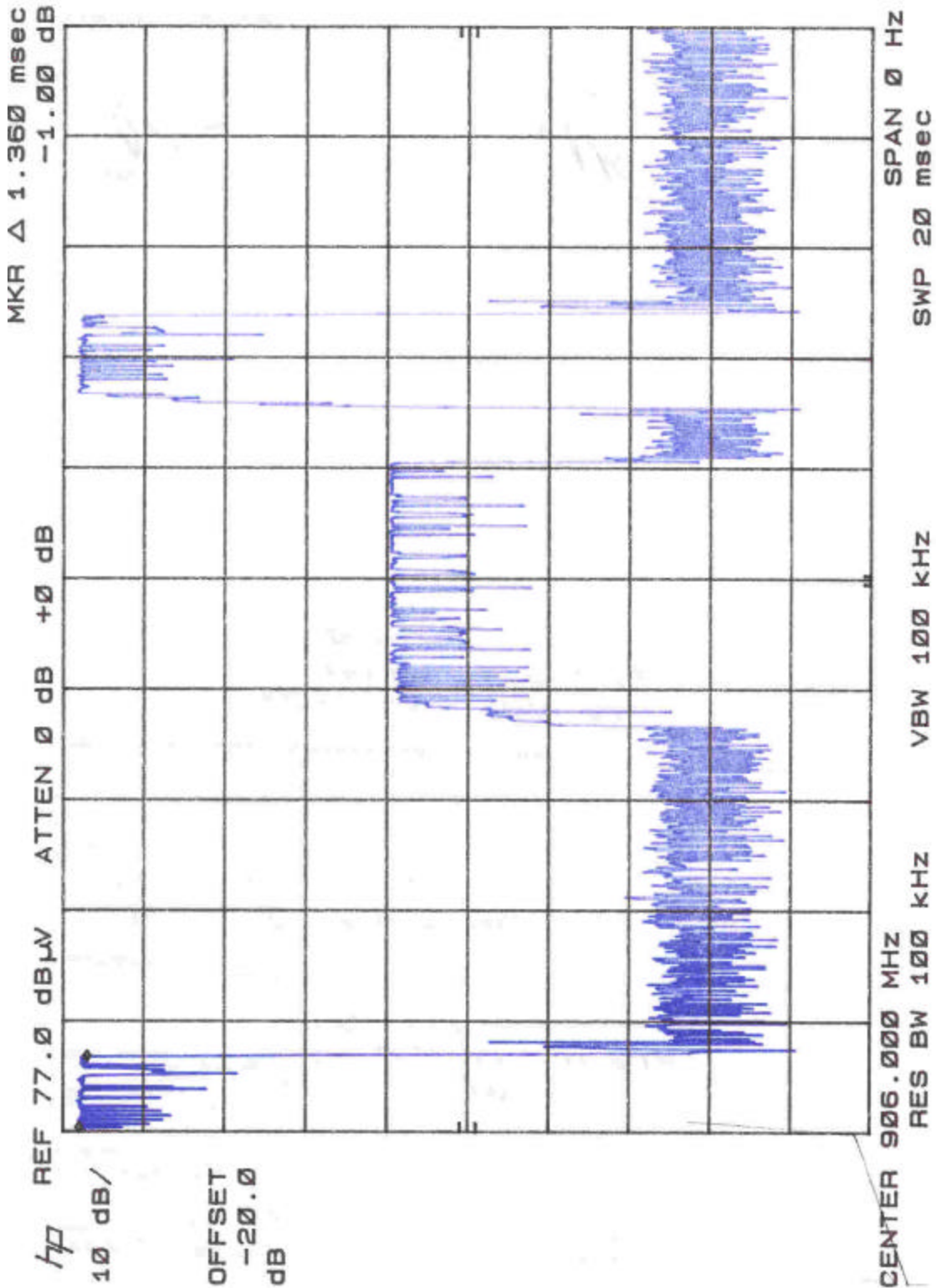


Figure 2. Duty Cycle Plot, Pulse Width

(Note: Lower level pulse is from nearby controller pad)

