

E. F. ELECTRONICS CO.  
217 W. MILL ST.  
MONTGOMERY, ILLINOIS 60538

REPORT NUMBER: 3541

EN 61000-3-2:2014+A1:2021 HARMONICS

Part 3: Limits-Section 2: Limits for Harmonic Current Emissions with Equipment  
Input Current Less Than 16 Amp per Phase.

EN 61000-3-3:2013+A1:2019 VOLTAGE FLUCTUATIONS

Par 3 Limits Section 3: Limits of Voltage Changes, Voltage Fluctuations and Flicker  
In Public Low-Voltage Supply Systems for Equipment with Rated Current less than or  
equal to 16 Amp per Phase. And not Subject to Conditional Connection.

THE FOLLOWING MEETS THE ABOVE SPECIFICATION:

TEST ITEM: Oberon Biofeedback/Biosensing Device  
Model Number: 10

Type of Equipment: Digital Device

Test Configuration: Normal Power, 230VAC 50Hz

Test Date: May 16, 2022

Manufacturer: Oberon  
26305 NE 44<sup>th</sup> St.  
Camus, WA 98607

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# E. F. ELECTRONICS COMPANY

RFI/EMC Testing Services

217 W. Mill St.  
Montgomery, IL 60538  
(630) 897-1950

## ADMINISTRATIVE DATA

TESTS PERFORMED FOR: PRODUCT SAFETY CONSULTING INC,  
600 COUNTRY CLUB DR. Ste I and J  
BENSENVILLE, IL. 60106

TEST SPECIFICATION: EN 61000-3-2:2014+A1:2021 HARMONICS  
EN 61000-3-3:2013+A1:2019 VOLTAGE FLUCTUATIONS

TEST ITEM: Oberon Biofeedback/Biosensing Device  
Model 10  
s/n RD15A-2102

TEST DATE: May 16, 2021

TEST REPORT NO. 3541

TESTS PERFORMED BY:



Edward J. French  
Narte Certified EMC Engineer  
EMC-002194-NE

## HARMONIC CURRENT AND FLICKER MEASUREMENTS

### 1.0 INTRODUCTION:

On May 16, 2022, a series of harmonic current and voltage fluctuation measurements was performed on a Oberon Biofeedback/Biosensing Device to determine if it could comply with European Union Norms EN 61000-3-2 for harmonic current emissions and EN 61000-4-3 for voltage fluctuations (flicker).

### 2.0 TEST FACILITY IDENTIFICATION:

All tests were performed by E. F. Electronics Company at their test facility located at 217 W. Mill St, Montgomery, Illinois.

### 3.0 TEST ITEM DESCRIPTION:

The Oberon Biofeedback System is a digital device, which was operated from a Hewlett-Packard Laptop PC. The Biofeedback has a sensor which when placed upon a body part measures electrical activity and provides therapy to a headset.

The device was powered by the USB connection to the HP Laptop.

All tests were performed for the Full Body Scan mode of operation.

The measurements were performed on the 230 VAC 50Hz power supply of the HP Laptop.

### 4.0 TEST ITEM SETUP:

Detailed test setup information is provided in Appendix A for the Harmonic Current test and Appendix B for the Voltage Fluctuations test.

The Voltech PM3000A and the Voltech IEC 61000-3 LISN are the basic test instruments which are controlled by a PC using the Voltech software. This provides for the proper IEC measurement method with data output.

The software provides for "Pass" or "Fail" determination and a printout of the relevant parameters measured.

### 5.0 RESULTS OF TEST:

The test data is presented in Appendices A and B of this report. All harmonic current measurements and Flicker (voltage variations) were below the specification limits.

### 6.0 CONCLUSION:

The Oberon Biofeedback System, Model 10 did comply with European Union Norms EN 61000-3-2 for Harmonic Currents and EN 61000-3-3 for Voltage Fluctuations.

APPENDIX A  
HARMONIC CURRENT EMISSIONS  
EN 61000-3-2

## HARMONIC CURRENT EMISSION MEASUREMENTS

### 1.0 PURPOSE:

This test measures the harmonic current emissions on the AC power line using IEC Standard 61000-3-2.

