



Department of Defense, Air Force Research Laboratory, Photomedicine to Enhance Military Readiness, Uniformed Services University, Ohio State University. Unpublished – Excerpts from presentation at WALT 2024, London, UK

# CASE STUDY

## PBM VALIDATION QUESTIONS

### **All devices:**

1. What are the device and individual mode wavelengths?
2. What does irradiance look like across the device?
3. What does irradiance look like for the average person's PBM treatment?
4. What, if any, irradiance differences are there over a single 20-minute PBM session?

### **Full Body Light Beds ONLY:**

1. What, if any, irradiance differences are there between the top and bottom canopy?

### **Panel; Based Devices ONLY:**

1. How do recommended treatment zones/ distances differ?
2. How far can you be from the device while still receiving PBM treatment?

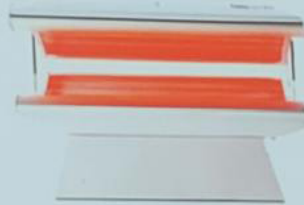
## VALIDATION

### Whole Body



**NovoTHOR**  
(Reported 30 mW/cm<sup>2</sup>)

<https://www.novothor.com/images/novothor-fab.png>



**TheraLight**  
(Reported 120 mW/cm<sup>2</sup>)

<https://www.theralight.com/theralight-360>



**ARRC LED**  
(Reported 76 mW/cm<sup>2</sup>)

<https://arccled.com/index.html>

### Panel-Based



**Joovv**  
(Reported 100 mW/cm<sup>2</sup>)

<https://joovv.com/vivifys-panels-2018-01-01-1500x.png?v=1501620202>



**BIOMAX 900**  
(Reported 135 mW/cm<sup>2</sup>)

<https://gpm.com/therapies/light-therapy/BIOMAX-900-LED-1-39117081-2x12-4880-5x6x-4-3922674204.png?v=1721822967>

### Wearables



**Tommie Copper**  
(Reported 153 mW/cm<sup>2</sup>)

<https://www.tommiecopper.com/products/red-light-therapy-gloves>



**Kineon**  
(Reported 25 mW/cm<sup>2</sup>)

[https://www.kineon.com/eq/fin/The\\_MCU6\\_Pro.png?v=1702042204&w=1020](https://www.kineon.com/eq/fin/The_MCU6_Pro.png?v=1702042204&w=1020)

## PBM Validation Methodology

### Measurement Device: GL SPECTIS 5.0 Touch VIS-IR Spectroradiometer

- Spectral range of 380 - 1050nm
- Radiometric accuracy of 4%  
(i.e. measurements made by the device can have an error margin of up to  $\pm 4\%$  compared to the true value)
- National Institute of Standards and Technology (NIST) traceable calibration

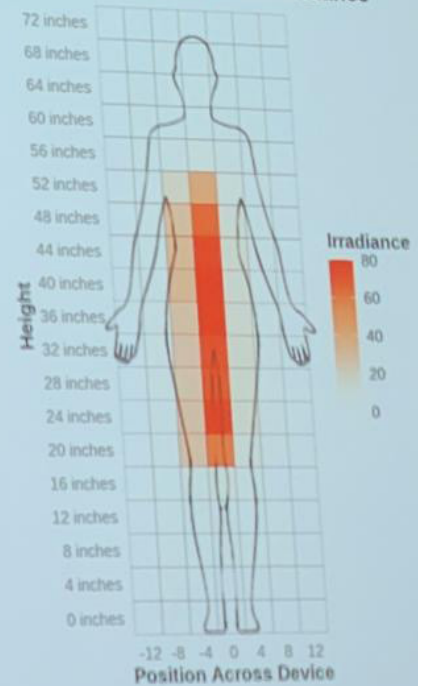


<https://www.instrumentchoice.com.au/1-x-110g-light-meter-bar-graph-led-5-ranges-4-light-type-selection>