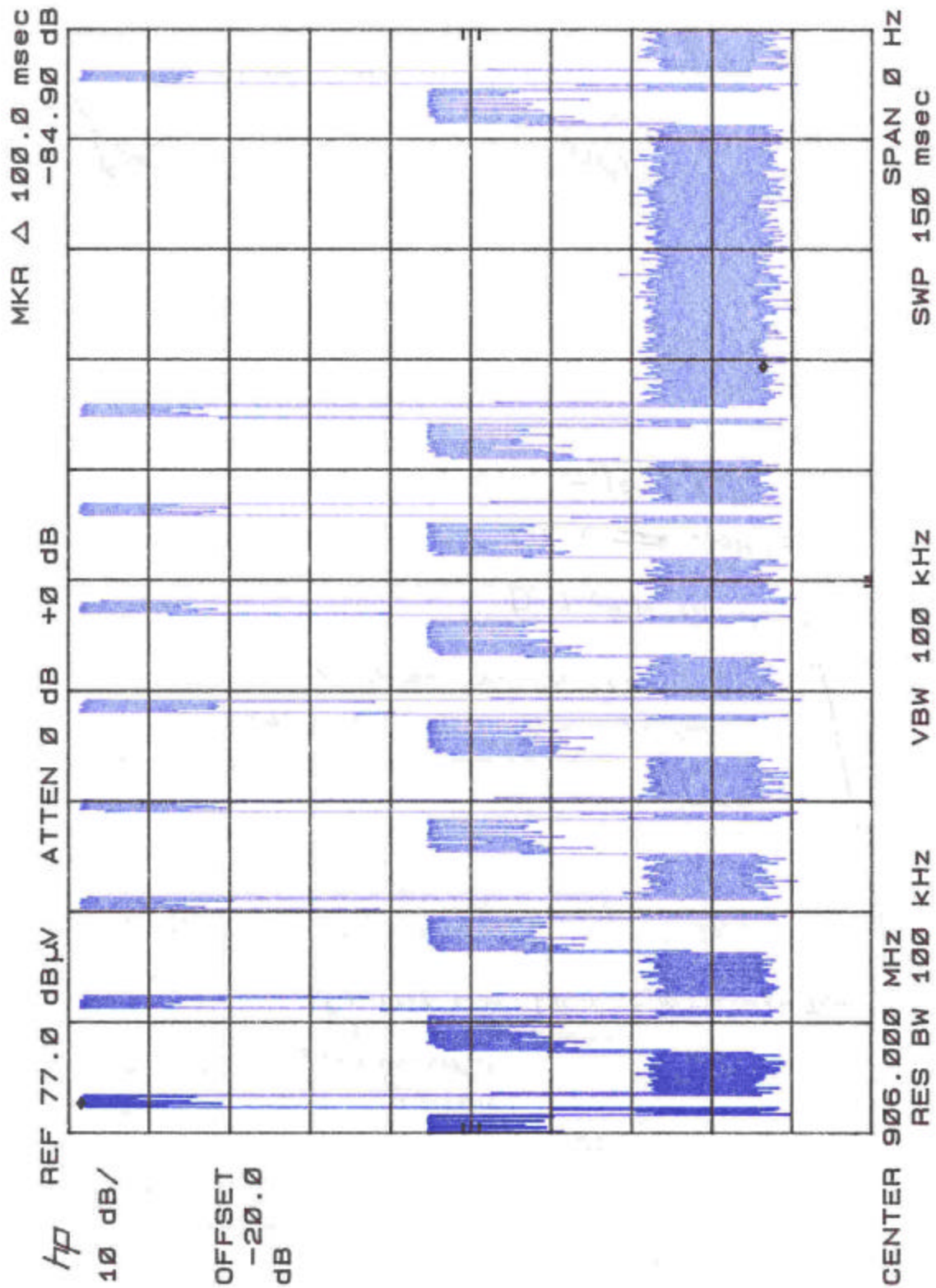


Figure 3. Duty Cycle Plot, Worst Case 100ms

From the data in Figure 1 through Figure 3, the following calculations are made.

On Time Per 100ms:

$$8 \times 1.36\text{ms} = 10.88\text{ms}$$

Duty cycle calculation:

$$10.88\text{ms}/100\text{ms} = 10.88\% \text{ on time} = -19.3\text{dB duty cycle correction}$$

4.2 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer.

At full modulation, the occupied bandwidth was measured for a low, middle and high channel as shown in Figures 1 through 3:

