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

REPORT NUMBER: 3540

EN 55032:2015 +A1;2020 (CISPR 32:2015)
Multimedia Equipment, Emissions, Class B RF Emissions

THE FOLLOWING MEETS THE ABOVE SPECIFICATION:

Formal Names: BIOFEEDBACK/BIOSENSING DEVICE

Type of Equipment: Digital Diagnostic Device

Test Configuration: Normal Power, 230VAC 50Hz

Test Dates: May 12 and 13, 2022

Manufacturer: Oberon
26305 NE 44th St.
Camus, WA. 98607

Tests Performed for: Product Safety Consulting Inc.
605 Country Club Dr. Ste I and J
Bensenville, IL. 60106-1330

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E. F. ELECTRONICS COMPANY
RFI/EMC Testing Services
217 W. Mill St.
Montgomery, IL 60538
(630) 897-1950

ADMINISTRATIVE DATA

MANUFACTURER: Oberon
26305 NE 44th. St.
Camus, WA. 98607

TESTS PERFORMED FOR: Product Safety Consulting inc.
605 Country Club Dr. Ste I and J
Bensenville, IL 60106-1330

TEST SPECIFICATION: EN55032:2015 +A1:2020 (CISPR 32:2015)
Multimedia Equipment, Emissions, Class B RF Emissions.

TEST ITEM: BIOFEEDBACK/BIOSENSING DEVICE
No. 7604
Model 10

TYPE OF EQUIPMENT: Digital Device

TEST DATES: May 12 and 13, 2022

TEST REPORT NO: 3540

TESTS PERFORMED BY:

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

EN 55032 CONDUCTED AND RADIATED EMISSION MEASUREMENTS ON A OBERON BIOFEEDBACK/BIOSENSING DEVICE.

1.0 INTRODUCTION:

On May 12 and 13, 2022, a series of conducted and radiated emission measurements were performed on an Oberon Biofeedback/Biosensing Device to determine if it could comply with European Union specification EN 55032 for Class B equipment.

2,0 TEST FACILITY IDENTIFICATION:

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

The radiated emission test was performed at a three-meter open area test site (OATS).

3.0 TEST ITEM DESCRIPTION:

The Oberon Biofeedback System is a diagnostic device which operates from a Lap Top PC using proprietary software.

The Biofeedback device was connected to a Hewlett-Packard Laptop PC using a USB cable. Its electrical power was derived from the USB cable which was connected to the HP Laptop PC. The HP Laptop PC received 230VAC power from the HP power supply.

The Biofeedback device received input patient biological signals from a biofeedback sensor which can be located near various patient organs. A headset was provided for providing therapeutic stimulus to the patient.

The only control for the device was the power on/off switch.

The emissions tests were performed for the "Full Body Scan" mode selected by operating the SCAN bar of the PC, with a test duration of approximately ten minutes.

4.0 APPLICABLE DOCUMENTS:

EN 55032:2015 +A1:2020 (CISPR 32:2015) Multimedia Equipment, Class B RF Emissions.

5.0 TEST EQUIPMENT:

The test equipment used for the performance of all tests is listed in Table I. All equipment is calibrated on a yearly basis with traceability to the NIST.

6.0 TEST SETUP:

The test setup was placed on top of an 80 cm. high wood stand. The Headphones and biofeedback sensor were placed on top of the wood tabletop.

Electrical power for the PC was derived from an Electrometrics ANS-2/2 Line Impedance Stabilization Network (LISN.

The LISN construction complies with CISPR 16, Section 2.

7.0 SPECIFICATION REQUIREMENTS:

CONDUCTED EMISSIONS:

The conducted emissions from a Class B device shall be below the following limits when measured using a 50 ohm/50 microhenry Line Impedance Stabilization Network (LISN):

Frequency MHz	Limit in dBμV CISPR Quasi-Peak	Limit in dBμV Average
0.15-5.0	66 to 56	56 to 46
0.5 to 5.0	56.0	46.0
5-30	60.0	50.0

The tighter limit shall apply at the edge of each band.