### 2.0 TEST PROCEDURE:

The test was performed using a Voltech PM3000A power analyzer which was controlled from a standard Personal Computer. The IEC test software was provided by Voltech Corporation.

### 3.0 TEST EQUIPMENT

The test equipment used is listed in Table I, located at the end of this report. The requirements for the measurement equipment are described in IEC 61000-4-7. The test voltage shall be maintained with  $\pm 2.0\%$  and the frequency within  $\pm 0.5\%$  of the nominal value. (IEC 61000-3-2 Annex A Clause A.2)

### 4.0 LEADS TESTED:

The test was performed for the 230VAC 50Hz power line. AC power was derived from the Voltech PM3000A analyzer.

### 5.0 REQUIREMENTS:

Figure 1 provides a flowchart for determining conformity. Clause 5 of IEC 61000-3-2 is used to determine the equipment class. For this product, Class A applies. The test observation period was determined from IEC 61000-3-2 Table 4. A 2-minute period was satisfactory to meet the repeatability requirement of IEC 61000-3-2 Clause 6.3.2.1.

TABLE II  
CLASS A LIMITS

### ODD HARMONICS:

HARMONIC NUMBER N	MAXIMUM CURRENT LIMIT in AMPERES
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15 to 39	$0.15 * 15/N$

## EVEN HARMONICS:

HARMONIC NUMBER N	MAXIMUM CURRENT LIMIT in AMPERES
2	1.08
4	0.43
6	0.30
8 to 40	$0.23 * 8/N$

### 5.2 PARTIAL ODD HARMONIC CURRENT:

The partial odd harmonic current (POHC) is defined as the square root of the sum of the squares of the odd harmonic currents of orders 21 to 39. This value shall not exceed the value calculated for the applicable limits. For Class A this value is 0.2514.

### 5.3 REPEATIBILITY REQUIREMENT:

The test duration must be sufficiently long to obtain a  $\pm 5\%$  repeatability between successive tests.

### 6.0 RESULTS OF TEST:

The measurements from the Voltech Analyzer are presented on Pages A3 through A5.

Page A3 is the summary page which indicates the fundamental current, power factor, and the computed POHC value.

Page A4 provides a table for all measured harmonic currents for comparison with the limit.

Page A5 provides a normalized graph of the measured currents against the limit.

Repeatability testing was performed using successive tests and comparing the data.

The Oberon Biofeedback/Biosensing Device, Model 10 did comply with the Harmonic Current Emission requirements of EN 61000-3-2.

**Product:** Oberon Biofeedback System

Serial no:

Page 1 of 1

Description: Full Body Scan Mode

Test Date: 5-16-22

Result Name:

**Type of Test:** EN61000:2001 Harmonics

Limits: Class A

Power Analyzer: Voltech PM3000A v2.22 s/n 4566

AC Source: Mains / Manual Source

**Harmonic Results**  
Against Chosen Limits:

Notes:

**PASS**

**Test Parameter Details**

	User Entered	Measured
Operating Frequency:	50	50.0439
Operating Voltage:	230	227.4186
Specified Power:	0.0000	0.0306
Fundamental Current:	0.0000	0.0027
Power Factor:	0.0000	0.0488
Average Input Current:		0.0027
Maximum POHC:		0.0005
POHC Limit:		0.2514
Maximum THC:		0.0005
Minimum Power:	75	
Class Multiplier:	1.0000	
Test Duration:	00:00:30	

Product: Biofeedback System

Serial no:

Description: Full Body Scan Mode

Result Name:

Page 1 of 1

Voltech IEC1000-3 Windows Software 3.13.08

Test Date: 5-16-22

Type of Test: Fluctuating Harmonics Test - Worst Case Table (2001)

Power Analyzer: Voltech PM3000A v2.22 s/n 4566

AC Source: Mains / Manual Source

Overall Result:

Notes:

