FCC Certification Test Report

FCC Certification Test Report for Ness Security Products Pty Ltd FCC ID: 02K-1B315

February 28, 2003

Prepared for:

Ness Security Products Pty Ltd
4/167 Prospect Highway
Seven Hills, NSW 2147
Australia

Prepared By:

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7560 Lindbergh Drive
Gaithersburg, Maryland 20879

FCC Certification Test Program

FCC Certification Test Report
for the
Ness Security Products Pty Ltd
SmartLink™ Medi-Call Radio Key Pendant
FCC ID:02K-1B315

February 28, 2003

WLL JOB# 7258

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Abstract

This report has been prepared on behalf of Ness Security Products Pty Ltd to support the attached Application for Equipment Authorization. The test report and application are submitted for a Periodic Intentional Radiator under Part 15.231 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a Ness Security Products Pty Ltd SmartLink™ Medi-Call Radio Key Pendant.

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 Ness Security Products Pty Ltd SmartLink™ Medi-Call Radio Key Pendant complies with the limits for a Periodic Intentional Radiator device under Part 15.231 of the FCC Rules and Regulations.

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1 Introduction

1.1 Compliance Statement

The Ness Security Products Pty Ltd SmartLink™ Medi-Call Radio Key Pendant complies with the limits for a Periodic Intentional Radiator device under Part 15.231 of the FCC Rules and Regulations.

1.2 Test Scope

Tests for radiated 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: Ness Security Products Pty Ltd
4/167 Prospect Highway
Seven Hills, NSW 2147

Purchase Order Number: 109915

Quotation Number: 60246-A

1.4 Test Dates

Testing was performed September and October, 2002.

1.5 Test and Support Personnel

Washington Laboratories, LTD Ken Gemmell

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
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 Ness Security Products Pty Ltd SmartLink™ Medi-Call Radio Key Pendant is part of the Medi-Call emergency alert system. The pendant is worn by the user on a wristband or a necklace. When the key is depressed a control signal is sent to the SmartLink™ dialer base unit (separate certification) so that the dialer unit can call 911.

The following table is a summary of the pendant device.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Ness Security Products Pty Ltd
FCC ID Number	02K-1B315
EUT Name:	Radio Key Pendant
Model:	SmartLink™ Medi-Call
FCC Rule Parts:	§15.231
Frequency Range:	315MHz
Maximum Output Power:	<1mW
Modulation:	Pulsed
Occupied Bandwidth:	157.5 kHz
Keying:	Manual
Type of Information:	Control
Number of Channels:	1
Power Output Level	Fixed
Antenna Type	Integral
Frequency Tolerance:	N/A
Interface Cables:	None
Power Source & Voltage:	Internal Battery

2.2 Test Configuration

The SmartLink™ Medi-Call Radio Key Pendant was configured with the neck chain option to maximize the radiated signal and was tested in a constant transmit mode. Conducted emissions testing was not performed as the unit is battery powered.

2.3 Testing Algorithm

The SmartLink™ Medi-Call Radio Key Pendant was configured for continuous transmission by continuously depressing the button.

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/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/03/03
HP	85650A	Quasi-Peak Adapter	3303A01786	7/05/03
Solar	8012-50-R-24BNC	LISN	8379493	6/20/03
ARA	LPB-2520	BiconiLog Antenna	1044	6/19/03
HP	85685A	RF Preselector	3221A01395	5/17/03
HP	8564E	Spectrum Analyzer	3643A00657	4/18/03
HP	8449B	RF Pre-Amplifier	3008A00385	9/26/03
ARA	DRG-118/A	Horn Antenna	1010	11/28/02

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 = $N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N$, 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 20log[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:
    - Duty cycle = $(N_1L_1 + N_2L_2 + \ldots + N_{N-1}L_{N-1} + N_NL_N)/100$ 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.