RADIATED EMISSIONS: The radiated field strengths from a Class B digital device, as determined at 10 meters, using CISPR Quasi-Peak detection, shall not exceed the following values:

Frequency (MHz)	Limit in dBμV/m
30-230	30.0
230-1000	37.0

Since the highest frequency used by the device is less than 100MHz, emissions measurement need only be performed up to a frequency of 1.0 GHz.

8.0 TEST PROCEEDURES FOR EMISSION MEASUREMENT:

CONDUCTED EMISSIONS: The test setup was placed on an 80 cm. high wood stand. located in the anechoic chamber. The AC powers cord was connected to an Electrometrics ANS 25/2 LISN and EMCO 3725/2 LISN which were located on the floor and bonded to the facility ground.

The test items and support equipment were arranged as shown in Figure D.8 of EN 55032. The excess cable length shall not hang closer than 40 cm to the reference ground plane and excess length shall be bundled into a 30 to 40 cm loop.

Conducted emissions were measured using a Hewlett Packard 8568B spectrum analyzer with a 10kHz bandwidth and peak detection. The analyzer was connected to the meter port of the LISN through Solar Electronics 7930-100 high pass filter. The filter rejects out of band emi below 150kHz.

The conducted emissions were measured and plotted for the worst-case operating mode. This was done for the high and low sides of the 230 VAC power line.

Manual "Average" and "Quasi-Peak" measurements were performed in instances where the limit was exceeded. A "Decision tree" for peak detector measurements is presented at the end of this report explains this process.

RADIATED EMISSIONS: A preliminary radiated scan was performed inside the anechoic chamber, at a one-meter distance, to identify frequencies of significant emission for further evaluation during the open field radiated test.

The open field test was performed at a three-meter distance. The test item was placed on a 80 cm high wood stand three meters from an EMCO 1052 antenna mast. The mast is equipped with a rope-pulley arrangement for varying the antenna height from one to four meters.

An Electrometrics biconical antenna was secured to the mast in the vertical polarization.

The antenna was connected to the Hewlett-Packard 8568B spectrum analyzer/85650A Quasi-peak module using a BNC cable. The Q.P. module provides for CISPR Quasi-peak detection using a 120kHz bandwidth. A Hewlett-Packard 8447D preamplifier was used to boost the receiver system sensitivity.

The spectrum analyzer was tuned to a frequency of significant emission. The test item was rotated through 360 degrees to find the side of highest emission. The antenna was then raised from one to 4 meters height to further maximize the emission.

The process of maximizing the emission was performed for each test frequency and for both horizontal and vertical antenna polarizations. An EMCO 3146A log-periodic antenna was used. for 200-1000MHz.

As the highest clock frequency is below 100MHz, measurements above 1 GHz need not be performed.

The data at three meters was converted to a field intensity expressed in dBμV/m by adding an antenna factor in dB/m to the data. The data was extrapolated to 10 meters using a linear field decay of -10 dB. The result can then be compared with the specification limit.

9.0 MODIFICATIONS FOR COMPLIANCE:

No modifications were needed for compliance.

10.0 RESULTS OF TEST:

The test data is shown on pages 4 through 10.

All emissions were determined to be below the EN 55032 Class B limits.

