Washington Laboratories, Ltd.

FCC Certification Test Report
For the
Pelican Accessories, Inc.
PL-6881 Nerf Controller

O7X-NERFPS2-01

WLL JOB# **9409**
October 16, 2006

Prepared for:

Pelican Accessories, Inc.
1840 East 27th Street
Vernon, CA 90058

Prepared By:

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Documentation Specialist

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Abstract

This report has been prepared on behalf of Pelican Accessories, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for an Intentional Radiator under Part 15.249 of the FCC Rules and Regulations. This Certification Test Report documents the test configuration and test results for a Pelican Accessories, Inc. PL-6881 Nerf Controller.

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, Inc. PL-6881 Nerf Controller complies with the limits for an Intentional Radiator device under FCC Part 15.249.

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1 Introduction

1.1 Compliance Statement

The Pelican Accessories, Inc. PL-6881 Nerf Controller complies with the limits for an Intentional Radiator device under FCC Part 15.249.

1.2 Test Scope

Tests for radiated emissions were performed. All measurements were performed in accordance with FCC the 2003 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, Inc. 1840 East 27th Street Vernon, CA 90058
Quotation Number:	63154

1.4 Test Dates

Testing was performed on the following date(s):	September 18 to October 2, 2006

1.5 Test and Support Personnel

Washington Laboratories, LTD	Greg Snyder, Steve Dovell
Client Representative	Shilo Prychak

1.6 Abbreviations

A	**A**mpere
ac	**a**lternating **c**urrent
AM	Amplitude Modulation
Amps	**Amp**ere**s**
b/s	**b**its per **s**econd
BW	**B**and**W**idth
CE	**C**onducted **E**mission
cm	**c**enti**m**eter
CW	**C**ontinuous **W**ave
dB	**d**eci**B**el
dc	**d**irect **c**urrent
EMI	**E**lectro**m**agnetic **I**nterference
EUT	**E**quipment **U**nder **T**est
FM	**F**requency **M**odulation
G	**g**iga - prefix for 10^9 multiplier
Hz	**H**ertz
IF	**I**ntermediate **F**requency
k	**k**ilo - prefix for 10^3 multiplier
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
M	**M**ega - prefix for 10^6 multiplier
m	**m**eter
µ	**m**icro - prefix for 10^{-6} multiplier
NB	**N**arrow**b**and
QP	**Q**uasi-**P**eak
RE	**R**adiated **E**missions
RF	**R**adio **F**requency
rms	**r**oot-**m**ean-**s**quare
SN	**S**erial **N**umber
S/A	**S**pectrum **A**nalyzer
V	**V**olt

2 Equipment Under Test

2.1 EUT Identification & Description

The Pelican Accessories, Inc. PL-6881 Nerf Controller is a wireless controller system for the Sony PS2 operating in the 2.4GHz frequency band. Four channels are available for use between 2407MHz and 2470. The unit is operated as a simplex system in that the controller only transmits commands to the host device (compliance addressed by Declaration of Conformity) which is connected to the PS2 system.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Pelican Accessories, Inc.
FCC ID:	O7X-NERFPS2-01
Model:	PL-6881 Nerf Controller
FCC Rule Parts:	§15.249
Frequency Range:	2407 – 2471MHz
Maximum Output Power:	N/A
Modulation:	FSK Pulsed
Occupied Bandwidth:	1.5MHz
Keying:	Manual
Type of Information:	Control
Number of Channels:	4
Power Output Level	Fixed
Antenna Type	Integral
Emission Type	F1D
Interface Cables:	N/A
Power Source & Voltage:	2.2Vdc from battery

2.2 Test Configuration

The PL-6881 Nerf Controller was configured as a standalone device and set for continuous transmission.

2.3 Testing Algorithm

For continuous transmit operation, a series of buttons were used to set the appropriate test frequency and one of the toggle switches on the Nerf Controller was taped down to simulate continuous play. The controller pad was tested in three orthogonal planes. Data reported herein are for the worst case orientation.

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

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

WLL Asset #	Manufacturer Model/Type	Function	Cal. Due
0474	HP, 8563E	ANALYZER, SPECTRUM	9/05/2007
0007	ARA LPB-2520	BICONILOG ANTENNA	12/20/2006
0522	HP, 8449B	PRE-AMPLIFIER, 1-26.5GHZ	5/04/2007
0425	ARA DRG118/A	MICROWAVE HORN ANTENNA	1/17/2007
0026	EMCO 3110B	BICONICAL ANTENNA	12/19/2006
0029	EMCO 3146A	LOG PERIODIC ANTENNA	7/18/2008

4 Test Results

4.1 Occupied Bandwidth: (FCC Part §2.1049)

Occupied bandwidth was performed by coupling the output of the EUT to the input of a spectrum analyzer via placing a receive antenna near the unit.