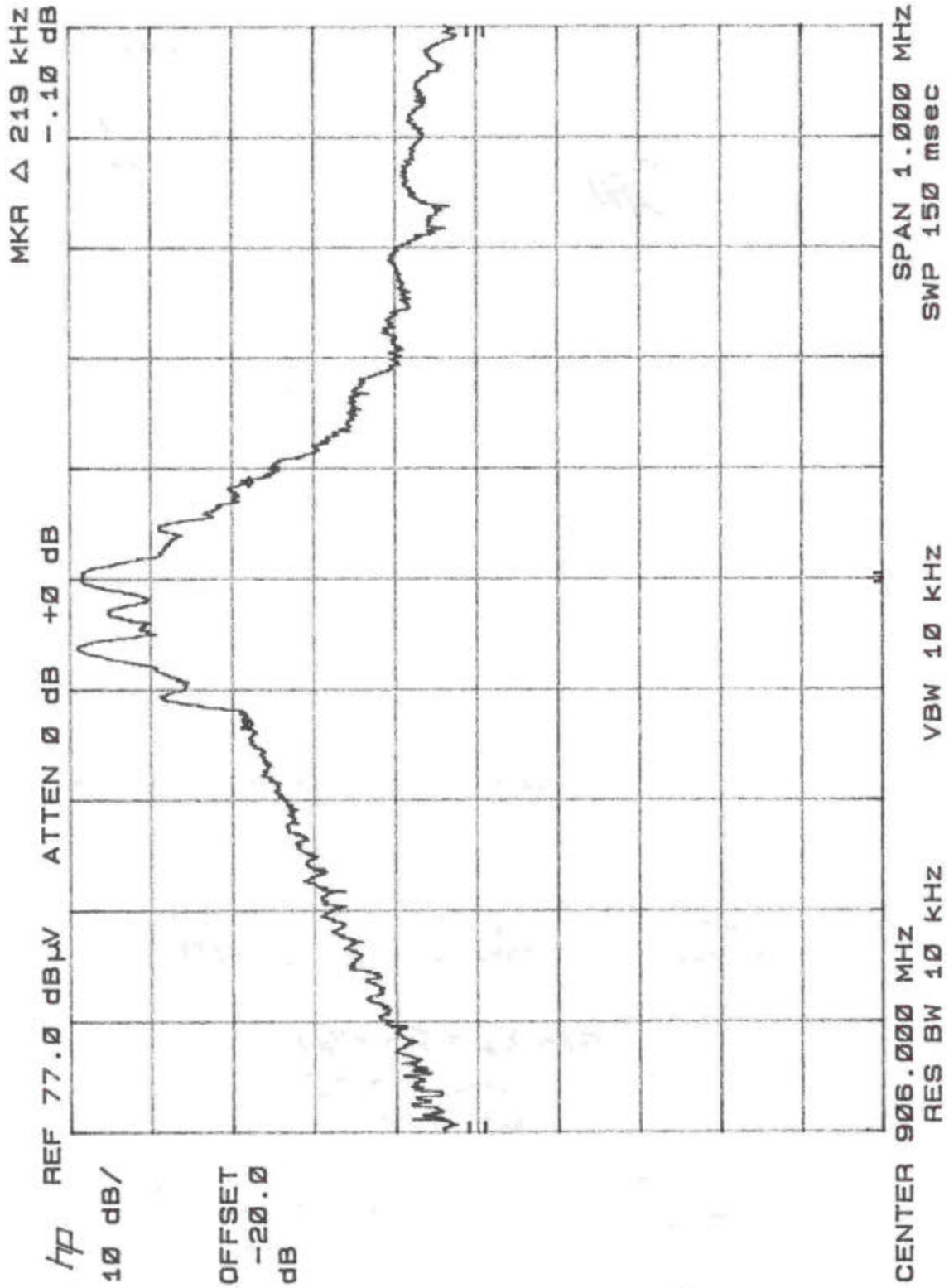


Figure 4. Occupied Bandwidth, Channel 1

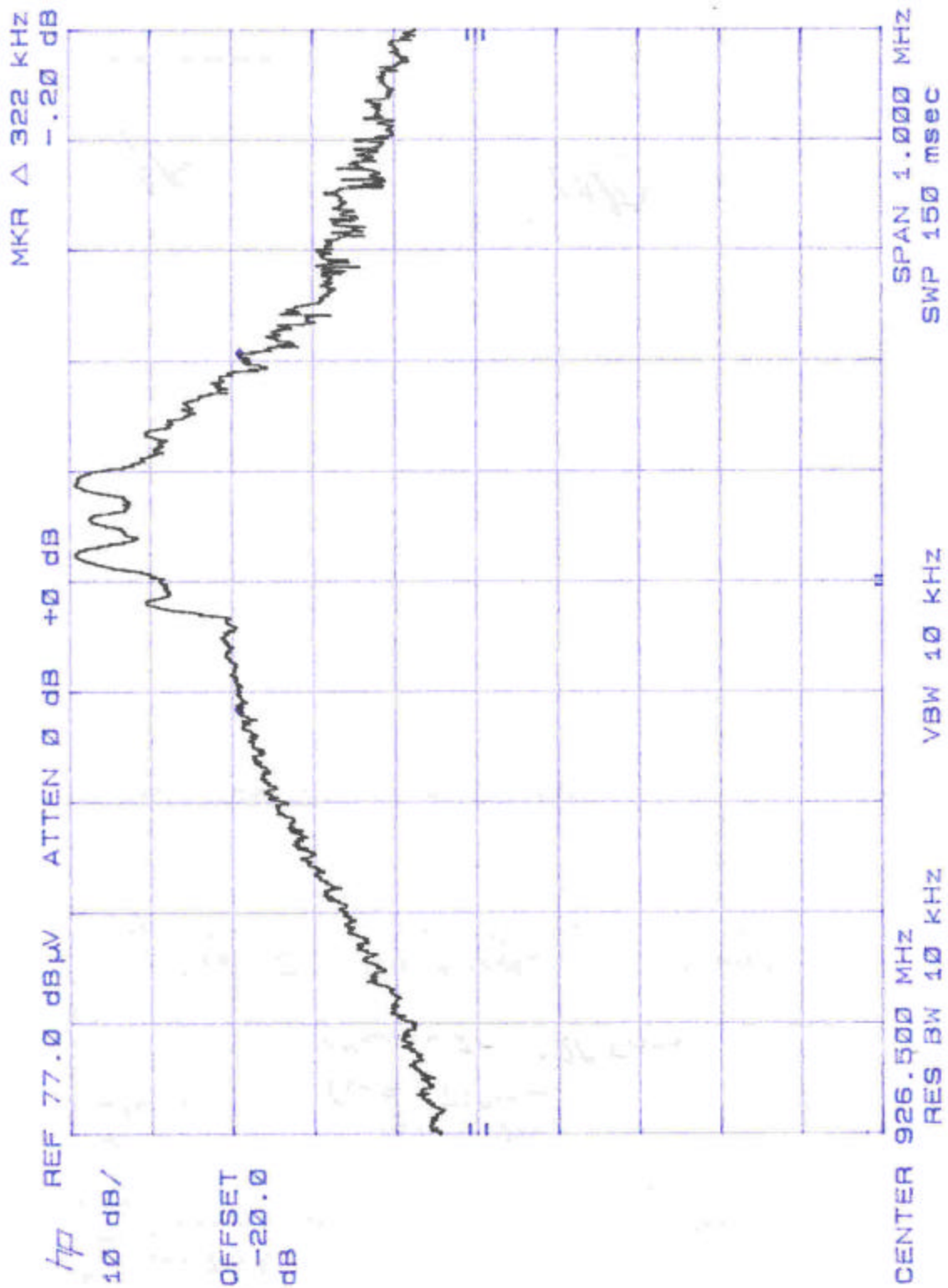


Figure 5. Occupied Bandwidth, Channel 2

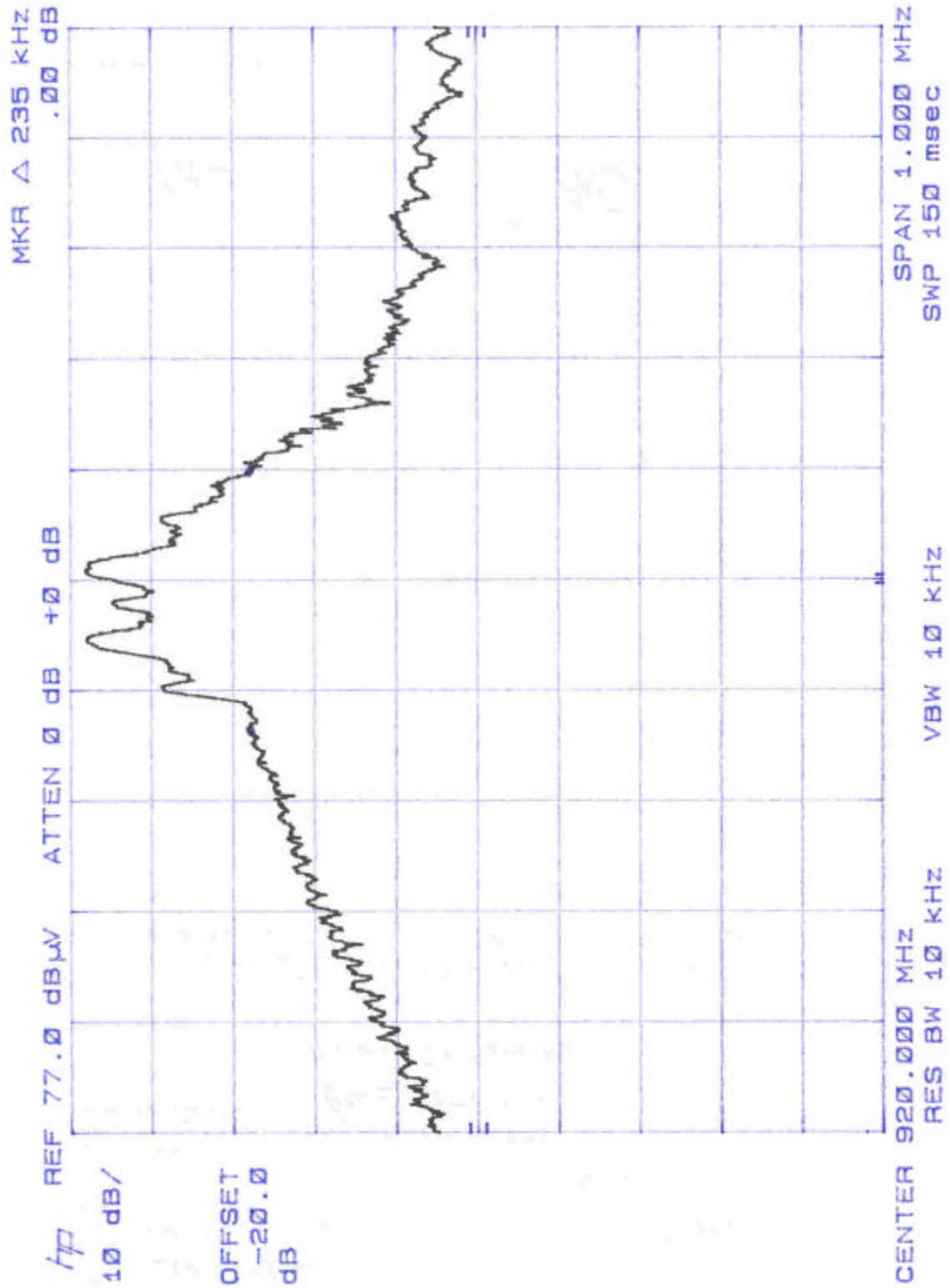


Figure 6. Occupied Bandwidth, Channel 3

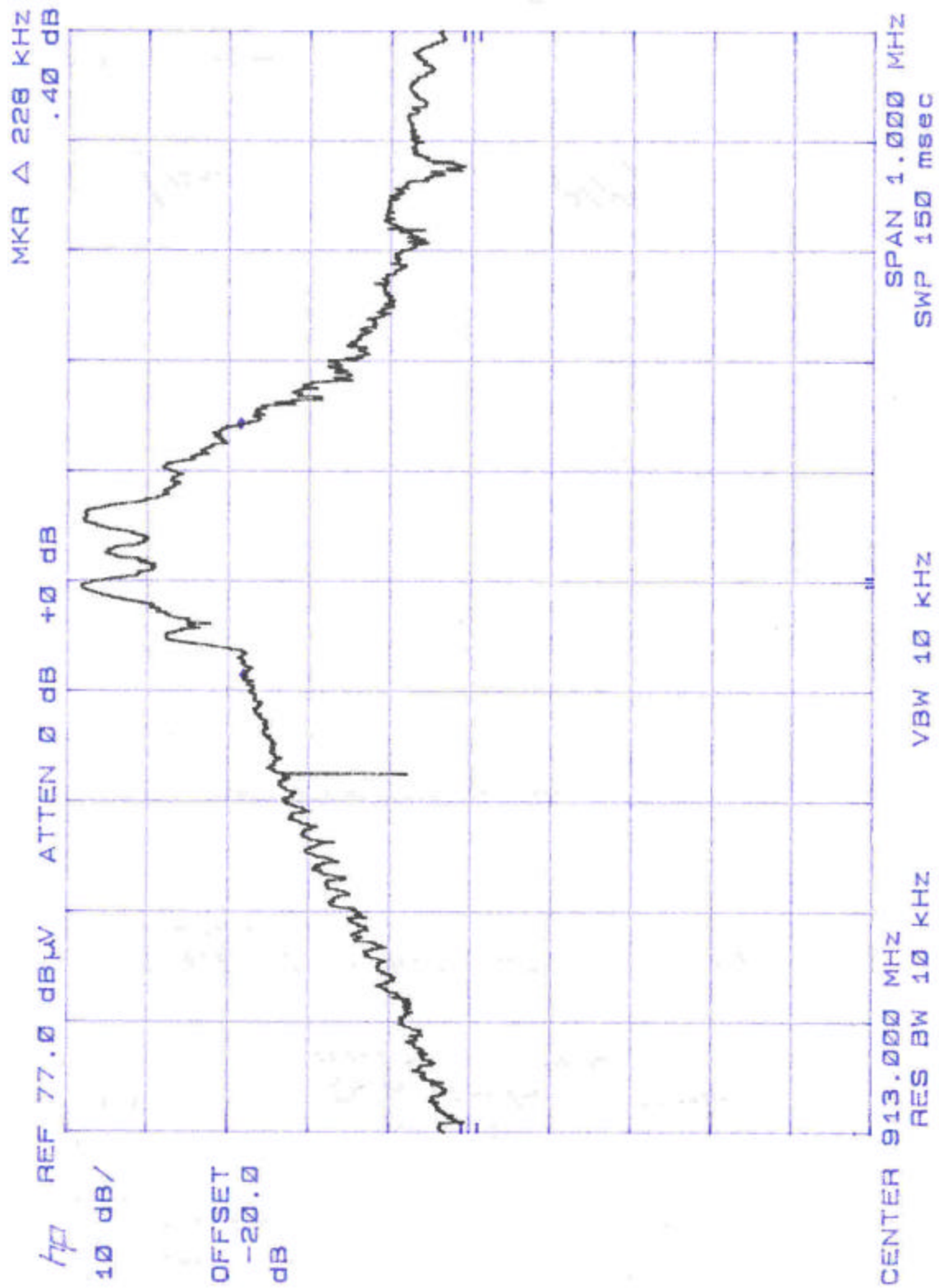


Figure 7. Occupied Bandwidth, Channel 4

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Channel	Frequency	Bandwidth
1	906 MHz	219 kHz
2	926.5 MHz	322 kHz
3	920 MHz	235 kHz
4	913 MHz	228 kHz

4.3 Radiated Emissions: (FCC Part §2.1053)

The EUT must comply with the radiated emission limits of 15.249(a). The limits are as shown in the following table.

Table 4. Radiated Emissions Limits

Fundamental Frequency	Field Strength of Fundamental (μV/m)	Field Strength of Harmonics (μV/m)
902 – 928 MHz	50,000	500
