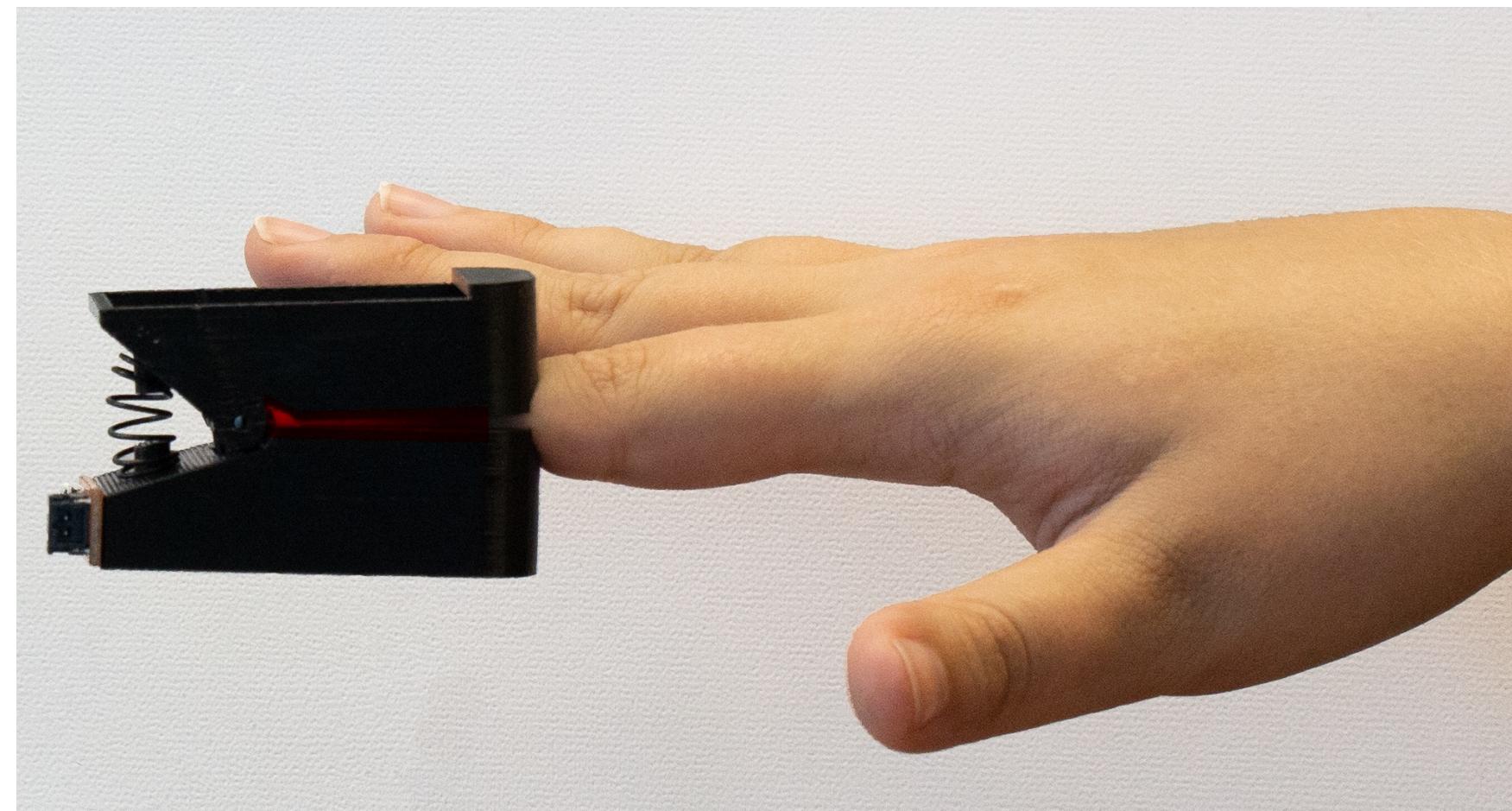


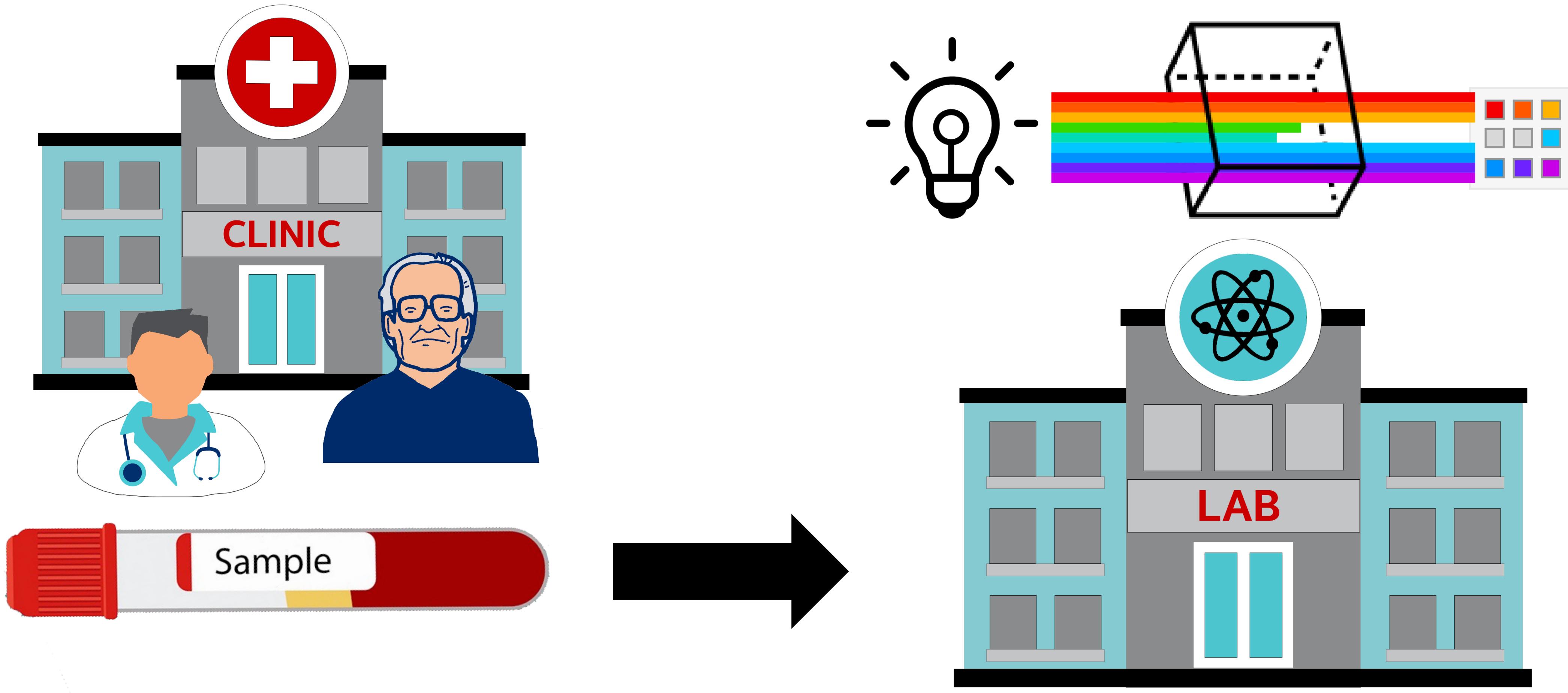
Lumos: An Open-Source Device for