PASS

Class	Class A
Class Multiplier	1

Harm	Limit 1	Limit 2	Average Reading	<L1 <L2	Max Reading	<L2	Pass FAIL	Harm	Limit 1	Limit 2	Average Reading	<L1 <L2	Max Reading	<L2	Pass FAIL
2	1.0800A	1.6200A	0.014mA	✓ ✓	0.014mA	✓	N/A	3	2.3000A	3.4500A	0.014mA	✓ ✓	0.014mA	✓	N/A
4	430.0mA	645.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	5	1.1400A	1.7100A	0.014mA	✓ ✓	0.014mA	✓	N/A
6	300.0mA	450.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	7	770.0mA	1.1550A	0.031mA	✓ ✓	0.038mA	✓	N/A
8	230.0mA	345.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	9	400.0mA	600.0mA	0.044mA	✓ ✓	0.044mA	✓	N/A
10	184.0mA	276.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	11	330.0mA	495.0mA	0.055mA	✓ ✓	0.064mA	✓	N/A
12	153.3mA	230.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	13	210.0mA	315.0mA	0.073mA	✓ ✓	0.073mA	✓	N/A
14	131.4mA	197.1mA	0.014mA	✓ ✓	0.014mA	✓	N/A	15	150.0mA	225.0mA	0.073mA	✓ ✓	0.076mA	✓	N/A
16	115.0mA	172.5mA	0.014mA	✓ ✓	0.014mA	✓	N/A	17	132.3mA	198.5mA	0.073mA	✓ ✓	0.073mA	✓	N/A
18	102.2mA	153.3mA	0.014mA	✓ ✓	0.014mA	✓	N/A	19	118.4mA	177.6mA	0.074mA	✓ ✓	0.077mA	✓	N/A
20	92.00mA	138.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	21	107.1mA	160.7mA	0.073mA	✓ ✓	0.073mA	✓	N/A
22	83.63mA	125.4mA	0.014mA	✓ ✓	0.014mA	✓	N/A	23	97.82mA	146.7mA	0.073mA	✓ ✓	0.073mA	✓	N/A
24	76.66mA	115.0mA	0.014mA	✓ ✓	0.014mA	✓	N/A	25	90.00mA	135.0mA	0.073mA	✓ ✓	0.073mA	✓	N/A
26	70.76mA	106.1mA	0.014mA	✓ ✓	0.014mA	✓	N/A	27	83.33mA	125.0mA	0.086mA	✓ ✓	0.095mA	✓	N/A
28	65.71mA	98.57mA	0.014mA	✓ ✓	0.014mA	✓	N/A	29	77.58mA	116.3mA	0.142mA	✓ ✓	0.150mA	✓	N/A
30	61.33mA	92.00mA	0.014mA	✓ ✓	0.014mA	✓	N/A	31	72.58mA	108.8mA	0.294mA	✓ ✓	0.304mA	✓	N/A
32	57.50mA	86.25mA	0.015mA	✓ ✓	0.016mA	✓	N/A	33	68.18mA	102.2mA	0.288mA	✓ ✓	0.297mA	✓	N/A
34	54.11mA	81.17mA	0.014mA	✓ ✓	0.014mA	✓	N/A	35	64.28mA	96.42mA	0.103mA	✓ ✓	0.105mA	✓	N/A
36	51.11mA	76.66mA	0.014mA	✓ ✓	0.014mA	✓	N/A	37	60.81mA	91.21mA	0.047mA	✓ ✓	0.052mA	✓	N/A
38	48.42mA	72.63mA	0.014mA	✓ ✓	0.014mA	✓	N/A	39	57.69mA	86.53mA	0.083mA	✓ ✓	0.091mA	✓	N/A
40	46.00mA	69.00mA	0.014mA	✓ ✓	0.014mA	✓	N/A								

<L1 : Reading is below limit 1.

