

**REPORT OF MEASUREMENT SERVICE**

**for**

**Three Devices**

**Measurement Date: Sep 27, 2023**

**Sales Order No.: 12417**

**OPTRONIC**<sup>™</sup>  
LABORATORIES

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## REPORT OF MEASUREMENT SERVICE

for

### Three Devices

Customer: PBM Foundation  
Martinsburg, WV 25401

Purchase Order No: PBM-1

#### 1. Material.

Three devices designated as (NeURO, Neuronic helmet and Suyzeko helmet) were submitted for measurement of spectral irradiance over the wavelength range of 380nm to 1100nm. The measurements were performed on September 27, 2023 at the Optronic Laboratories' facilities in Orlando, Florida.

The NeURO device is an open head gear style equipped with five LEDs (Nasal, Front and three in the back).

The Neuronic and Suyzeko helmets are equipped with LEDs and clear plastic inside.

#### 2. Method of Measurement and Standards.

Spectral measurements were made using an OL 770VIS/NIR High-Speed Multi-Channel Spectroradiometer equipped with an ND filter wheel and an IS-1 1 inch integrating sphere equipped with a 1.0 mm aperture. The system was calibrated immediately before the measurements were performed using a NIST traceable 1000-watt lamp standard of Spectral Irradiance.

The In-house Standard used to calibrate the system was measured by direct comparison to NIST supplied FEL 1000-watt Standard of Spectral Irradiance, S/N: F-714 (NIST Test No. 685/287791) from 250 nm to 2400 nm<sup>1/</sup> and is traceable to SI units through NIST.

The NeURO device was operated for maximum intensity, the integrating sphere was placed flush with each LED housing and its position was optimized for maximum signal. The three LEDs on the back side are referred to in the measurement results as Back, Back Right and Back Left which is based on its location when placed on a head.

Both helmets (NeURO and Suyzeko helmet) were operated at maximum intensity, the integrating sphere was placed flush with the clear plastic and positioned to receive the maximum signal level.

Measurements were performed with an ambient temperature at 23 °C ± 3 °C; relative humidity less than 60 %.

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<sup>1/</sup> The spectral irradiance of F-714 at 2500 nm was obtained at Optronic Laboratories and is traceable to an OL 480 Variable Temperature Blackbody Calibration Standard (*refer to Bulletin 104 for additional information*).



### 3. Results.


Peak wavelength and integrated values are given in Table 1. The wavelength accuracy of the measurement system is given in Table 2. Measured values of spectral irradiance ( $mW/cm^2 \text{ nm}$ ) over the wavelength range of 380 nm to 1100 nm, are provided on a spreadsheet "PBM Foundation-Rev C (12417).xlsx" and dated 10/26/2023.

Graphical representation of these values is included with this report.

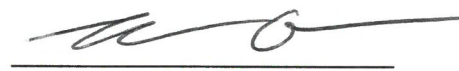
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Measurement by:

Reviewed by:



Tarek Nagaty  
Systems Lab Manager



Kristian Ocasio  
Systems Lab Technician

**Table 1**  
**Calculated Values**

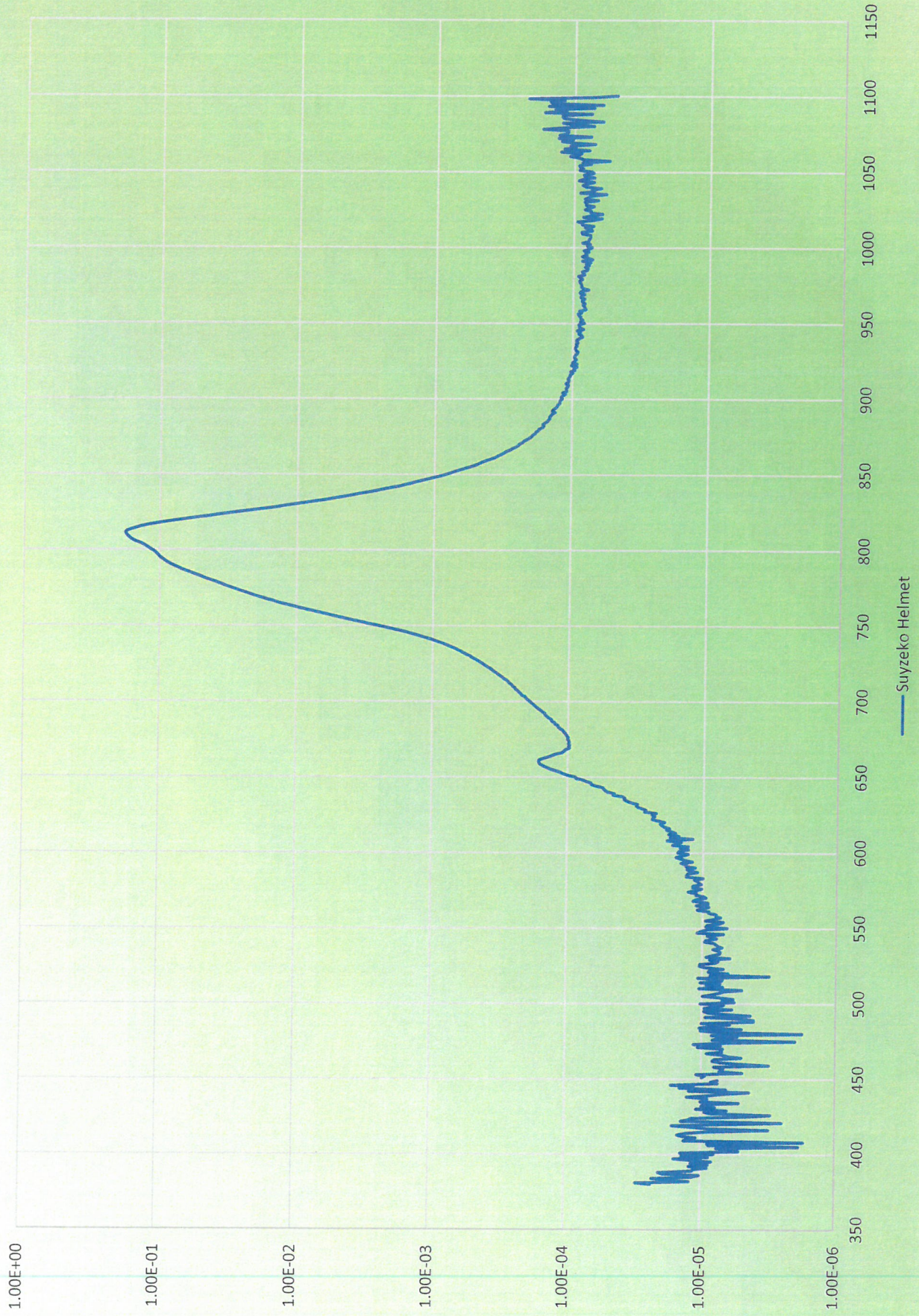
Measurement position	Helmets		NeURO			
	Suyzeko	Neuronic	Back Left	Back	Back Right	Front
<b>Peak Wavelength (nm)</b>	811	1059	810	810	808	811
<b>Integrated value over 60nm window (<math>mW/cm^2</math>)</b>						
781nm-841nm	4.74					182.06
1031nm - 1091nm		6.22				
780nm - 840nm			316.70	333.24	277.25	183.69
778nm - 838nm					282.43	

**Table 2**  
**Wavelength Accuracy of The Measurement System**

$\lambda$ actual	peak measured	error
404.656	404.49	-0.166
435.835	435.77	-0.065
491.604	491.99	0.386
546.074	546.19	0.116
696.543	696.46	-0.083
706.722	706.63	-0.092
727.294	727.13	-0.164
738.398	738.22	-0.178
750.513	750.48	-0.033
763.510	763.41	-0.100
772.421	772.35	-0.071
811.531	811.36	-0.171
826.452	826.63	0.178
841.643	841.92	0.277
852.144	852.29	0.146
866.794	866.96	0.166
912.297	912.33	0.033
922.450	922.39	-0.060
1013.980	1013.87	-0.110