Wearable Spectroscopy Research



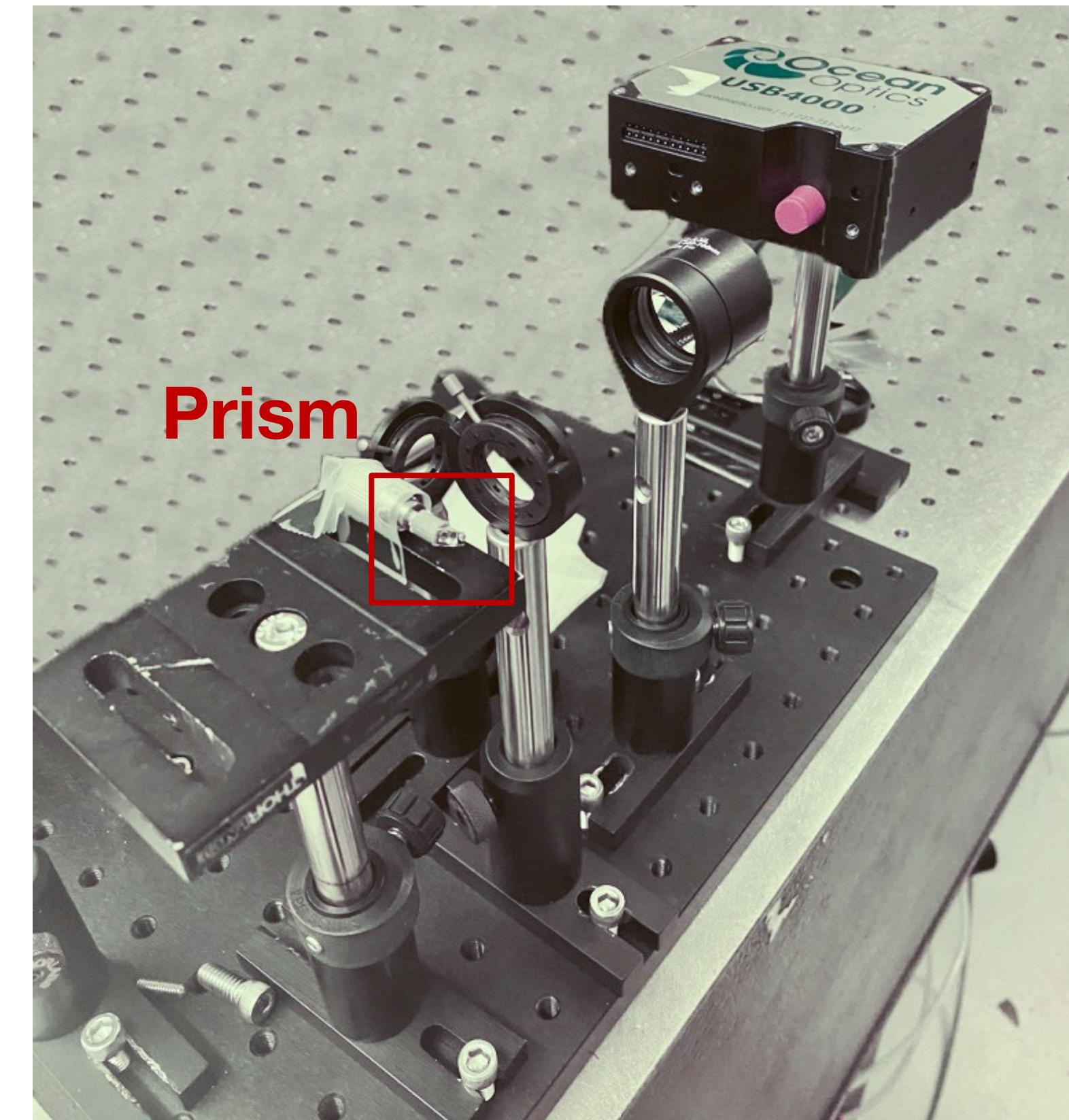
Amanda Watson
Link Lab
University of Virginia