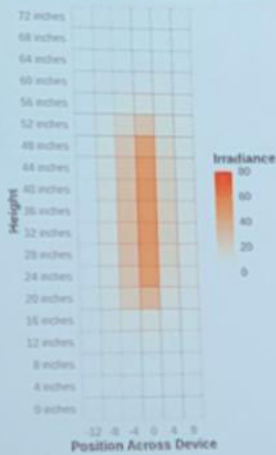
# BIOMAX 900

- Deep Tissue Treatment (8-15" from device)
  - Average irradiance at 8": 69.06 mW/cm<sup>2</sup>
  - Average irradiance at 15": 56.08 mW/cm<sup>2</sup>
- Superficial Treatment (16-24" from device)
  - Average irradiance at 16": 53.93 mW/cm<sup>2</sup>
  - Average irradiance at 24": 43.13 mW/cm<sup>2</sup>

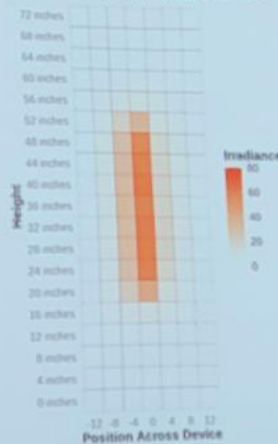
BIOMAX 8 inch Treatment Distance



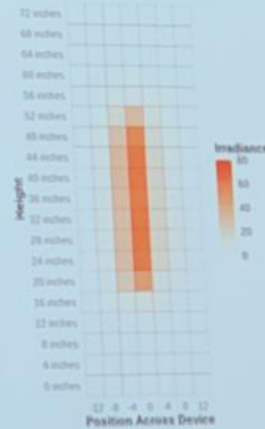
BIOMAX 24 inch Treatment Distance



BIOMAX 16 inch Treatment Distance



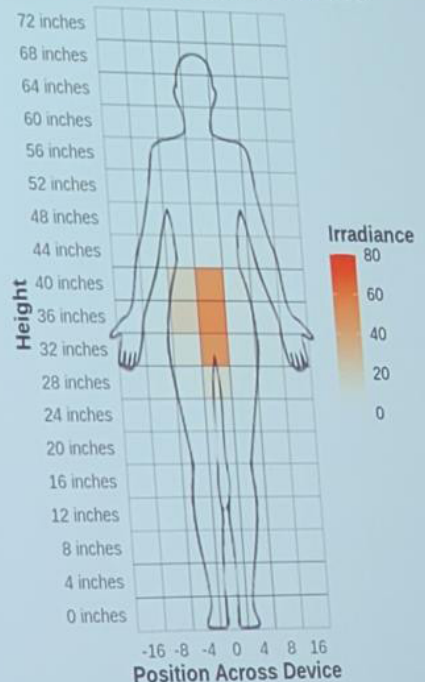
BIOMAX 14 inch Treatment Distance



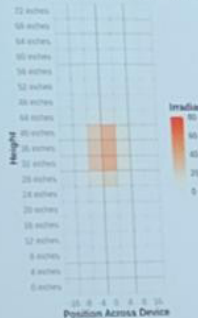
# Joovv Mini 3.0

- Topical Heating Treatment (4-6" from device)
  - Average irradiance at 4": 16.41 mW/cm<sup>2</sup>
  - Average irradiance at 6": 23.66 mW/cm<sup>2</sup>
- Recovery+ Treatment (12-14" from device)
  - Average irradiance at 12": 24.68 mW/cm<sup>2</sup>
  - Average irradiance at 14": 25.18 mW/cm<sup>2</sup>
- Standard Treatment (16-24" from device)
  - Average irradiance at 16": 24.29 mW/cm<sup>2</sup>
  - Average irradiance at 24": 22.81 mW/cm<sup>2</sup>