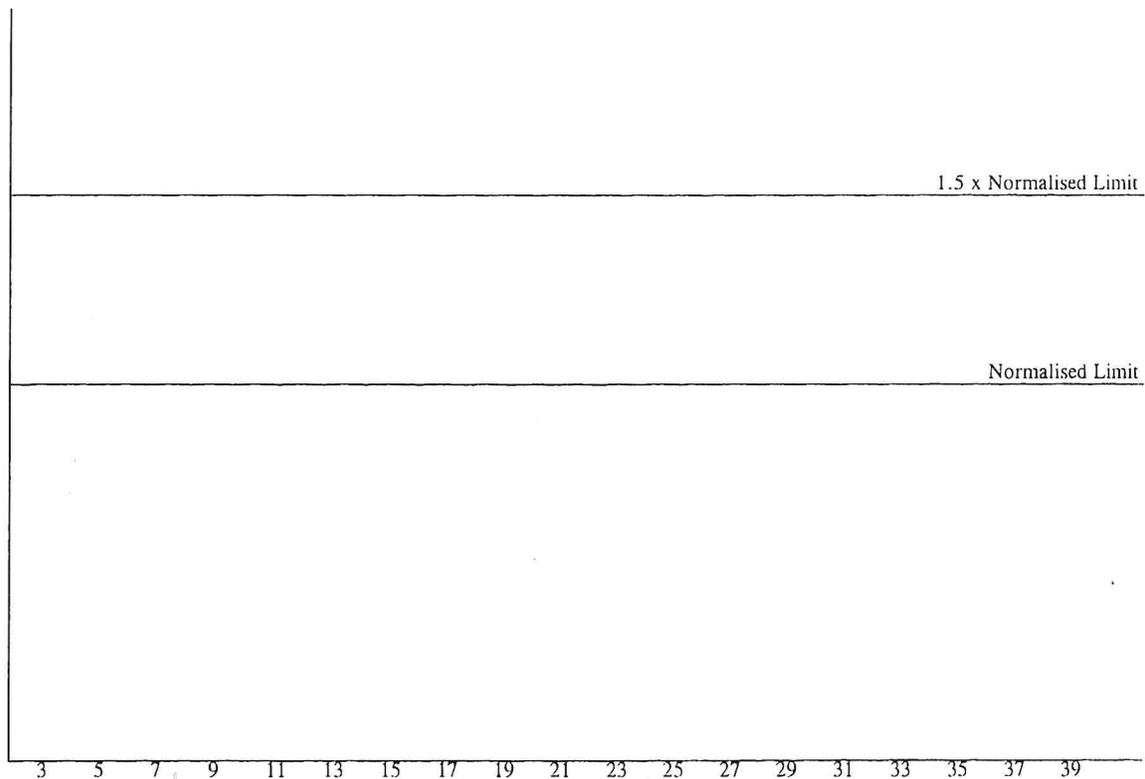
<L2 : Reading is below limit 2.