Traditional Spectroscopy



Technical Challenges



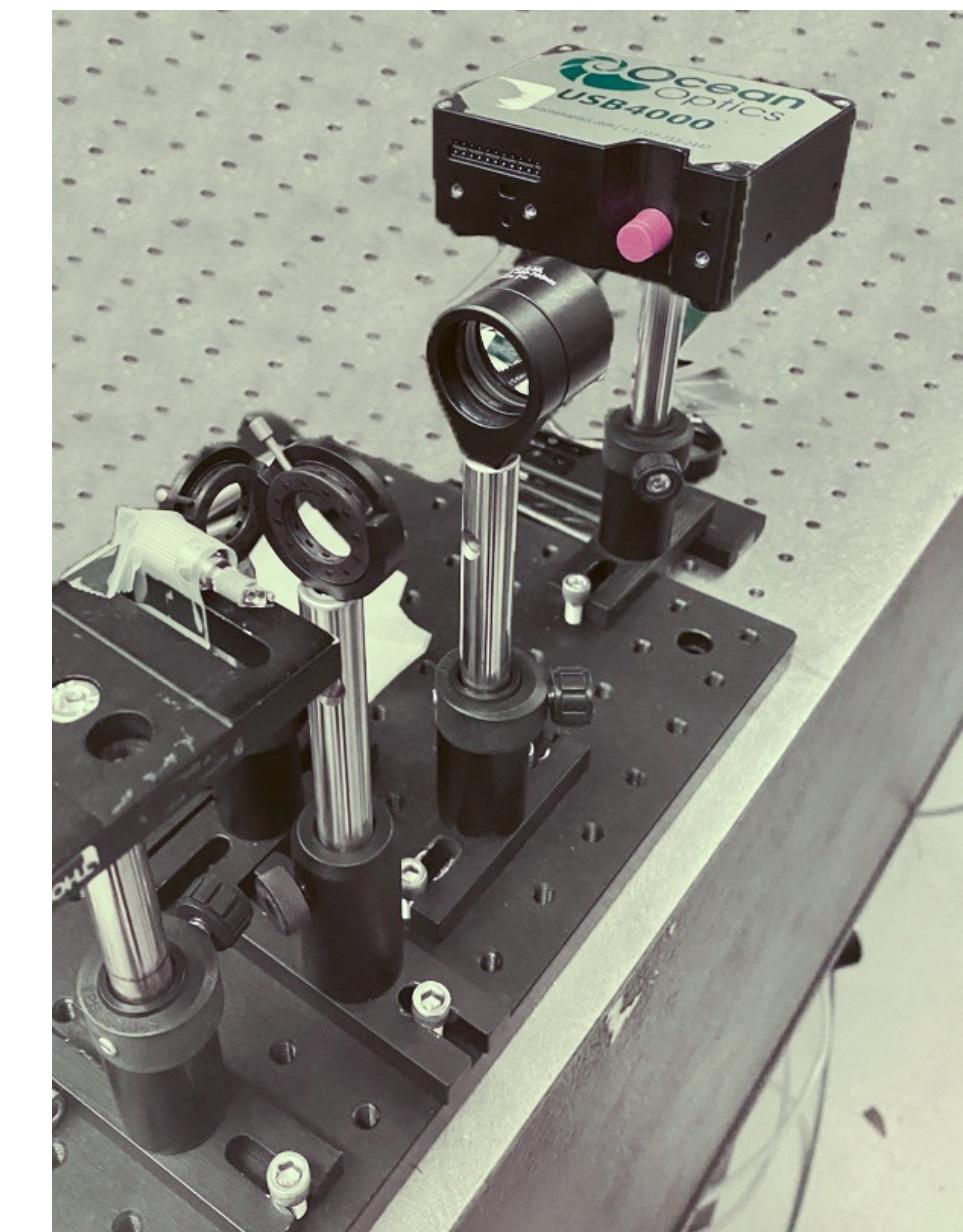
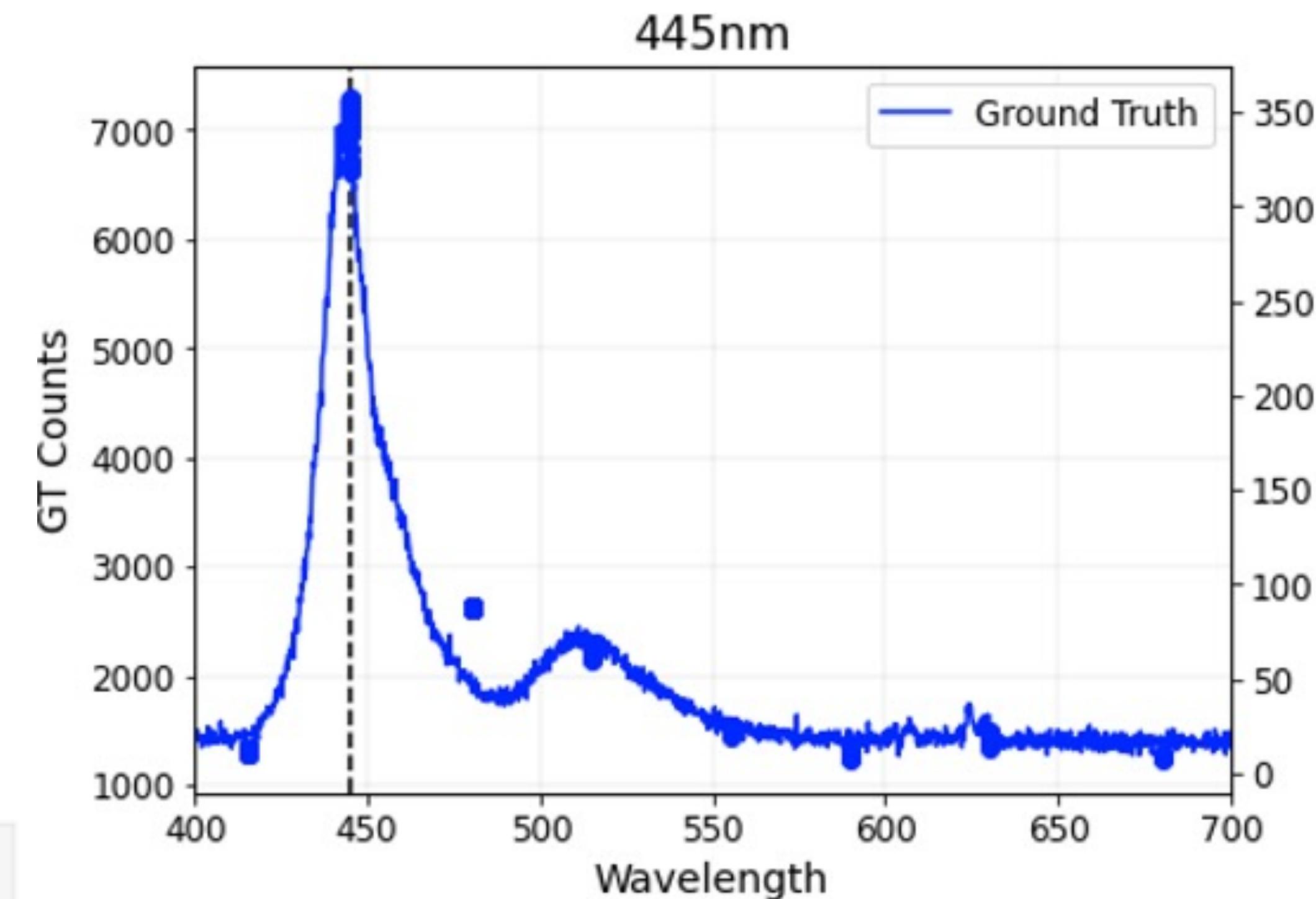
Footprint