Spectral Values (mW/cm<sup>2</sup>) for the Suyzeko Helmet



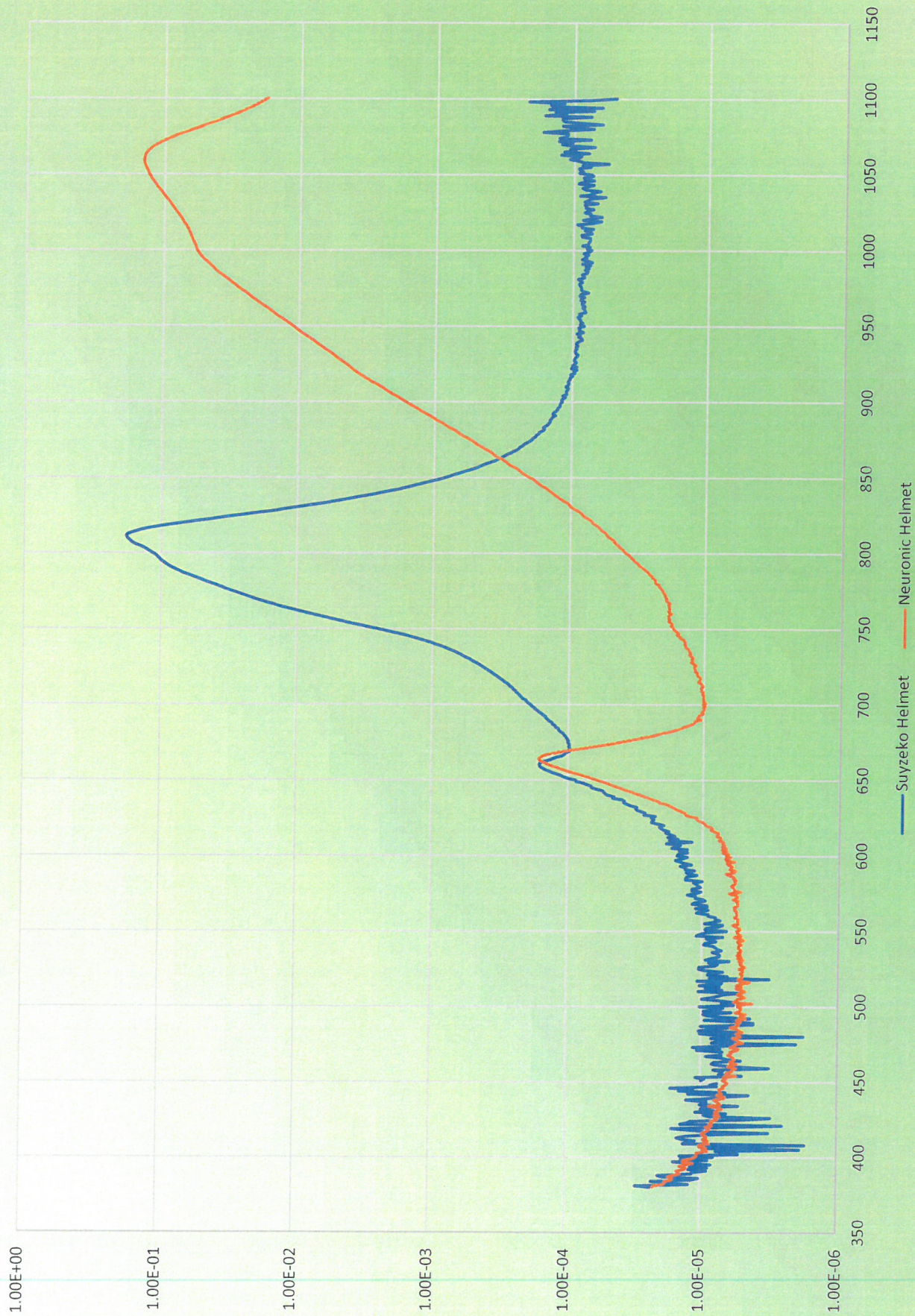


Spectral Values (mW/cm<sup>2</sup>) for Neuronic Helmet





Spectral Values (mW/cm<sup>2</sup>)





Spectral Values (mW/cm<sup>2</sup>) for NeURO Head Set