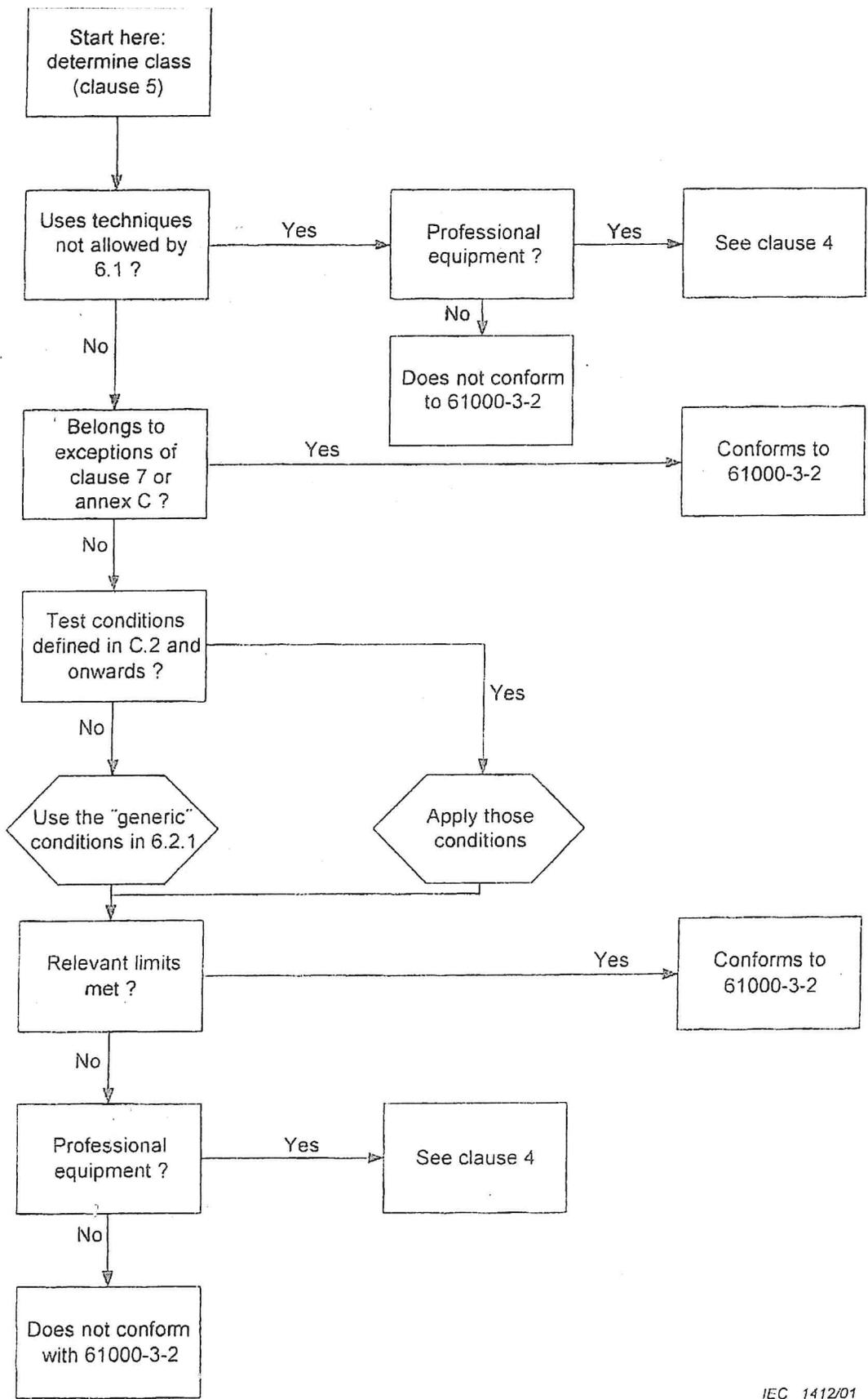
N/A : Harmonic current below 0.6% of rated current or 5mA, whichever is greater, are disregarded.

Product: Biofeedback System		Page 1 of 1
Serial no:		
Description: Full Body Scan		
Result Name:		
Voltech IEC1000-3 Windows Software 3.13:08		Test Date: 5-16-22
Type of Test:	Fluctuating Harmonics Test - Normalised Bar Chart (2001)	
Power Analyzer:	Voltech PM3000A v2.22 s/n 4566	
AC Source:	Mains / Manual Source	
Overall Result:	Notes:	

Class	Class A
Class Multiplier	1

Reading 1





IEC 1412/01

Figure 1 -- Flowchart for determining conformity



Test setup for Harmonic Current and Voltage Fluctuations (Flicker) Measurement on the 230VAC Power Line

APPENDIX B  
VOLTAGE FLUCTUATIONS (FLICKER)  
EN 61000-3-3

## APPENDIX B

### IEC 61000-3-3 VOLTAGE FLUCTUATIONS TEST

#### 1.0 PURPOSE:

This test measures the voltage fluctuations on the AC power mains which result from operation of the test item.

The object is to minimize objectionable fluctuations or flicker of lighting systems used on the same AC power mains.

#### 2.0 REQUIREMENTS:

The limits are shown in Table B-1. These are for short term, long term and maximum voltage variations.