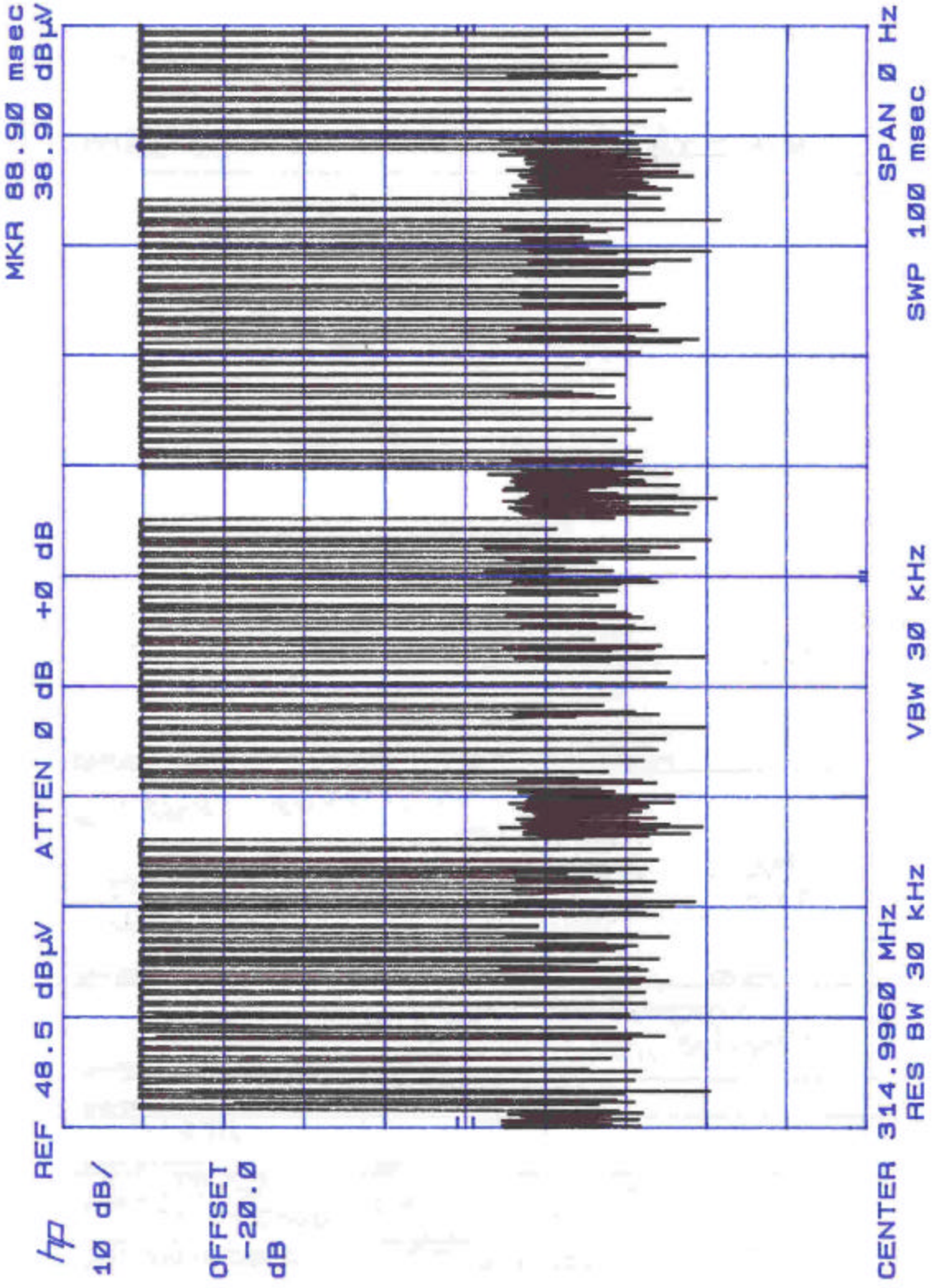

Figure 1. Duty Cycle Plots Full Period