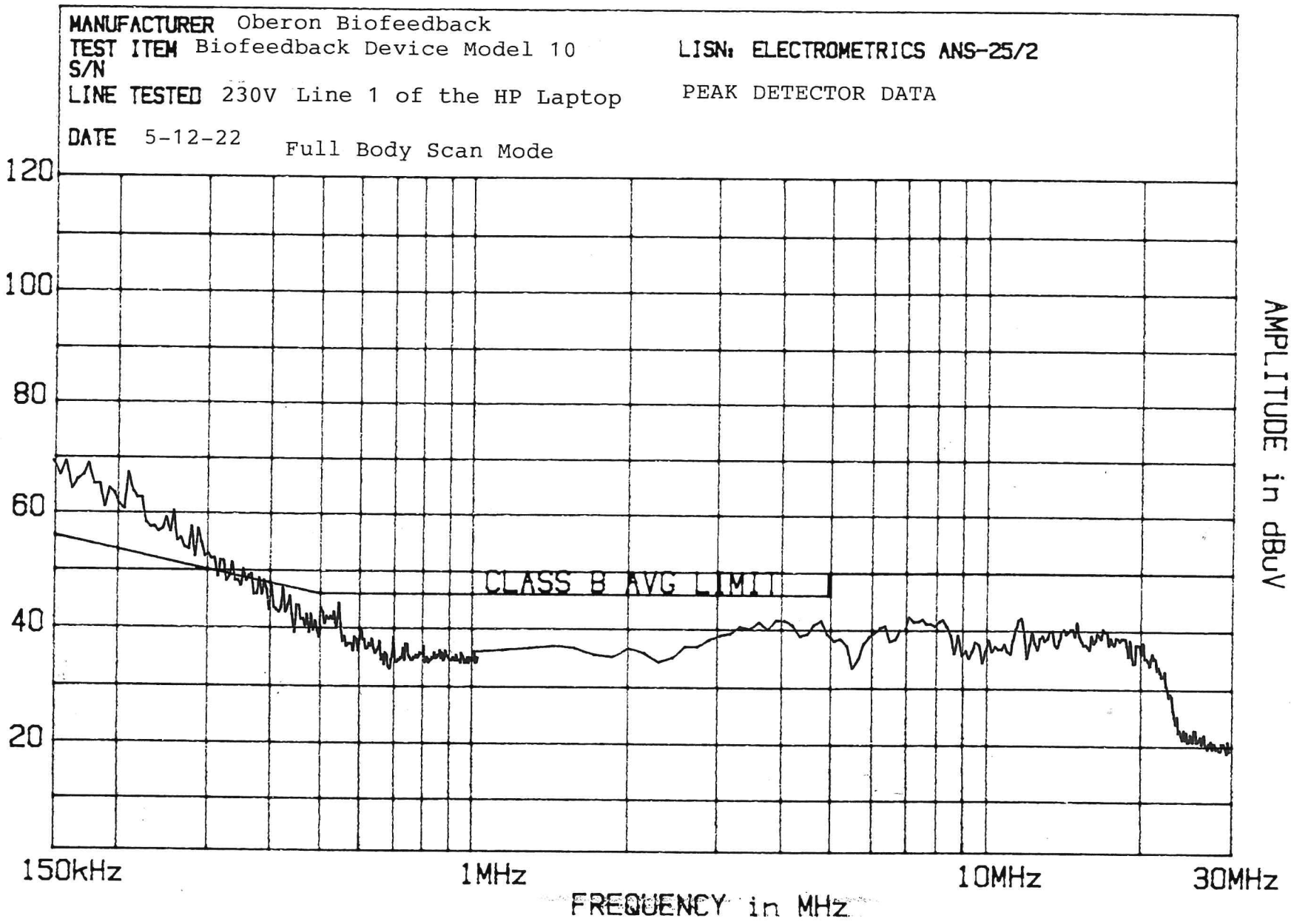
11.0 CERTIFICATION:

E. F. Electronics Company hereby certifies that the Oberon Biofeedback/Biosensing Device Model 10 did comply with European Union Specification EN 55032, Class B for Multimedia Equipment, Radio Frequency emissions.