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

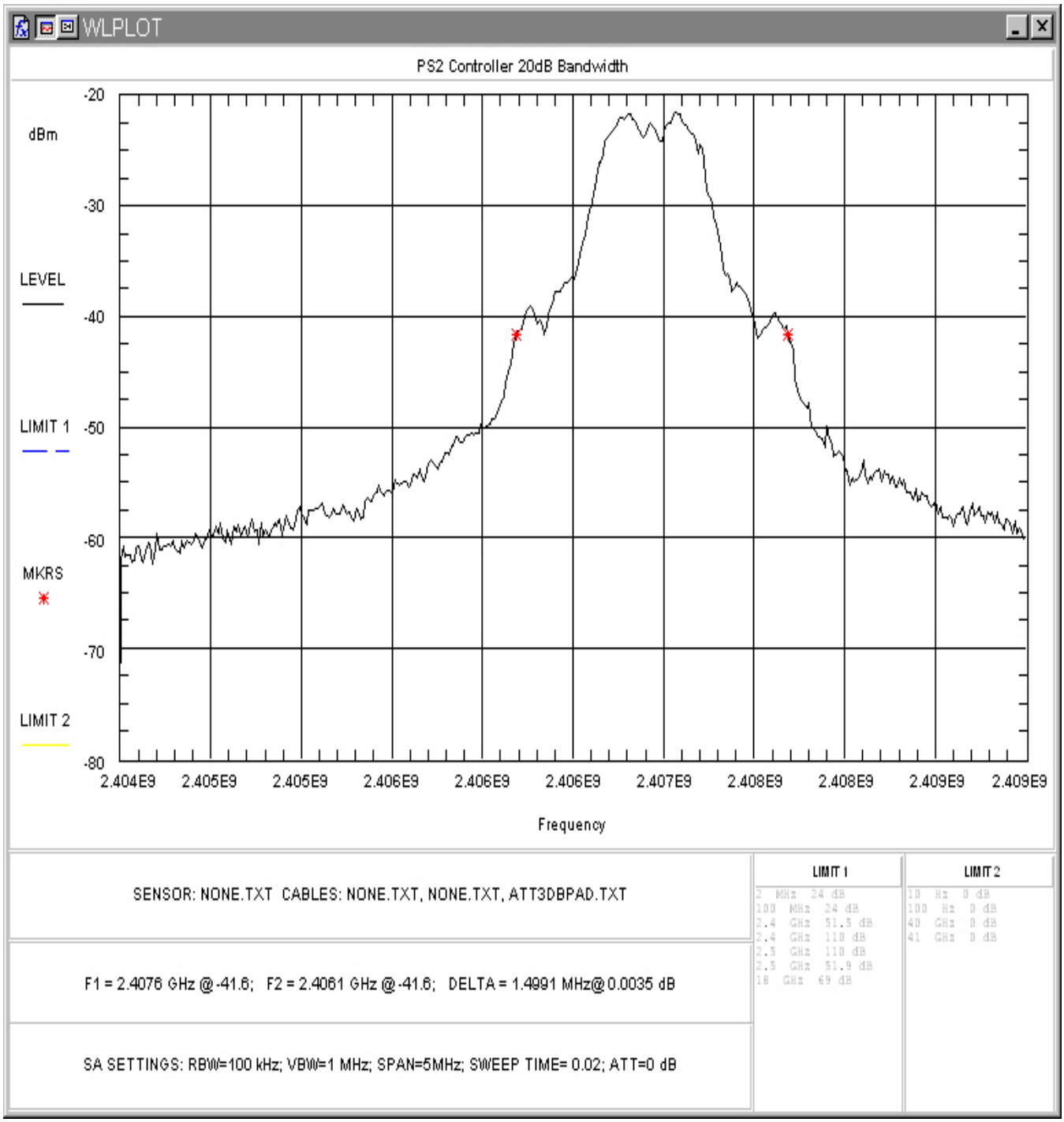

Figure 4-1. Occupied Bandwidth, Low Channel, 2407MHz

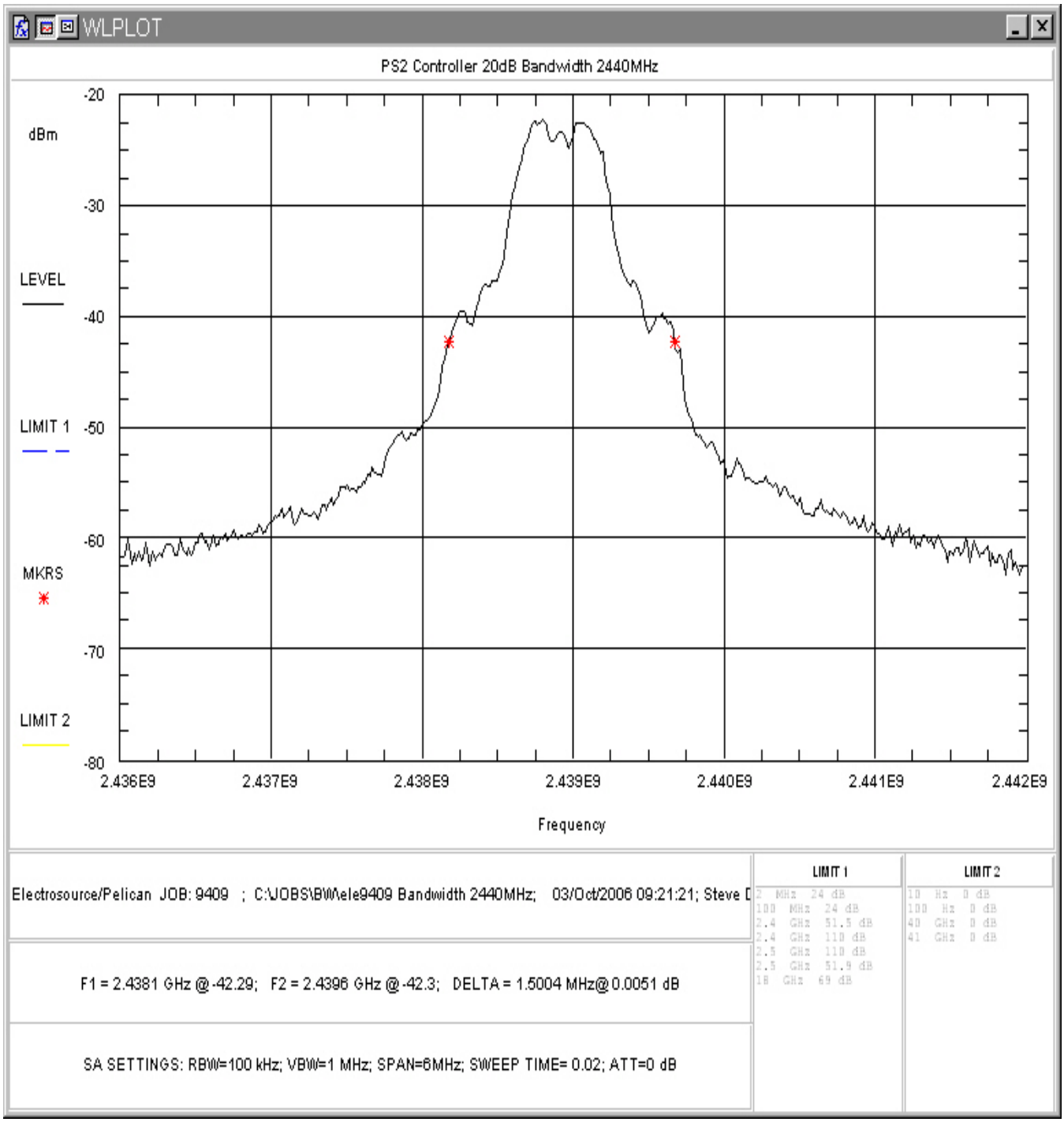

Figure 4-2. Occupied Bandwidth, Mid Channel, 2439MHz

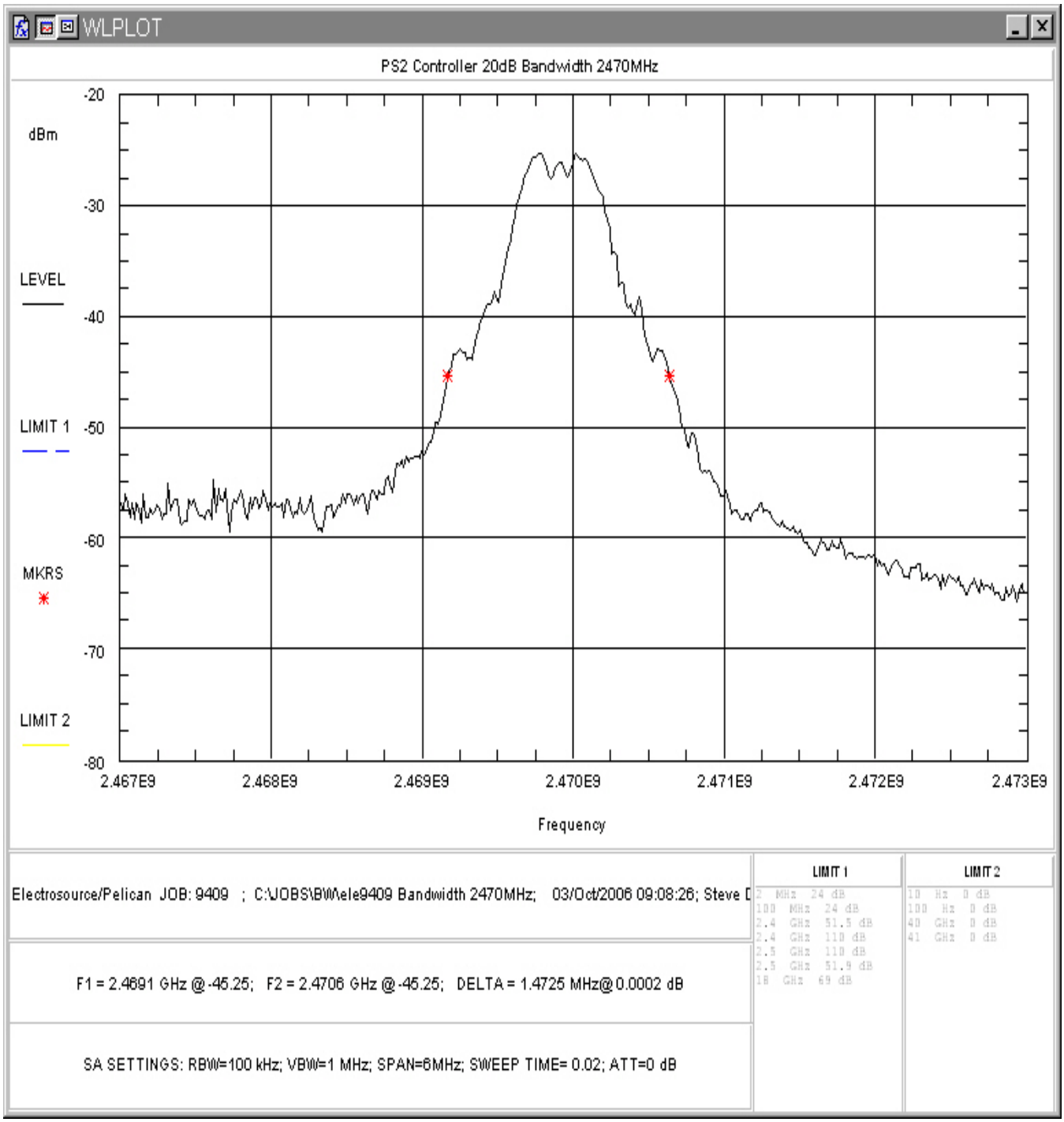

Figure 4-3. Occupied Bandwidth, High Channel, 2470MHz

Table 3 provides a summary of the Occupied Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth
Low Channel 2407MHz	1.499MHz
Mid Channel 2440MHz	1.500MHz
High Channel 2470MHz	1.472MHz

4.2 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 GHz	250,000	2500

4.2.1 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 C63.4-2003. 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	120kHz	>100 kHz
>1000 MHz	1 MHz	3000 Hz (Avg.) 1MHz (Peak)

Emissions were measured to the 10th harmonic of the transmit frequency. Worst case emission levels are reported. No emissions were detected above the 3rd harmonic.

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): EdBµV/m = VdBµV + AFdB/m + CCdB + DCCdB - GdB