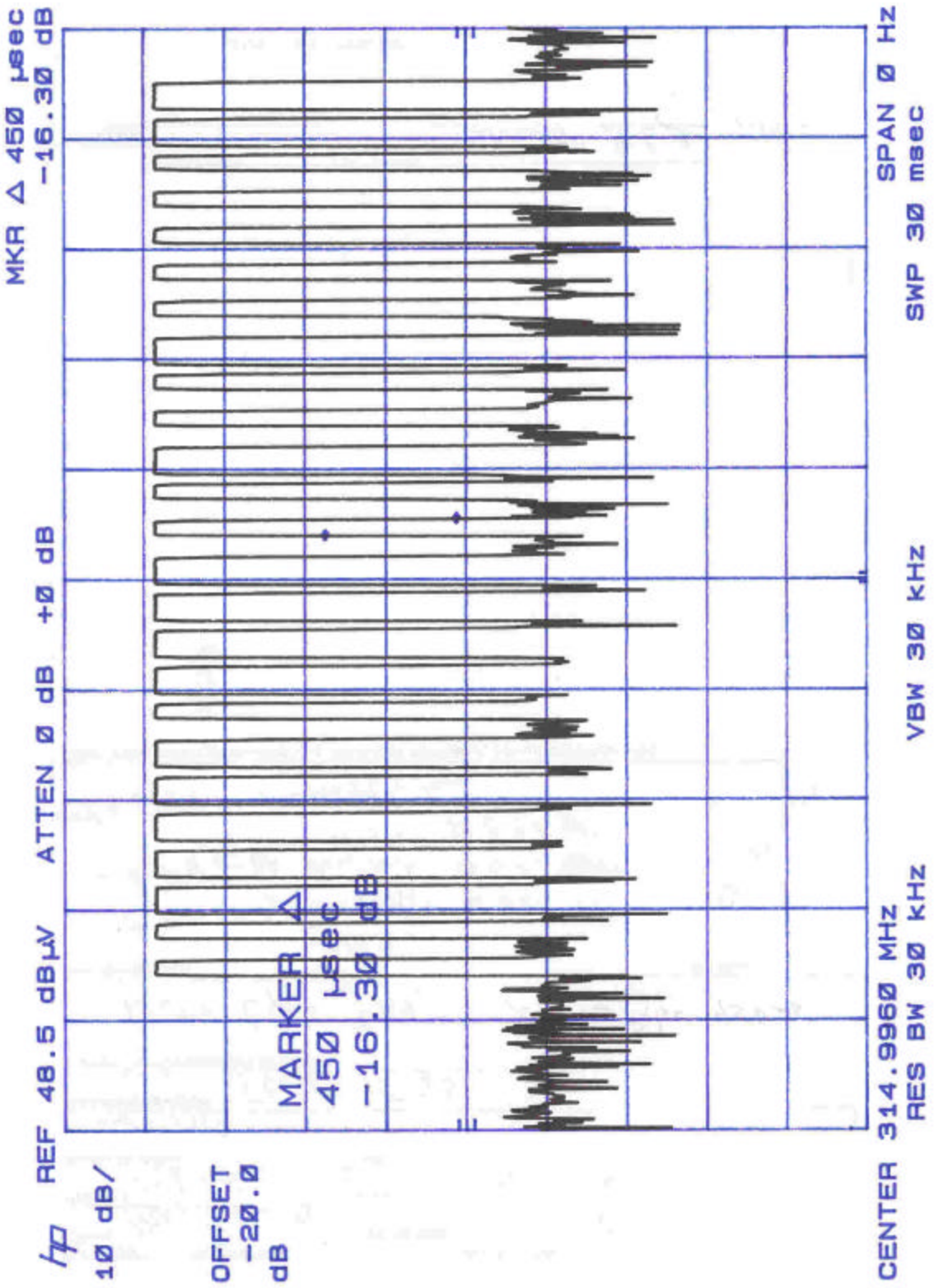

Figure 2. Duty Cycle Plot "Narrow Pulse Width"