230 V Line 1

E. F. ELECTRONICS CO.

EN55032, FCC CONDUCTED EMISSIONS



Line 2

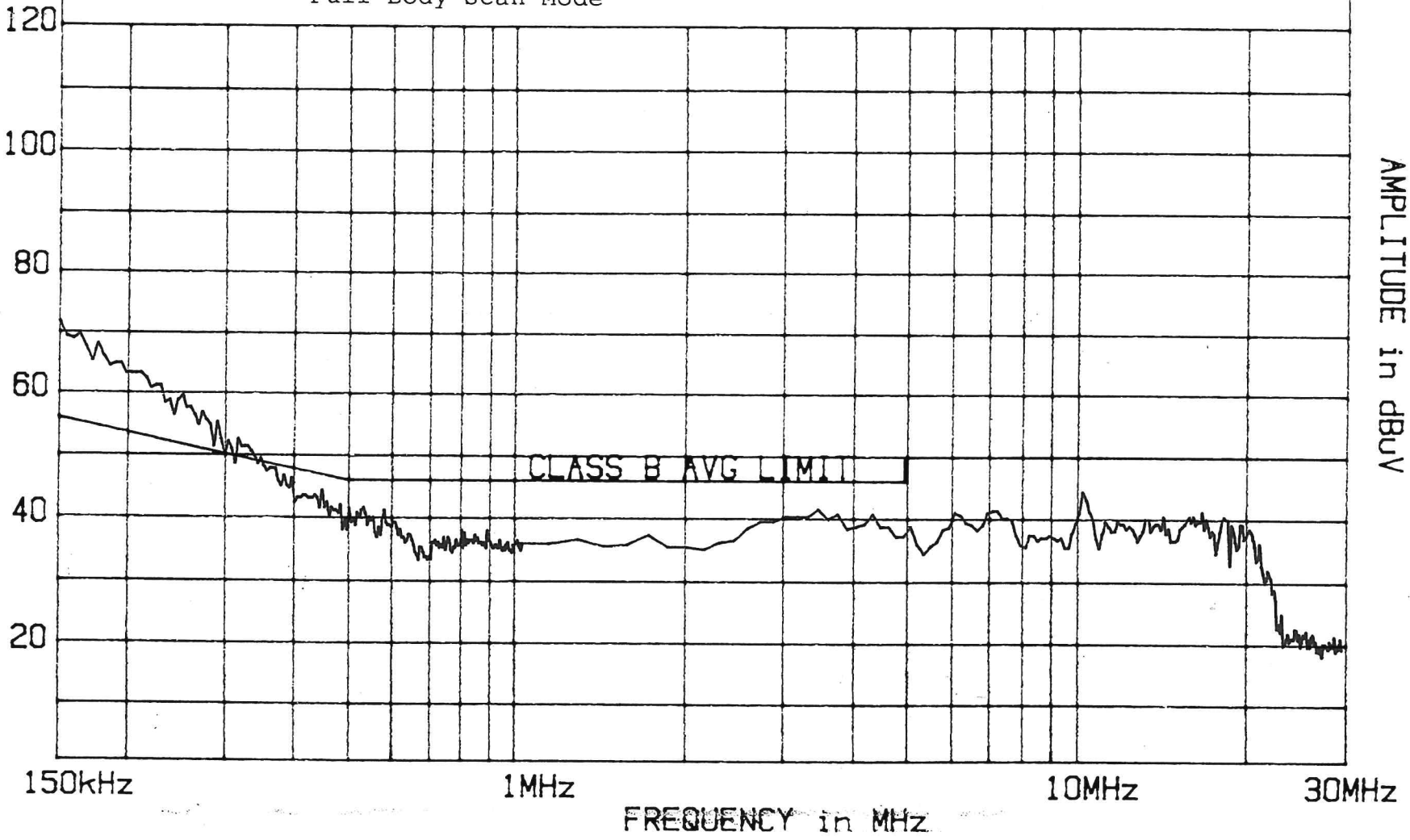
E. F. ELECTRONICS CO.

EN55032, FCC CONDUCTED EMISSIONS

RP 3540

MANUFACTURER Oberon Biofeedback
TEST ITEM Biofeedback Device Model 10
S/N
LINE TESTED 230V Line 2 of the HP Laptop
DATE 5-12-22
Full Body Scan Mode

LISN: ELECTROMETRICS ANS-25/2
PEAK DETECTOR DATA



E. F. Electronics Co.
Data Sheet

Manufacturer: Oberon
Test Item: Biofeedback/Biosensor Device
Test Specification: EN 55032 Class B Conducted Emissions
Test Date: 5-12-22
Operating Mode: Full Body Scan