#### 3.0 TEST PROCEDURE:

The test item received 230VAC 50Hz power from a Voltech IEC 61000-3-3 LISN. A Voltech PM3000A power analyzer was used to measure the voltage fluctuations over a five-minute time interval. The test was performed using software provided by Voltech.

The Voltech Flickermeter was configured using the test software. The test was run, and the long term, short term and maximum voltage fluctuations were measured and recorded. The test time for the measurement of short duration flicker was ten minutes.

The long-term flicker value was determined over a two-hour measurement period in which all successive short-term flicker values are all below the long-term flicker limit of 0.650.

#### 4.0 RESULTS OF TEST:

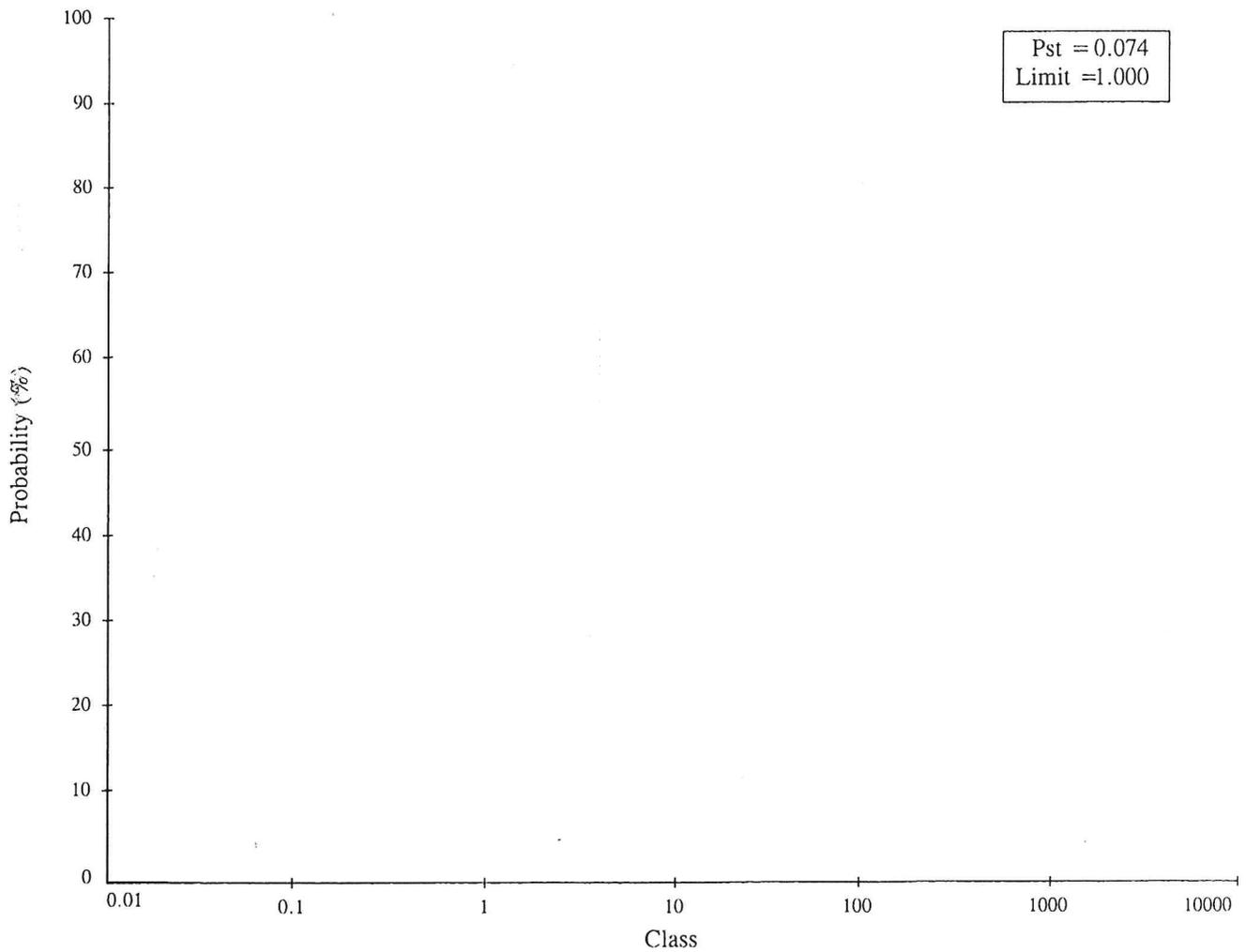
The data is presented at the end of this Appendix. The Oberon Biofeedback System did comply with EN 61000-3-3 Part 3 for Voltage Fluctuations.