2400 – 2483.5 MHz	50,000	500
5725 – 5875 MHz	50,000	500
24.00 – 24.25 MHz	250,000	2500

4.3.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-1992. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	100kHz	>100kHz
>1000 MHz	1 MHz	1MHz (peak)

Emissions were measured to the 10th harmonic of the transmit frequency. The Dongle was tested in two orthogonal planes. Worst case emission levels are reported.

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level): V dBμV

Antenna Factor (Ant Corr): AFdB/m

Cable Loss Correction (Cable Corr): CCdB

Duty Cycle Correction (Average) DCCdB

Amplifier Gain: GdB

Electric Field (Corr Level):
$$\text{EdB}\mu\text{V/m} = \text{VdB}\mu\text{V} + \text{AFdB/m} + \text{CCdB} + \text{DCCdB} - \text{GdB}$$

Table 5: Radiated Emissions Test Data

CLIENT:	Electro-Source	DATE:	10/21/02
TESTER:	James Ritter	JOB #:	7300
<u>EUT Information:</u>		<u>Test Requirements:</u>	
EUT:	Shockwave	TEST STANDARD:	FCC Part 15
CONFIGURATION:	EUT RX Dongle	DISTANCE:	3m
		CLASS:	15.247
<u>Test Equipment/Limit:</u>			
ANTENNA:	A_00007		
CABLE:	CSITE2_3m		
LIMIT:	LFCC_3m_Class_B		
AMPLIFIER (dB)	0		

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 1										
906.00	H	180.0	2.7	43.2	21.7	7.6	72.5	4198.0	50000.0	-21.5
906.00	V	180.0	1.2	45.6	21.7	7.6	74.9	5534.1	50000.0	-19.1
Channel 2										
926.50	H	180.0	3.6	42.1	22.3	7.6	72.1	4010.2	50000.0	-21.9
926.50	V	180.0	1.5	47.2	22.3	7.6	77.2	7213.9	50000.0	-16.8
Channel 4										
913.00	H	180.0	1.4	48.4	22.0	7.5	77.9	7891.1	50000.0	-16.0
913.00	V	180.0	3.5	43.6	22.0	7.5	73.1	4540.9	50000.0	-20.8