Frequency MHz	Meter Read-dB	Class B Limit dBuV	Margin dB
AVERAGE DETECTOR:			
Conducted for the HP PC			
230V Line 1			
Average Detector			
0.156	28.8	55.7	26.9
0.193	30.1	53.9	23.8
0.209	28.5	53.2	24.7
0.270	27.9	51.1	23.2
0.305	25.7	48.9	23.2
Quasi-Peak Detector			
0.150	55.0	66.0	11.0
0.156	59.3	65.7	6.4
0.200	52.0	61.8	9.8
230V Line 2			
Average Detector			
0.150	22.3	56.0	33.7
0.175	24.6	54.7	30.1
0.217	27.0	53.6	26.6
0.386	21.4	48.1	26.7
Quasi-Peak Detector			
0.153	52.6	65.8	13.2
0.156	48.6	65.7	17.1
0.200	51.0	61.8	10.8

Measurement uncertainty 0.8 dB

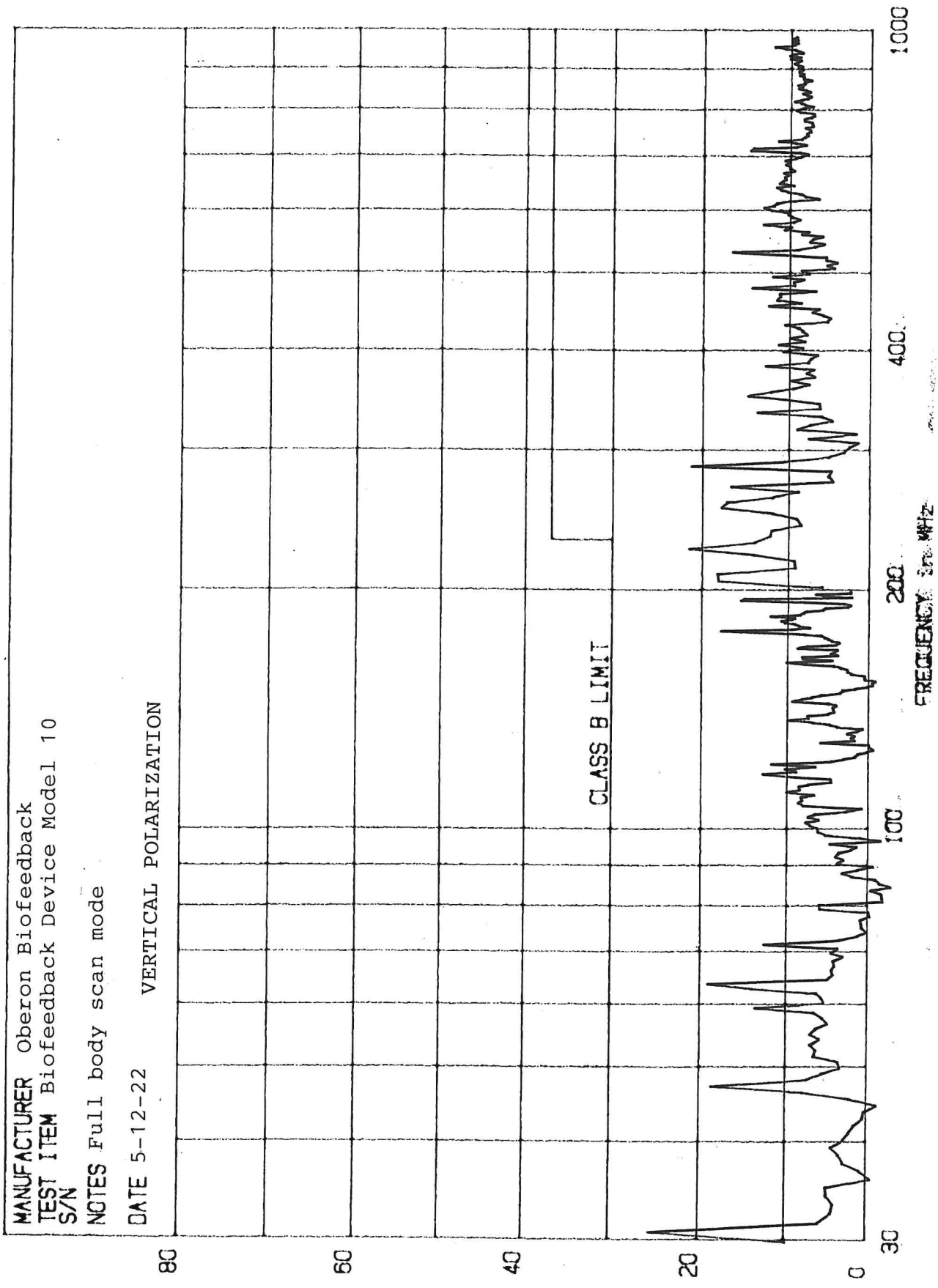
Vert

E. F. Electronics Co.

EN55032 RADIATED EMISSIONS

MANUFACTURER Oberon Biofeedback
TEST ITEM Biofeedback Device Model 10
S/N
NOTES Full body scan mode

DATE 5-12-22 VERTICAL POLARIZATION



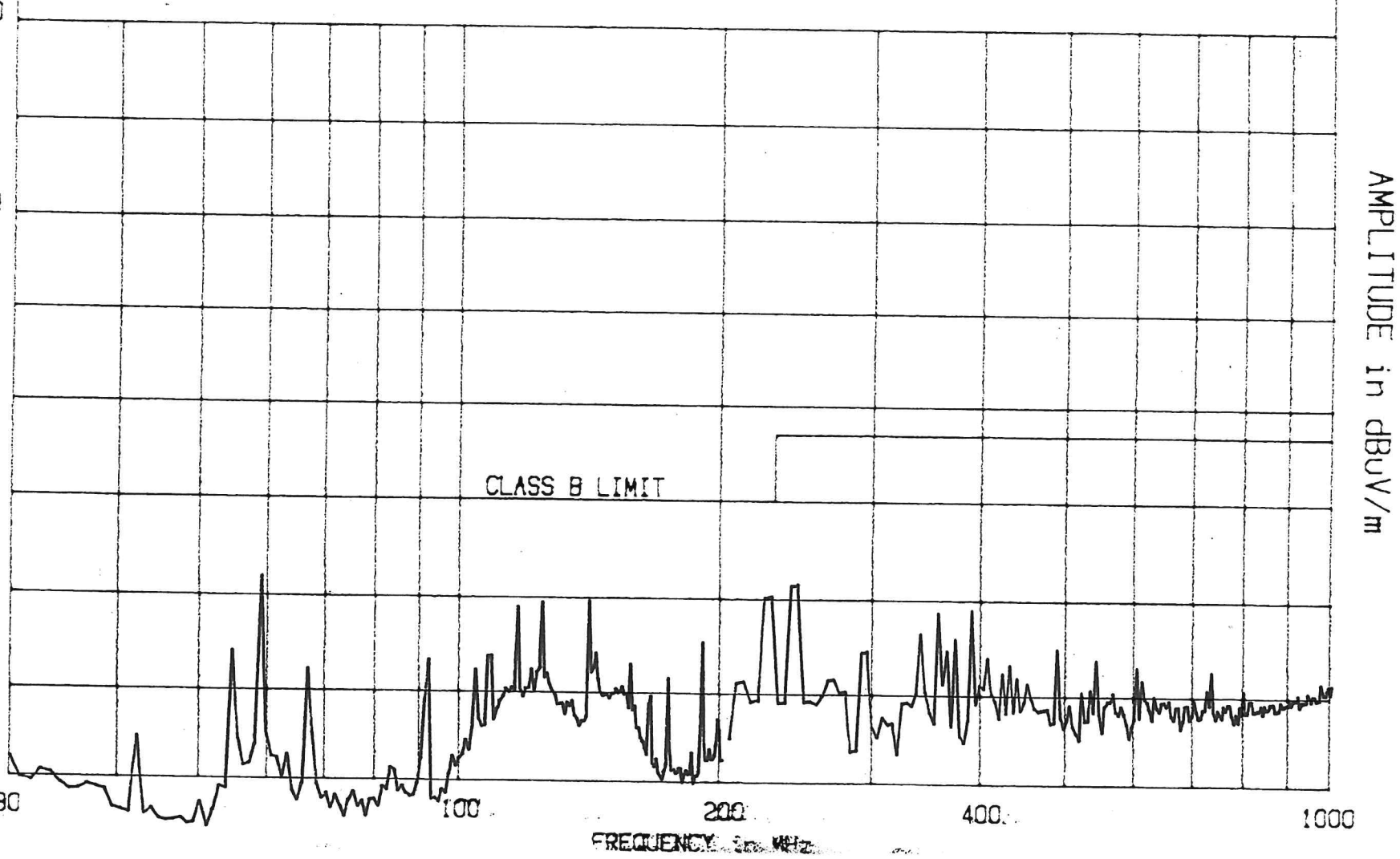
E. F. Electronics Co.