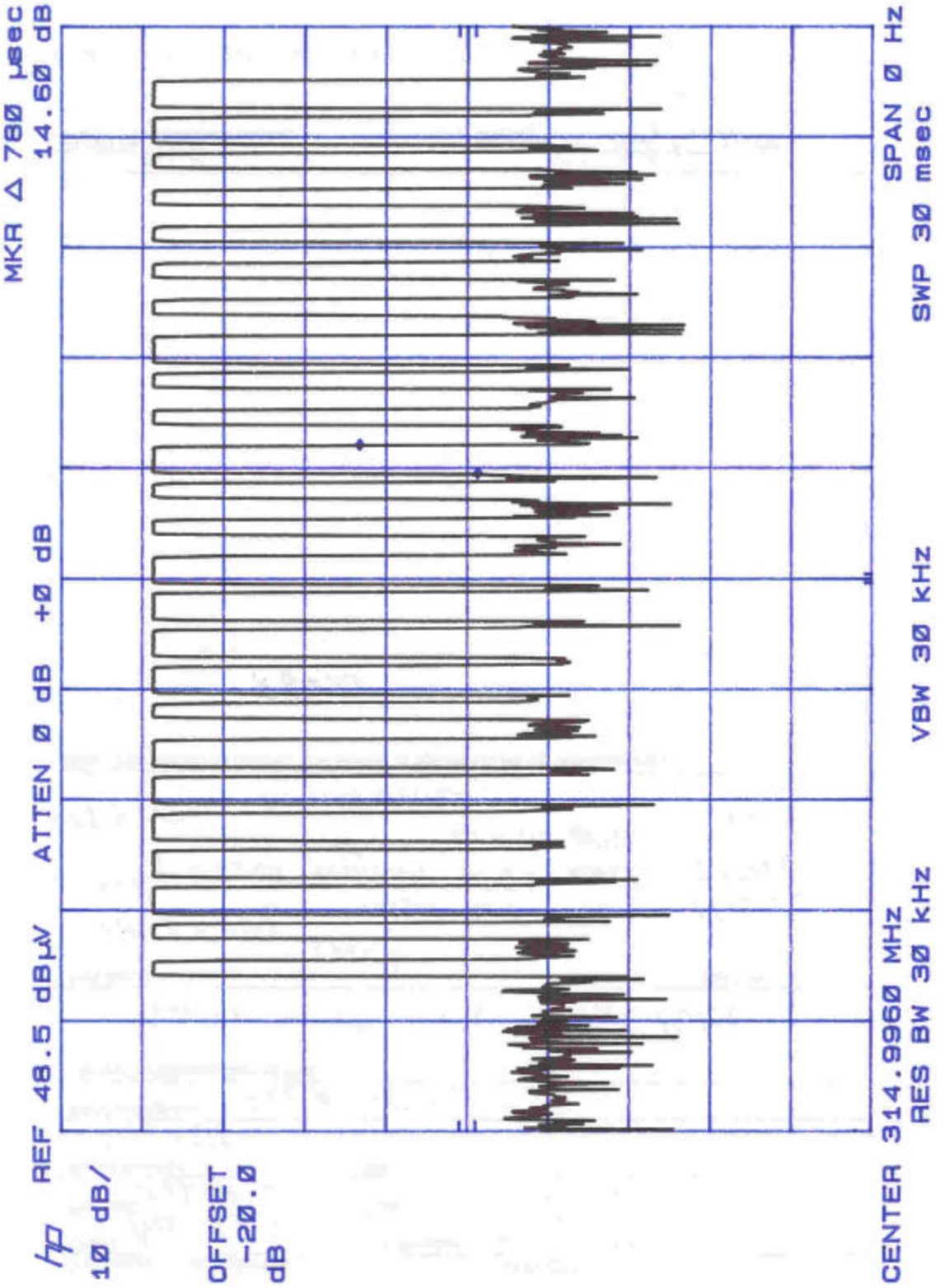

Figure 3. Duty Cycle Plot "Wide Pulse Width"

From the data in Figure 1 and Figure 2, the following calculations are made.

Total Time Per Code Group:

29ms

On Time Per Code Group:

(12 x 450us) + (13 x 780us) = 15.54ms

The data are summarized in the following table.

Table 3. Duty Cycle Correction

Measurement Time	Total ON Time	Duty Cycle (%)	Duty Cycle (dB)
29ms	15.54ms	0.536	-5.42

4.2 RF Power Output: (FCC Part §2.1046)

N/A – Integral Antenna

4.3 Modulation Characteristics: (FCC Part §2.1047); Audio Frequency Response

N/A

4.4 Occupied Bandwidth: (FCC Part §2.1049)

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

FCC Part 15.231 states that the 20 dB bandwidth of the modulated carrier shall be as follows:

Frequency Range (MHz)	Occupied Bandwidth Limit
70-900 MHz	0.25%
> 900 MHz	0.5%

At full modulation, the occupied bandwidth was measured as shown:

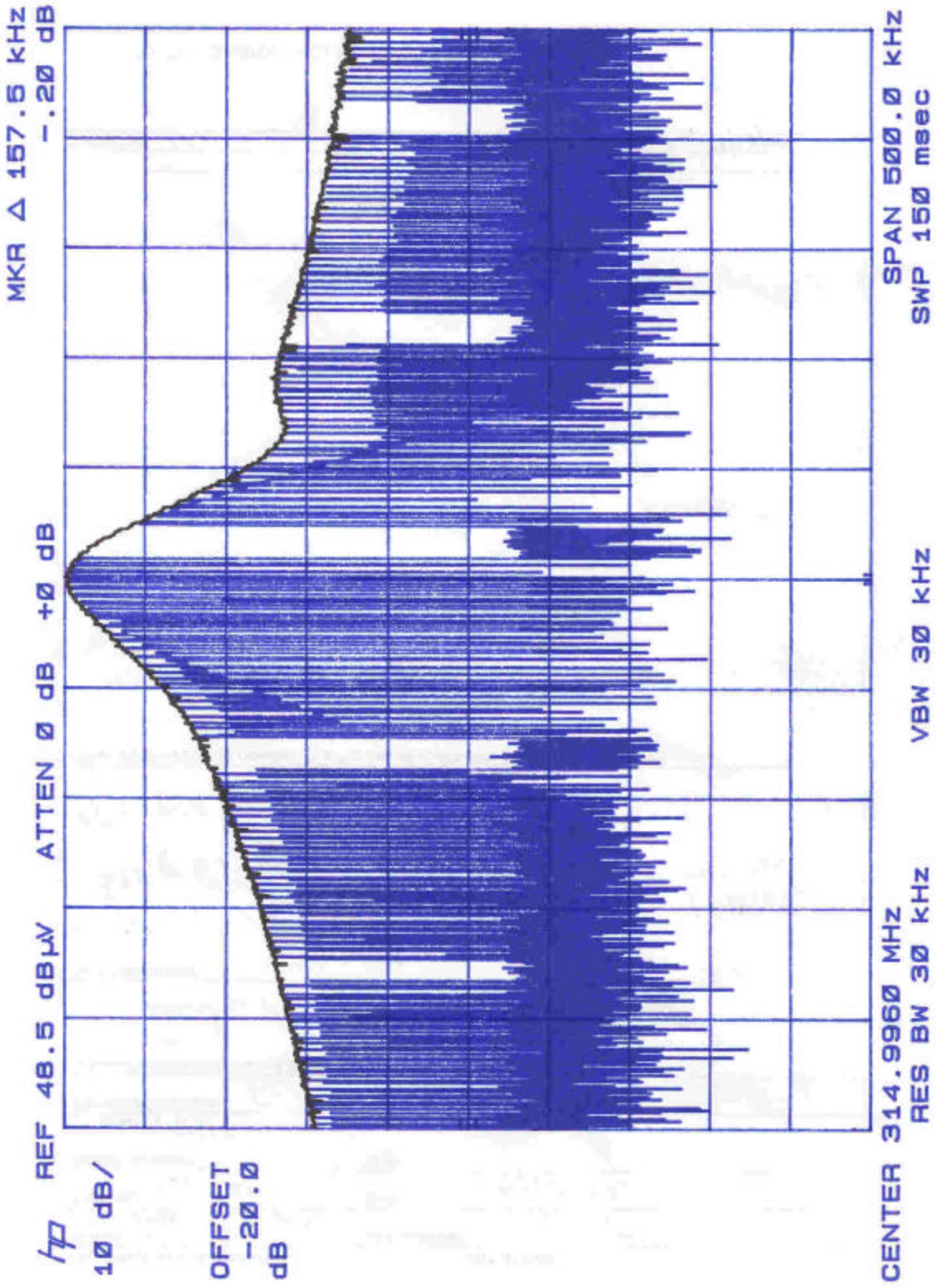

Figure 4. Occupied Bandwidth

Table 4 provides a summary of the Occupied Bandwidth Results.

Table 4. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
315 MHz	157.5 kHz	787.5 kHz	Pass

4.5 Radiated Spurious Emissions: (FCC Part §2.1053)

The EUT must comply with requirements for radiated spurious emissions. The limits are as shown in the following table.

Table 5. Radiated Spurious Emissions Limits

Frequency	Fundamental	Harmonic Level (-dBc or E-Field)
Fundamental	6040.4 uV/m	
Harmonics		604.4 uV/m
Restricted bands		500 uV/m

4.5.1 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	10Hz (avg), 1MHz (peak)

Emissions were measured to the 10th harmonic of the transmit frequency.