Table 6: Spurious Radiated Emissions, Average Data Above 1GHz

CLIENT:	Electro-Source	DATE:	10/21/02
TESTER:	James Ritter	JOB #:	7300
EUT Information:		Test Requirements:	
EUT:	Shockwave	TEST STANDARD:	FCC Part 15
CONFIGURATION:	EUT RX Dongle	DISTANCE:	3m
		CLASS:	15.249

Test Equipment/Limit:

ANTENNA: A_00004
CABLE: CSITE2_HF
LIMIT: LFCC_3m_Class_B
AMPLIFIER (dB) 34

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Duty Cycle Corr. (dB)	Corr. Level (Avg) (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 4											
1826.00	H	190.0	1.0	58.1	28.3	3.1	-19.3	36.3	65.3	500.0	-17.7
1826.00	V	190.0	1.0	56.2	28.3	3.1	-19.3	34.4	52.3	500.0	-19.6
2739.00	H	210.0	1.0	54.2	30.3	2.9	-19.3	34.1	50.9	500.0	-19.9
2739.00	V	170.0	1.0	52.9	30.3	2.9	-19.3	32.8	43.6	500.0	-21.2
3652.00	H	190.0	1.0	45.6	31.4	2.8	-19.3	26.5	21.1	500.0	-27.5
3652.00	V	190.0	1.0	47.2	31.4	2.8	-19.3	28.1	25.4	500.0	-25.9
4565.00	H	180.0	1.0	43.8	32.5	3.8	-19.3	26.8	21.8	500.0	-27.2
4565.00	V	0.0	1.0	44.9	32.5	3.8	-19.3	27.9	24.8	500.0	-26.1
5478.00	H	0.0	1.0	40.8	34.0	4.2	-19.3	25.8	19.5	500.0	-28.2*
5478.00	V	200.0	1.0	43.0	34.0	4.2	-19.3	28.0	25.1	500.0	-26.0
6391.00	H	0.0	1.0	39.6	36.1	4.2	-19.3	26.6	21.3	500.0	-27.4*
6391.00	V	0.0	1.0	39.6	36.1	4.2	-19.3	26.6	21.4	500.0	-27.4*
7304.00	H	0.00	1.0	40.0	37.9	4.6	-19.3	29.1	28.7	500.0	-24.8*
7304.00	V	0.0	1.0	41.4	37.9	4.6	-19.3	30.5	33.6	500.0	-23.4*
8217.00	H	0.0	1.0	42.2	38.5	4.9	-19.3	32.3	41.1	500.0	-21.7*
8217.00	V	0.0	1.0	43.9	38.5	4.9	-19.3	34.0	50.2	500.0	-20.0*
9130.00	H	0.0	1.0	41.1	39.1	4.9	-19.3	31.9	39.5	500.0	-22.1*
9130.00	V	0.0	1.0	42.6	39.1	4.9	-19.3	33.4	46.7	500.0	-20.6*
Channel 1											
1812.00	V	210.0	1.0	61.5	28.3	3.1	-19.3	39.6	95.8	500.0	-14.3
1819.00	H	180.0	1.0	60.4	28.3	3.1	-19.3	38.5	84.4	500.0	-15.5
2718.00	V	190.0	1.0	57.7	30.3	2.9	-19.3	37.6	75.9	500.0	-16.4
2725.00	H	200.0	1.0	57.3	30.3	2.9	-19.3	37.2	72.6	500.0	-16.8
3624.00	V	200.0	1.0	46.46	31.4	2.8	-19.3	27.3	23.2	500.0	-26.7
3631.00	H	185.0	1.0	48.2	31.4	2.8	-19.3	29.1	28.4	500.0	-24.9
4530.00	V	190.0	1.0	44.7	32.4	3.7	-19.3	27.5	23.8	500.0	-26.4
4537.00	H	190.0	1.0	44.7	32.4	3.7	-19.3	27.6	24.0	500.0	-26.4
5436.00	V	0.0	1.0	40.1	33.9	4.3	-19.3	25.0	17.8	500.0	-29.0*