Table 5: Radiated Emission Test Data, Fundamental

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
Low Ch.											
2407.000	H	65.0	1.0	57.1	29.2	2.9	89.2	28857.3	50000.0	-4.8	**Avg**
2407.000	V	120.0	1.0	56.0	29.2	2.9	88.1	25424.7	50000.0	-5.9	**Avg**
Mid Ch.											
2439.000	H	65.0	1.0	53.9	29.2	3.0	86.0	20034.3	50000.0	-7.9	**Avg**
2439.000	V	260.0	1.0	55.7	29.2	3.0	87.9	24789.8	50000.0	-6.1	**Avg**
High Ch.											
2470.000	H	268.0	1.0	53.1	29.3	3.0	85.4	18540.2	50000.0	-8.6	**Avg**
2470.000	V	214.0	1.0	53.5	29.3	3.0	85.8	19414.0	50000.0	-8.2	**Avg**
Low Ch.											
2407.000	H	65.0	1.0	58.6	29.2	2.9	90.7	34297.0	500000.0	-23.3	**Peak**
2407.000	V	120.0	1.0	58.0	29.2	2.9	90.1	32007.8	500000.0	-23.9	**Peak**
Mid Ch.											
2439.000	H	65.0	1.0	55.6	29.2	3.0	87.8	24506.0	500000.0	-26.2	**Peak**
2439.000	V	260.0	1.0	57.2	29.2	3.0	89.4	29462.7	500000.0	-24.6	**Peak**
High Ch.											
2470.000	H	268.0	1.0	54.0	29.3	3.0	86.3	20564.3	500000.0	-27.7	**Peak**
2470.000	V	214.0	1.0	55.5	29.3	3.0	87.8	24440.8	500000.0	-26.2	**Peak**

Table 6: Radiated Emission Test Data, Spurious Emissions

Frequency (MHz)	Polarity H/V	Az Deg	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)	Notes
Low Ch.												
4814.000	V	18.0	1.0	51.3	32.9	4.1	37.2	51.0	356.5	500.0	-2.9	Avg
7221.000	H	180.0	1.0	39.8	36.8	5.0	37.5	44.1	160.2	500.0	-9.9	Avg
7221.000	V	180.0	1.0	42.1	36.8	5.0	37.5	46.4	208.8	500.0	-7.6	Avg
2390.000	H	334.0	1.0	53.8	29.1	2.9	38.1	47.7	244.1	5000.0	-26.2	Peak
2390.000	V	18.0	1.0	55.5	29.1	2.9	38.1	49.4	296.8	5000.0	-24.5	Peak
4814.000	H	33.0	1.0	48.7	32.9	4.1	37.2	48.4	263.4	5000.0	-25.6	Peak
4814.000	V	18.0	1.0	57.2	32.9	4.1	37.2	56.9	700.7	5000.0	-17.1	Peak
7221.000	H	180.0	1.0	54.5	36.8	5.0	37.5	58.8	870.3	5000.0	-15.2	Peak
7221.000	V	180.0	1.0	57.9	36.8	5.0	37.5	62.2	1287.3	5000.0	-11.8	Peak
Mid Ch.												
4880.000	V	360.0	1.0	51.5	33.0	4.1	37.2	51.4	371.0	500.0	-2.6	Avg
7317.000	H	180.0	1.0	38.4	36.9	5.0	37.6	42.8	137.4	500.0	-11.2	Avg
7317.000	V	180.0	1.0	37.4	36.9	5.0	37.6	41.8	122.5	500.0	-12.2	Avg
4880.000	H	129.0	1.0	48.3	33.0	4.1	37.2	48.2	256.5	5000.0	-25.8	Peak
4880.000	V	360.0	1.0	57.8	33.0	4.1	37.2	57.7	766.2	5000.0	-16.3	Peak
7317.000	H	180.0	1.0	52.8	36.9	5.0	37.6	57.2	721.3	5000.0	-16.8	Peak
7317.000	V	180.0	1.0	55.7	36.9	5.0	37.6	60.1	1007.2	5000.0	-13.9	Peak
High Ch.												
4940.000	H	60.0	1.0	42.3	33.2	4.1	37.2	42.3	131.0	500.0	-11.6	Avg
4940.000	V	0.0	1.0	50.8	33.2	4.1	37.2	50.8	348.5	500.0	-3.1	Avg
7470.000	H	180.0	1.0	37.9	37.0	5.1	37.6	42.4	131.4	500.0	-11.6	Avg
7470.000	V	180.0	1.0	39.0	37.0	5.1	37.6	43.5	149.1	500.0	-10.5	Avg
2483.500	H	19.0	1.0	52.3	29.3	3.0	38.1	46.5	211.4	5000.0	-27.5	Peak
2483.500	V	12.0	1.0	51.3	29.3	3.0	38.1	45.5	188.4	5000.0	-28.5	Peak
4940.000	H	60.0	1.0	48.7	33.2	4.1	37.2	48.7	273.7	5000.0	-25.2	Peak
4940.000	V	0.0	1.0	57.0	33.2	4.1	37.2	57.0	711.6	5000.0	-16.9	Peak
7470.000	H	180.0	1.0	53.7	37.0	5.1	37.6	58.2	810.1	5000.0	-15.8	Peak
7470.000	V	180.0	1.0	55.4	37.0	5.1	37.6	59.9	985.3	5000.0	-14.1	Peak