Environment

Battery Life

Form Factor

Wearable Spectroscopy



Footprint

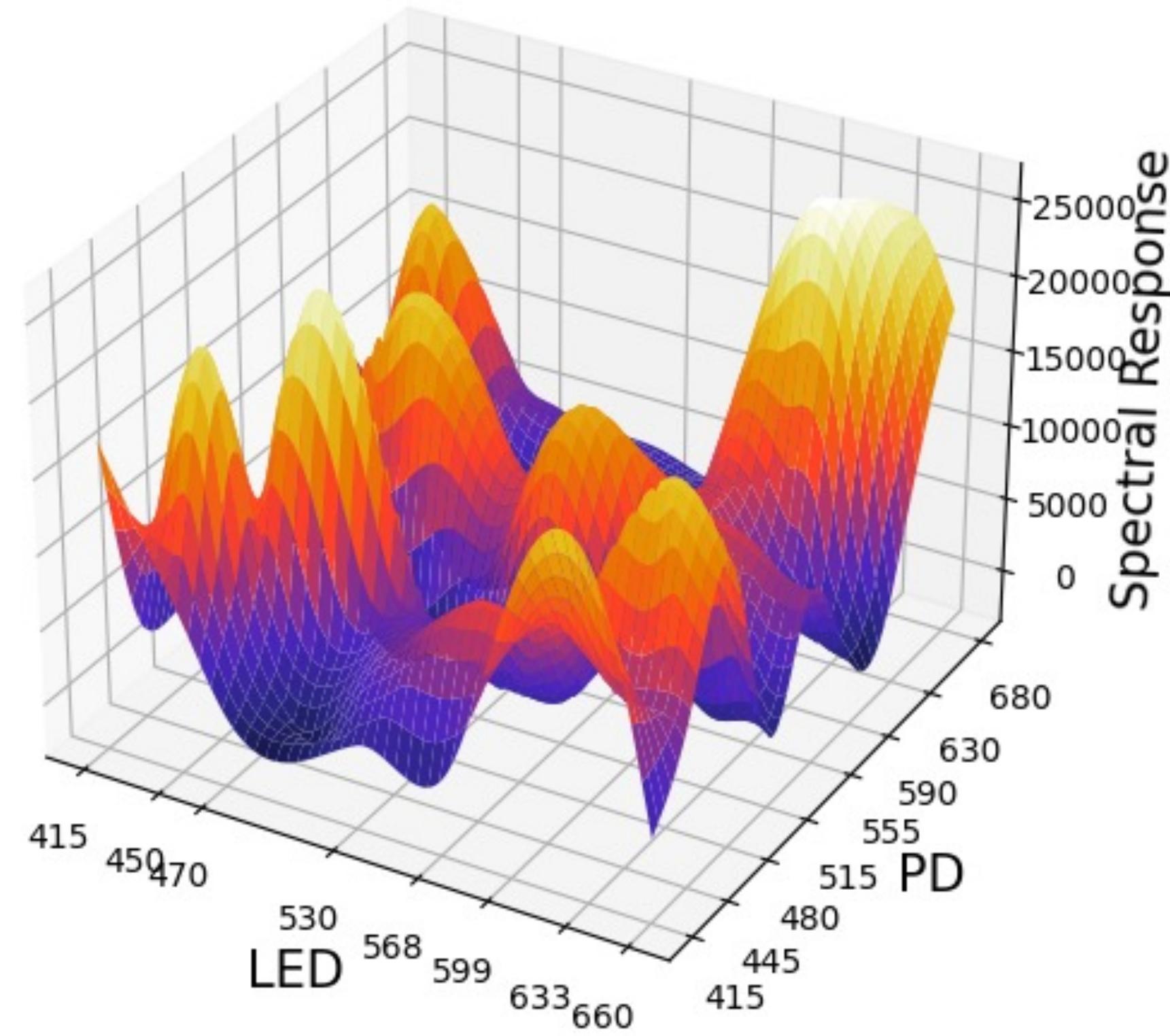
Environment

Battery Life