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Duty Cycle Corr. (dB)	Corr. Level (Avg) (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
5443.00	H	0.0	1.0	39.5	33.9	4.3	-19.3	24.4	16.6	500.0	-29.6*
6342.00	V	0.00	1.0	39.8	35.9	4.2	-19.3	26.6	21.4	500.0	-27.4*
6349.00	H	0.0	1.0	40.3	36.0	4.2	-19.3	27.1	22.7	500.0	-26.8*
7248.00	V	0.0	1.0	43.0	37.8	4.5	-19.3	32.0	40.0	500.0	-21.9*
7255.00	H	0.00	1.0	42.0	37.8	4.5	-19.3	31.0	35.7	500.0	-22.9*
8154.00	V	0.0	1.0	43.6	38.5	4.9	-19.3	33.7	48.1	500.0	-20.3*
8161.00	H	0.0	1.0	44.8	38.5	4.9	-19.3	34.8	55.2	500.0	-19.1*
9060.00	V	0.0	1.0	42.4	39.1	4.9	-19.3	33.1	45.0	500.0	-20.9*
9067.00	H	0.0	1.0	42.4	39.1	4.9	-19.3	33.1	45.2	500.0	-20.9*
Channel 2											
1853.00	H	190.0	1.0	54.0	28.4	3.2	-19.3	32.4	41.6	500.0	-21.6
1853.00	V	220.0	1.0	53.9	28.4	3.2	-19.3	32.2	40.7	500.0	-21.8
2779.50	H	210.0	1.0	50.9	30.4	2.9	-19.3	30.9	35.0	500.0	-23.1
2779.50	V	185.0	1.0	49.6	30.4	2.9	-19.3	29.5	30.0	500.0	-24.4
3706.00	H	170.0	1.0	45.6	31.4	2.8	-19.3	24.8	17.4	500.0	-29.2
3706.00	V	190.0	1.0	45.7	31.4	2.8	-19.3	23.1	14.2	500.0	-30.9
4632.50	H	200.0	1.0	43.9	32.6	3.9	-19.3	27.1	22.6	500.0	-26.9
4632.50	V	170.0	1.0	42.1	32.6	3.9	-19.3	25.3	18.4	500.0	-28.7*
5559.00	H	0.0	1.0	42.8	34.2	4.2	-19.3	27.9	24.8	500.0	-26.1
5559.00	V	0.0	1.0	40.1	34.2	4.2	-19.3	25.2	18.2	500.0	-28.8*
6485.50	H	0.0	1.0	41.6	36.3	4.2	-19.3	28.9	27.7	500.0	-25.1*
6485.50	V	0.00	1.0	41.8	36.3	4.2	-19.3	29.1	28.4	500.0	-24.9*
7412.00	H	0.00	1.0	42.9	37.9	4.6	-19.3	32.2	40.7	500.0	-21.8*
7412.00	V	0.0	1.0	41.1	37.9	4.6	-19.3	30.3	32.9	500.0	-23.6*
8338.50	H	0.0	1.0	43.8	38.6	4.9	-19.3	34.0	50.1	500.0	-20.0*
8338.50	V	0.0	1.0	43.0	38.6	4.9	-19.3	33.2	45.7	500.0	-20.8*
9265.00	H	0.0	1.0	42.4	39.2	5.0	-19.3	33.4	46.7	500.0	-20.6
9265.00	V	0.0	1.0	43.4	39.2	5.0	-19.3	34.4	52.4	500.0	-19.6*

* = ambient

Table 7: Spurious Radiated Emissions, Peak Data Above 1GHz

CLIENT: Electro-Source
TESTER: James Ritter
EUT Information:
EUT: Shockwave
CONFIGURATION: EUT RX Dongle

DATE: 10/21/02
JOB #: 7300
Test Requirements:
TEST STANDARD: FCC Part 15
DISTANCE: 3m
CLASS: 15.249

Test Equipment/Limit:
ANTENNA: A_00004
CABLE: CSITE2_HF
LIMIT: LFCC_3m_Class_B
AMPLIFIER (dB) 34

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (Avg) (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
Channel 4										
1826.00	H	190.0	1.0	58.1	28.3	3.1	55.6	602.6	5000	-18.4
1826.00	V	190.0	1.0	56.2	28.3	3.1	53.7	484.2	5000	-20.3
2739.00	H	210.0	1.0	54.2	30.3	2.9	53.4	467.7	5000	-20.6
2739.00	V	170.0	1.0	52.9	30.3	2.9	52.1	402.7	5000	-21.9
3652.00	H	190.0	1.0	45.6	31.4	2.8	45.8	195.0	5000	-28.2
3652.00	V	190.0	1.0	47.2	31.4	2.8	47.4	234.4	5000	-26.6
4565.00	H	180.0	1.0	43.8	32.5	3.8	46.1	201.8	5000	-27.9
4565.00	V	0.0	1.0	44.9	32.5	3.8	47.2	229.1	5000	-26.8
5478.00	H	0.0	1.0	40.8	34.0	4.2	45.1	179.9	5000	-28.9*
5478.00	V	200.0	1.0	43.0	34.0	4.2	47.3	231.7	5000	-26.7
6391.00	H	0.0	1.0	39.6	36.1	4.2	45.9	197.2	5000	-28.1*
6391.00	V	0.0	1.0	39.6	36.1	4.2	45.9	197.2	5000	-28.1*
7304.00	H	0.00	1.0	40.0	37.9	4.6	48.4	263.0	5000	-25.6*
7304.00	V	0.0	1.0	41.4	37.9	4.6	49.8	309.0	5000	-24.2*
8217.00	H	0.0	1.0	42.2	38.5	4.9	51.6	380.2	5000	-22.4*
8217.00	V	0.0	1.0	43.9	38.5	4.9	53.3	462.4	5000	-20.7*
9130.00	H	0.0	1.0	41.1	39.1	4.9	51.2	363.1	5000	-22.8*
9130.00	V	0.0	1.0	42.6	39.1	4.9	52.7	431.5	5000	-21.3*
Channel 1										
1812.00	V	210.0	1.0	61.5	28.3	3.1	58.9	881.0	5000	-15.1
1819.00	H	180.0	1.0	60.4	28.3	3.1	57.8	776.2	5000	-16.2
2718.00	V	190.0	1.0	57.7	30.3	2.9	56.9	699.8	5000	-17.1
2725.00	H	200.0	1.0	57.3	30.3	2.9	56.5	668.3	5000	-17.5
3624.00	V	200.0	1.0	46.46	31.4	2.8	46.6	213.8	5000	-27.4
3631.00	H	185.0	1.0	48.2	31.4	2.8	48.4	263.0	5000	-25.6
4530.00	V	190.0	1.0	44.7	32.4	3.7	46.8	218.8	5000	-27.2
4537.00	H	190.0	1.0	44.7	32.4	3.7	46.9	221.3	5000	-27.1