EN55032 RADIATED EMISSIONS

MANUFACTURER Oberon Biofeedback
TEST ITEM Biofeedback Device Model 10
S/N
NOTES Full body scan mode

PEAK DETECTOR DATA

DATE 5-12-22 HORIZONTAL POLARIZATION



E. F. ELECTRONICS COMPANY

DATA SHEET

Manufacturer: Oberon
Test Item: Biofeedback/Biosensor Device
Test Date: 5-13-21
Operating Mode: Full Body Scan
Test Standard: EN 55032 Class B
Quasi-Peak Data, at three meters
HORIZONTAL ANTENNA POLARIZATION

Freq Mhz	Rdg dBuV	A.F. dB	Total dBuV	Limit dBuv	Margin dB
32.6	-7.4	17.4	10.0	30.0	20.0
48.0	-3.4	12.0	8.6	30.0	21.4
59.8	6.2	7.8	14.0	30.0	16.0
63.9	17.9	7.7	25.6	30.0	4.4
72.0	8.3	8.5	16.8	30.0	13.2
95.6	11.4	12.8	24.2	30.0	5.8
128.1	4.6	16.5	21.1	30.0	8.9
154.8	4.7	16.9	21.6	30.0	8.4
192.5	6.6	18.8	25.4	30.0	4.6
207.0	6.3	17.0	23.3	30.0	6.7
224.0	8.4	14.8	23.2	30.0	6.8
288.0	4.1	16.8	20.9	37.0	16.1
350.2	2.4	18.7	21.1	37.0	15.9
400.0	1.9	17.1	19.0	37.0	18.0

Maximums: Front side of the test setup
Antenna Height 1.2 meters
Measurement uncertainty: 2.25 dB

TABLE I
EQUIPMENT LIST

MANUFACTURER/DESCRIPTION	MODEL	SERIAL NO.	CAL DATE
RECEIVERS:			
Hewlett Packard spectrum analyzer	8568B		
Display Section	85662A	2542A11893	8-14-21
RF Section	85680B	2601A02184	8-14-21
Hewlett-Packard QP Adapter	85650A	2412A00418	8-14-21
Hewlett-Packard preselector	85685A	3107A01265	8-14-21
Hewlett Packard plotter	7470A	2250A19310	---
Hewlett Packard computer	9825A	1622A010550	---
AMPLIFIERS:			
Hewlett-Packard	8447D	2944A10665	8-16-21
ANTENNAS:			
EMCO log-periodic	3146	8911-1112	8-09-21
Electrometrics Biconical	BIA-30S	348	8-09-21
MISCELLANEOUS:			
Electrometrics LISN	ANS-25/2	2550	8-11-21
Elgar 50Hz Power Supply	2501M	0717A00297	8-13-21
EMCO antenna mast	1052	2025	---
Solar Electronics High Pass Filter	7930-100	816306	8-16-21