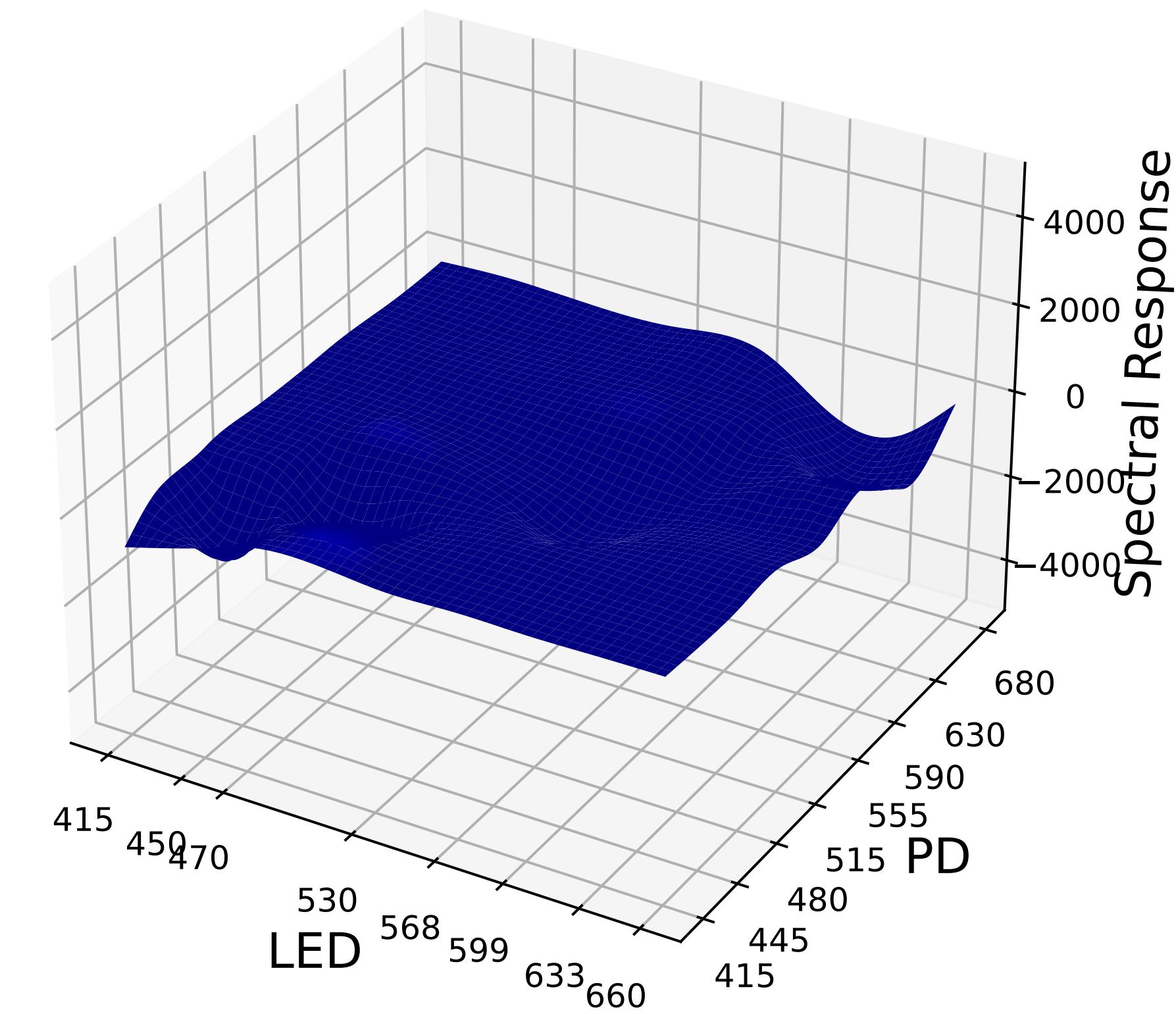
Form Factor

Lumos Signal

No Medium



No Medium



Footprint

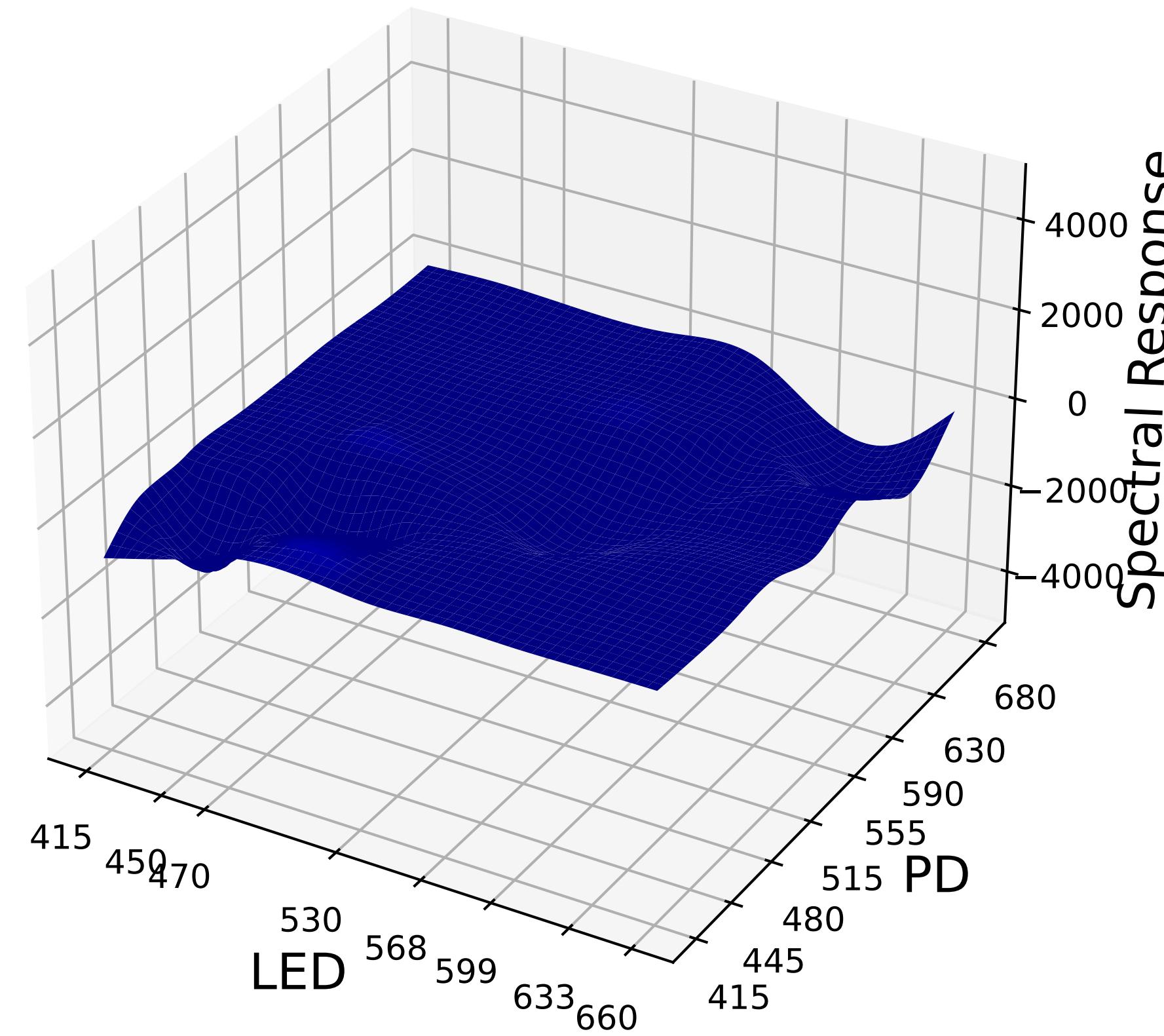