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (Avg) (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
5436.00	V	0.0	1.0	40.1	33.9	4.3	44.3	164.1	5000	-29.7*
5443.00	H	0.0	1.0	39.5	33.9	4.3	43.7	153.1	5000	-30.3*
6342.00	V	0.00	1.0	39.8	35.9	4.2	45.9	197.2	5000	-28.1*
6349.00	H	0.0	1.0	40.3	36.0	4.2	46.4	208.9	5000	-27.6*
7248.00	V	0.0	1.0	43.0	37.8	4.5	51.3	367.3	5000	-22.7*
7255.00	H	0.00	1.0	42.0	37.8	4.5	50.3	327.3	5000	-23.7*
8154.00	V	0.0	1.0	43.6	38.5	4.9	53	446.7	5000	-21.0*
8161.00	H	0.0	1.0	44.8	38.5	4.9	54.1	507.0	5000	-19.9*
9060.00	V	0.0	1.0	42.4	39.1	4.9	52.4	416.9	5000	-21.6*
9067.00	H	0.0	1.0	42.4	39.1	4.9	52.4	416.9	5000	-21.6*
Channel 2										
1853.00	H	190.0	1.0	54.0	28.4	3.2	51.7	384.6	5000	-22.3
1853.00	V	220.0	1.0	53.9	28.4	3.2	51.5	375.8	5000	-22.5
2779.50	H	210.0	1.0	50.9	30.4	2.9	50.2	323.6	5000	-23.8
2779.50	V	185.0	1.0	49.6	30.4	2.9	48.8	275.4	5000	-25.2
3706.00	H	170.0	1.0	45.6	31.4	2.8	44.1	160.3	5000	-29.9
3706.00	V	190.0	1.0	45.7	31.4	2.8	42.4	131.8	5000	-31.6
4632.50	H	200.0	1.0	43.9	32.6	3.9	46.4	208.9	5000	-27.6
4632.50	V	170.0	1.0	42.1	32.6	3.9	44.6	169.8	5000	-29.4*
5559.00	H	0.0	1.0	42.8	34.2	4.2	47.2	229.1	5000	-26.8
5559.00	V	0.0	1.0	40.1	34.2	4.2	44.5	167.9	5000	-29.5*
6485.50	H	0.0	1.0	41.6	36.3	4.2	48.2	257.0	5000	-25.8*
6485.50	V	0.00	1.0	41.8	36.3	4.2	48.4	263.0	5000	-25.6*
7412.00	H	0.00	1.0	42.9	37.9	4.6	51.5	375.8	5000	-22.5*
7412.00	V	0.0	1.0	41.1	37.9	4.6	49.6	302.0	5000	-24.4*
8338.50	H	0.0	1.0	43.8	38.6	4.9	53.3	462.4	5000	-20.7*
8338.50	V	0.0	1.0	43.0	38.6	4.9	52.5	421.7	5000	-21.5*
9265.00	H	0.0	1.0	42.4	39.2	5.0	52.7	431.5	5000	-21.3
9265.00	V	0.0	1.0	43.4	39.2	5.0	53.7	484.2	5000	-20.3*

* = ambient

4.4 Conducted Emissions (AC Power Line)

The EUT was placed on an 80 cm high 1 x 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 /50 mH Line Impedance Stabilization Network bonded to a 3 x 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power and data cables were moved about to obtain maximum emissions.

The 50 output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 450 kHz to 30 MHz was measured. The detector function was set to quasi-peak or peak, as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth.

AC Power Line conducted emissions test data are included in Table 8.

Table 8: AC Power Line Conducted Emissions Test Data Sheet

CLIENT:	Electro Source	DATE:	10/25/02
TEST STANDARD:	FCC Part 15	JOB #:	7300
MODEL:	D2028H (PL651)	CLASS:	FCC_B
TESTER:	J. Ritter	TEST VOLTAGE:	120 VAC

LINE 1 – NEUTRAL

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.28	49.0	60.9	-12.0	37.3	50.9	-13.6
0.71	38.4	56.0	-17.6	38.4	46.0	-7.6
2.14	34.7	56.0	-21.3	34.7	46.0	-11.3
5.30	21.6	60.0	-38.4	21.6	50.0	-28.4
19.3	30.4	60.0	-29.6	30.4	50.0	-19.6
24.64	34.3	60.0	-25.7	34.3	50.0	-15.7

LINE 2 – PHASE

Frequency MHz	Level QP dBuV	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Limit AVG dBuV	Margin AVG dB
0.28	48.1	60.9	-12.8	36.9	50.9	-14.1
0.71	37.6	56.0	-18.4	37.6	46.0	-8.4
2.14	35.2	56.0	-20.8	35.7	46.0	-10.3
5.30	22.5	60.0	-37.5	20.9	50.0	-29.1
19.42	31.6	60.0	-28.4	31.6	50.0	-18.4
24.64	34.6	60.0	-25.4	33.5	50.0	-16.5