Joovv 6 inch Treatment Distance



Joovv 24 inch Treatment Distance



Joovv 16 inch Treatment Distance



Joovv 14 inch Treatment Distance



Joovv 12 inch Treatment Distance





## Irradiance Over a PBMT Session

	Average	Reported
<b>Joovv Mini 3.0</b>	<b>51.85 mW/cm<sup>2</sup></b>	<b>100 mW/cm<sup>2</sup></b>
<b>BIOMAX 900</b>	<b>33.95 mW/cm<sup>2</sup></b>	<b>135 mW/cm<sup>2</sup></b>



### Joovv Mini 3.0

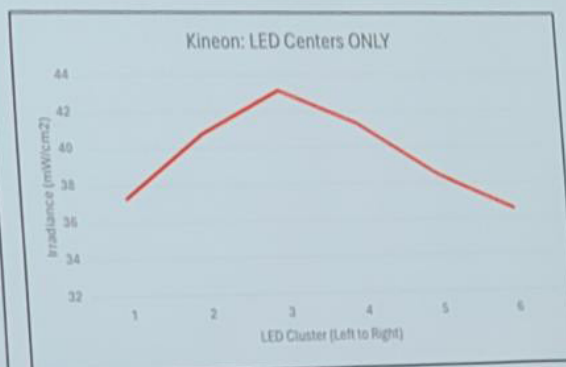
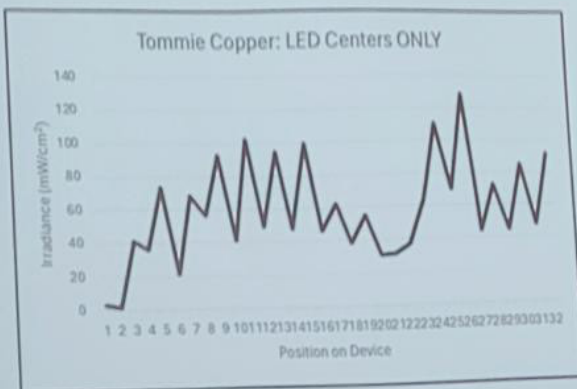
- Topical Heating (4-6" from device): 33.28 mW/cm<sup>2</sup>
- Recovery+ (12-14" from device): 34.14 mW/cm<sup>2</sup>
- Standard (16-24" from device): 34.42 mW/cm<sup>2</sup>

### BIOMAX 900

- Deep Tissue (8-15" from device): 56.65 mW/cm<sup>2</sup>
- Superficial (16-24" from device): 47.04 mW/cm<sup>2</sup>

## Irradiance Analysis: Wearable PBM Devices

	Actual (Average)	Reported
<b>Tommie Copper</b>	<b>55.21 mW/cm<sup>2</sup></b>	<b>153 mW/cm<sup>2</sup></b>
<b>Klineon</b>	<b>39.60 mW/cm<sup>2</sup></b>	<b>25 mW/cm<sup>2</sup></b>



## SUMMARY

### **Need for Validation:**

The inconsistencies in irradiance data emphasize the importance of independent validation of manufacturer-reported specifications to ensure accurate and reliable information for researchers and end-users.

### **Treatment Stability:**

Devices maintained reasonably consistent irradiance levels over a single PBMT session, with little to no decay observed throughout individual sessions or over a full day of treatments. These data show that the effects of PBMT treatment time could be investigated without concern that irradiance is variable.

### **Effectiveness of Panel-Based Devices:**

While panel-based PBMT devices are marketed for their ability to provide treatment from various angles and distances, the actual treatment effectiveness was found to be confined to the area directly in front of the device. Recommendations for treatment should

include treatment within a defined space relative to panel surface.

### **PBMT Bed Performance:**

Among the beds tested, the ARRC LED bed exhibited the highest irradiance, suggesting it delivers the most intense light therapy. However, the NovoTHOR PBM bed demonstrated the highest consistency in irradiance across different treatment zones and measurements, indicating this device produces the most reliable and uniform treatment.

## CONCLUSION

**This study provides valuable data to inform users in decision-making when considering use of these devices.**