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

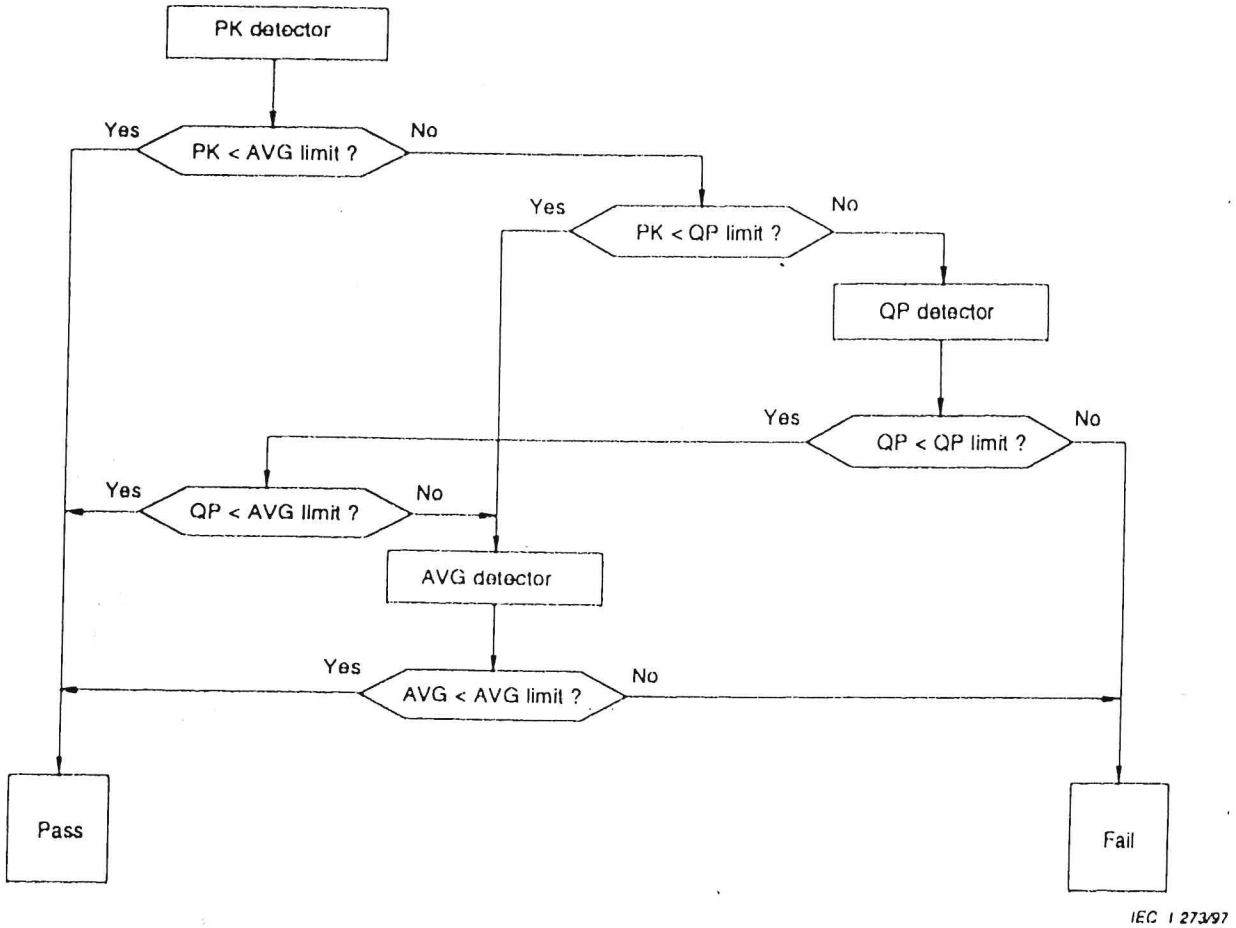
FIGURE 1

Decision tree for peak detector measurements

If using a peak measuring receiver to reduce the testing time when performing conducted disturbance measurements at the mains or the telecommunication ports in the frequency range 150 kHz to 30 MHz, the following decision tree is used to determine a final pass/fail judgement.

Spectrum analyzers or receivers provided with RF preselectors which automatically follow the frequency being scanned by the spectrum analyzer or receiver should have a sufficiently long dwell time on each frequency to avoid amplitude errors in the measured values.

In addition, in order not to influence the measurement results, the video bandwidth of the spectrum analyzer shall be equal to, or greater than, the resolution bandwidth.



PK Peak
QP Quasi-peak
AVG Average

Decision tree for peak detector measurements

Conducted Emission Measurement Test Setup

0.15-30MHz

LISN is on the floor at right side of the test setup.