Environment

Battery Life

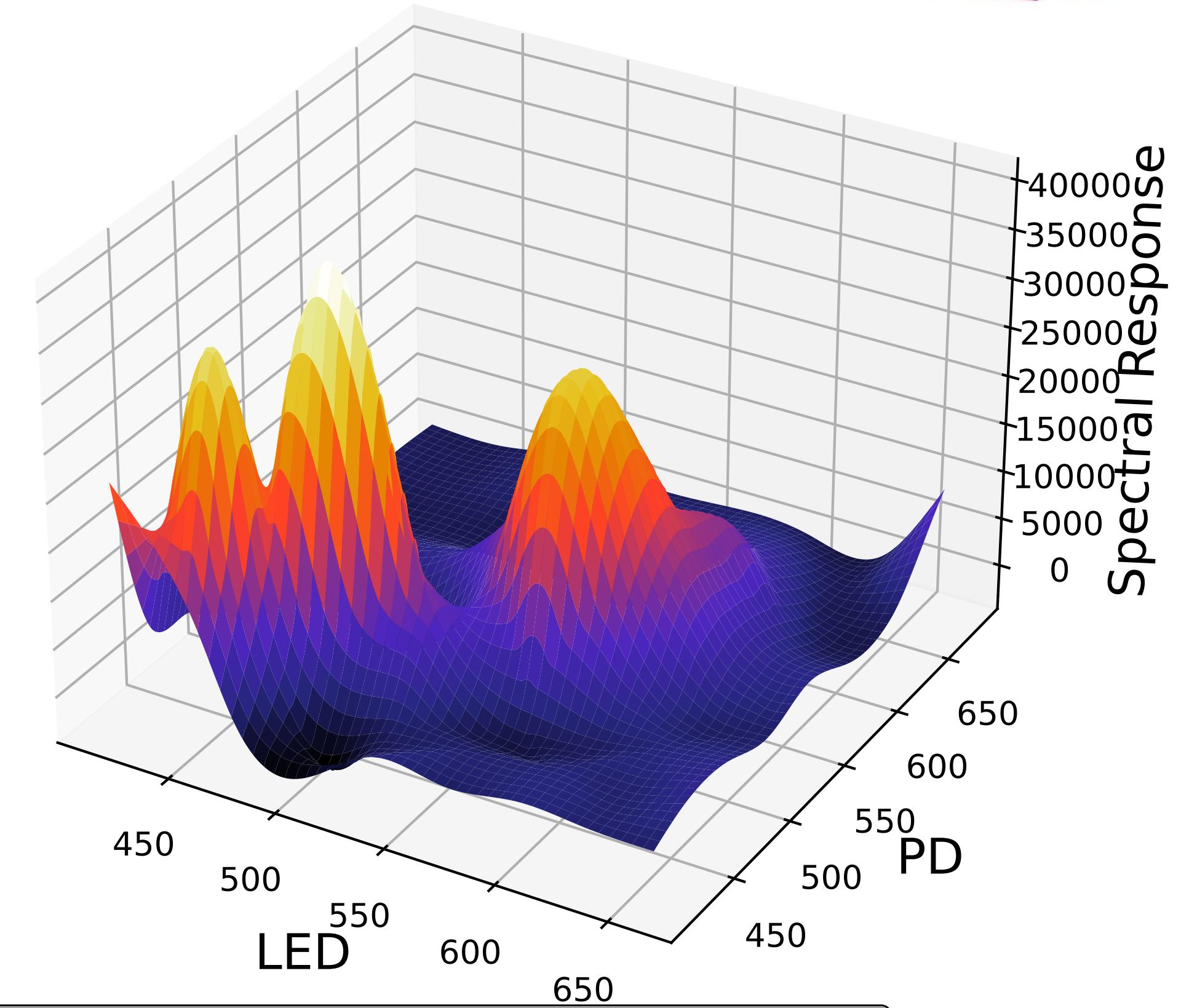
Form Factor

Experimental Evaluation

No Medium



Green



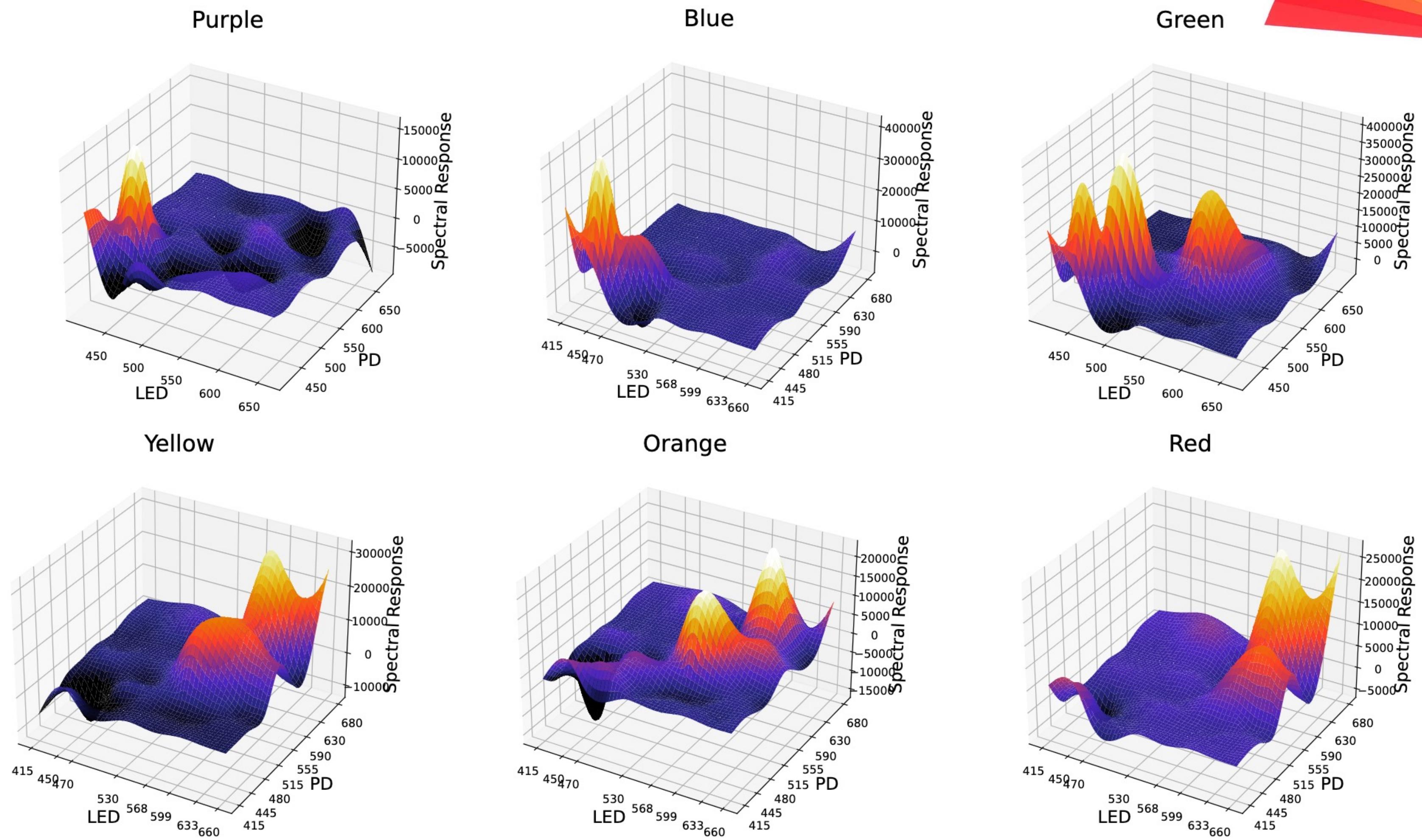