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:	DCdB
Amplifier Gain*:	GdB
Electric Field (Corr Level):	EdBµV/m = VdBµV + AFdB/m + CCdB + DCdB - GdB

Table 6: Radiated Emission Test Data

CLIENT: Ness Security Products DATE: 9/24/02
TESTER: Ken Gemmell JOB #: 7258

EUT Information:

EUT: Pendant
TEST STANDARD: FCC Part 15.231
DISTANCE: 3m

Test Requirements:

Low FrequencyTest Equipment/Limit:

ANTENNA: A_00007
CABLE: CSITE2_3m
LIMIT: LFCC_3m_Class_B
TX Frequency 314.97

High Frequency Test Equipment/Limit:

ANTENNA: A_00004
CABLE: CSITE2_HF

Peak Data - Harmonics X orientation

Freq. (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp. (dB)	Duty Cycle (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
314.97	V	270.0	1.0	46.9	14.6	3.9	0.0	-5.4	60.02	1002.5	6040.4	-15.6
629.94	V	180.0	1.0	11.6	18.9	5.9	0.0	-5.4	31.00	35.5	604.0	-24.6
944.91	V	180.0	1.0	5.9	22.9	7.8	0.0	-5.4	31.19	36.3	604.0	-24.4
1259.88	V	180.0	1.0	57.7	26.1	1.9	36.1	-5.4	44.09	160.1	604.0	-11.5
1574.85	V	180.0	1.0	58.6	27.5	2.6	35.8	-5.4	47.44	235.6	500.0	-6.5
1889.82	V	180.0	1.0	47.6	28.6	3.2	35.6	-5.4	38.37	82.9	604.0	-17.2
2204.79	V	180.0	1.0	53.6	29.3	3.3	35.5	-5.4	45.26	183.3	500.0	-8.7
2519.76	V	180.0	1.0	54.0	29.9	3.0	35.6	-5.4	45.97	198.8	604.0	-9.7
2834.73	V	180.0	1.0	54.4	30.4	2.8	35.7	-5.4	46.60	213.7	500.0	-7.4
3149.70	V	180.0	1.0	50.1	30.9	2.8	35.6	-5.4	42.65	135.6	604.0	-13.0
314.97	H	0.0	1.0	56.3	14.6	3.9	0.0	-5.4	69.42	2958.5	6040.4	-6.2
629.94	H	90.0	1.0	14.5	18.9	5.9	0.0	-5.4	33.90	49.5	604.0	-21.7
944.91	H	180.0	1.0	11.2	22.9	7.8	0.0	-5.4	36.49	66.8	604.0	-19.1
1259.88	H	180.0	1.0	61.1	26.1	1.9	36.1	-5.4	47.52	237.7	604.0	-8.1
1574.85	H	180.0	1.0	58.4	27.5	2.6	35.8	-5.4	47.24	230.2	500.0	-6.7
1889.82	H	180.0	1.0	54.5	28.6	3.2	35.6	-5.4	45.36	185.4	604.0	-10.3
2204.79	H	180.0	1.0	56.3	29.3	3.3	35.5	-5.4	47.95	249.9	500.0	-6.0
2519.76	H	180.0	1.0	57.6	29.9	3.0	35.6	-5.4	49.55	300.2	604.0	-6.1
2834.73	H	180.0	1.0	54.8	30.4	2.8	35.7	-5.4	46.97	223.0	500.0	-7.0
3149.70	H	180.0	1.0	48.2	30.9	2.8	35.6	-5.4	40.72	108.6	604.0	-14.9

Table 6: Radiated Emission Test Data (continued)