Product: Biofeedback System		Page 1 of 1
Serial no:		
Description: Full Body Scan		
Result Name:		
Voltech IEC1000-3 Windows Software 3.13.08		Test Date: 5-16-22
Type of Test:	Flickermeter Test - Table	
Power Analyzer:	Voltech PM3000A v2.22 s/n 4566	
AC Source:	Mains / Manual Source	
Overall Result:	Notes:	
<b>PASS</b>	Measurement method - Voltage	

	Pst	dc (%)	dmax (%)	d(t) > 3.3%(ms)
Limit	1.000	3.300	4.000	500
Reading 1	0.074	0.031	0.119	0

Product: Biofeedback System		Page 1 of 1
Serial no:		
Description: Full Body Scan		
Result Name:		
Voltech IEC1000-3 Windows Software 3.13.08		Test Date: 5-16-22
Type of Test:	Flickermeter Test - Pst Curve	
Power Analyzer:	Voltech PM3000A v2.22 s/n 4566	
AC Source:	Mains / Manual Source	
Overall Result:	Notes:	
PASS	Measurement method - Voltage	

Pst Curve 1



**TABLE B-1**  
**LIMITS- VOLTAGE FLUCTUATIONS**

The limits shall be applicable to voltage fluctuations and flicker at the supply terminals of the equipment under test, measured or calculated according to clause 4 under test conditions, described in clause 6 and annex A. Tests made to prove compliance with the limits are considered to be type tests.

The following limits apply:

The value of  $P_{st}$  shall not be greater than 1.0

The value of  $P_{lt}$  shall not be greater than 0.65

$T_{max}$ , the accumulated time value of  $d(t)$  with a deviation exceeding 3.3% during a single voltage change at the EUT terminals shall not exceed 500ms.

The maximum relative steady-state voltage change,  $d_c$  shall not exceed 3.3%.

The maximum relative voltage change  $d_{MAX}$ , shall not exceed:

a) 4% without additional conditions

b) 6% for equipment which is:

Switched manually, or

Switched automatically more frequently than twice per day, and also has either a delayed restart (the delay not being less than a few tens of seconds), or manual restart, after a power supply interruption.

$P_{st}$  and  $P_{lt}$  requirements shall not be applied to voltage changes associated with manual switching.

TABLE I  
EQUIPMENT LIST

MANUFACTURER/DESCRIPTION	MODEL	SERIAL NO.	CAL DATE
Voltech Power Analyzer	PM3000A	4566	8-15-21
Voltech IEC Network	IEC 1000	7181	8-15-21
Elgar 50Hz power source	CW2501M	0715A00297	8-15-21

All calibrations are on a yearly basis, traceable to the NIST

**TABLE II**  
**TEST ITEM CONFIGURATION FOR CE EMISSIONS AND IMMUNITY TESTS**

**MANUFACTURER:** OBERON

**TEST ITEM:** BIOFEEDBACK/BIOSENSING DEVICE  
**INPUT POWER:** From HP LAPTOP using USB CONNECTION  
**Size:** 8.75" by 6.5" by 1.50"

**ACCESSORIES:** Biofeedback Sensor with 26" Cable Length  
Koss Headphones (Modified) with 107" Cable Length

**CABLES:** USB Cable with ferrite at each end, 76" long.

**PC:** Hewlett-Packard Laptop, provided by Product Safety Inc.  
Powered from 230VAC 50Hz

**EMI MODIFICATIONS:** None