Peak Data - Harmonics Y orientation

Freq. (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp. (dB)	Duty Cycle (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
314.97	V	180	1	46.6	14.6	3.9	0.0	-5.4	59.68	963.8	6040.4	-15.9
629.94	V	180	1	14.8	18.9	5.9	0.0	-5.4	34.18	51.2	604.0	-21.4
944.91	V	180	1	6.2	22.9	7.8	0.0	-5.4	31.48	37.5	604.0	-24.1
1259.88	V	180	1	57	26.1	1.9	36.1	-5.4	43.44	148.6	604.0	-12.2
1574.85	V	180	1	58.9	27.5	2.6	35.8	-5.4	47.77	244.5	500.0	-6.2
1889.82	V	180	1	53.8	28.6	3.2	35.6	-5.4	44.63	170.4	604.0	-11.0
2204.79	V	180	1	54.4	29.3	3.3	35.5	-5.4	46.05	200.8	500.0	-7.9
2519.76	V	180	1	54.7	29.9	3	35.6	-5.4	46.58	213.3	604.0	-9.0
2834.73	V	180	1	55	30.4	2.8	35.7	-5.4	47.11	226.8	500.0	-6.9
3149.7	V	180	1	53.5	30.9	2.8	35.6	-5.4	46.13	202.6	604.0	-9.5
314.97	H	90	1	55.2	14.6	3.9	0.0	-5.4	68.28	2594.2	6040.4	-7.3
629.94	H	180	1	8.6	18.9	5.9	0.0	-5.4	27.98	25.1	604.0	-27.6
944.91	H	180	1	7.3	22.9	7.8	0.0	-5.4	32.58	42.6	604.0	-23.0
1259.88	H	180	1	52.3	26.1	1.9	36.1	-5.4	38.74	86.5	604.0	-16.9
1574.85	H	180	1	56.2	27.5	2.6	35.8	-5.4	45.07	179.2	500.0	-8.9
1889.82	H	180	1	50.4	28.6	3.2	35.6	-5.4	41.23	115.2	604.0	-14.4
2204.79	H	180	1	55.2	29.3	3.3	35.5	-5.4	46.85	220.2	500.0	-7.1
2519.76	H	180	1	57.2	29.9	3	35.6	-5.4	49.08	284.4	604.0	-6.5
2834.73	H	180	1	55.1	30.4	2.8	35.7	-5.4	47.21	229.4	500.0	-6.8
3149.7	H	180	1	48.2	30.9	2.8	35.6	-5.4	40.83	110.1	604.0	-14.8

Table 6: Radiated Emission Test Data (continued)

Peak Data - Harmonics Z orientation

Freq. (MHz)	Pol. H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBuV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp. (dB)	Duty Cycle (dB)	Corr. Level (dBuV/m)	Corr. Level (uV/m)	Limit (uV/m)	Margin dB
314.97	V	180	1	48.3	14.6	3.9	0.0	-5.4	61.38	1172.2	6040.4	-14.2
629.94	V	180	1	10.7	18.9	5.9	0.0	-5.4	30.08	31.9	604.0	-25.5
944.91	V	180	1	8.9	22.9	7.8	0.0	-5.4	34.18	51.2	604.0	-21.4
1259.88	V	180	1	62	26.1	1.9	36.1	-5.4	48.44	264.3	604.0	-7.2
1574.85	V	180	1	57.8	27.5	2.6	35.8	-5.4	46.67	215.4	500.0	-7.3
1889.82	V	180	1	51.9	28.6	3.2	35.6	-5.4	42.73	136.9	604.0	-12.9
2204.79	V	180	1	54.4	29.3	3.3	35.5	-5.4	46.05	200.8	500.0	-7.9
2519.76	V	180	1	56.3	29.9	3	35.6	-5.4	48.18	256.4	604.0	-7.4
2834.73	V	180	1	53.1	30.4	2.8	35.7	-5.4	45.21	182.2	500.0	-8.8
3149.7	V	180	1	49.4	30.9	2.8	35.6	-5.4	42.03	126.4	604.0	-13.6
314.97	H	90	1	53.2	14.6	3.9	0.0	-5.4	66.28	2060.6	6040.4	-9.3
629.94	H	135	1	11.3	18.9	5.9	0.0	-5.4	30.68	34.2	604.0	-24.9
944.91	H	180	1	7.8	22.9	7.8	0.0	-5.4	33.08	45.1	604.0	-22.5
1259.88	H	180	1	52.8	26.1	1.9	36.1	-5.4	39.24	91.7	604.0	-16.4
1574.85	H	180	1	55.2	27.5	2.6	35.8	-5.4	44.07	159.7	500.0	-9.9
1889.82	H	180	1	51	28.6	3.2	35.6	-5.4	41.83	123.4	604.0	-13.8
2204.79	H	180	1	54.8	29.3	3.3	35.5	-5.4	46.45	210.2	500.0	-7.5
2519.76	H	180	1	55.3	29.9	3	35.6	-5.4	47.18	228.5	604.0	-8.4
2834.73	H	180	1	53.8	30.4	2.8	35.7	-5.4	45.91	197.5	500.0	-8.1
3149.7	H	180	1	52.9	30.9	2.8	35.6	-5.4	45.53	189.1	604.0	-10.1

4.6 Frequency Stability: (FCC Part §2.1055)

N/A