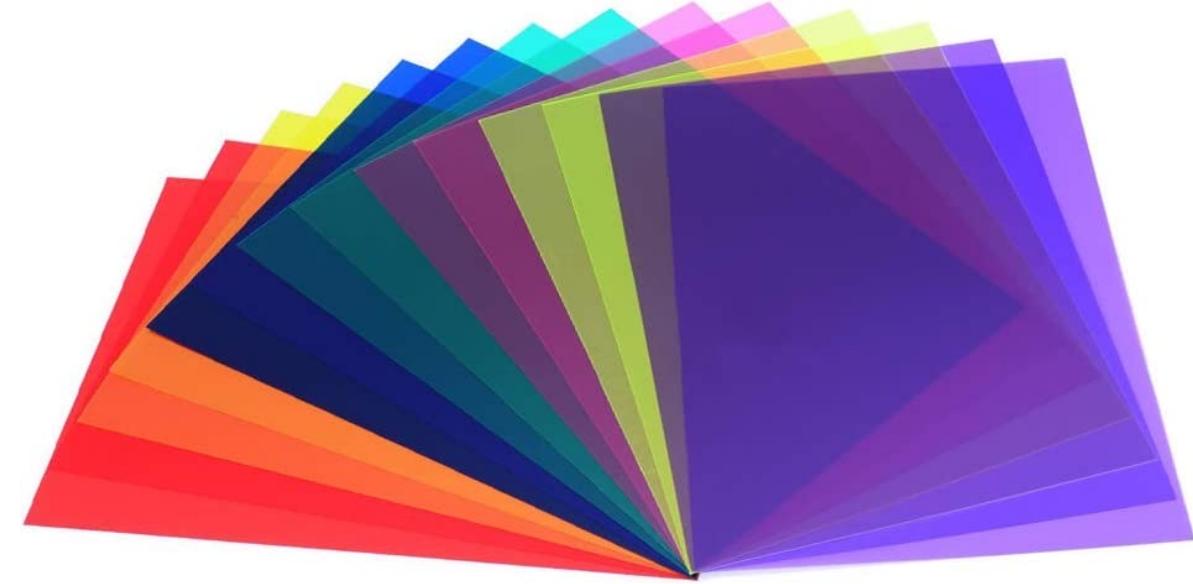
Footprint

Environment

Battery Life

Form Factor

Experimental Evaluation



Footprint

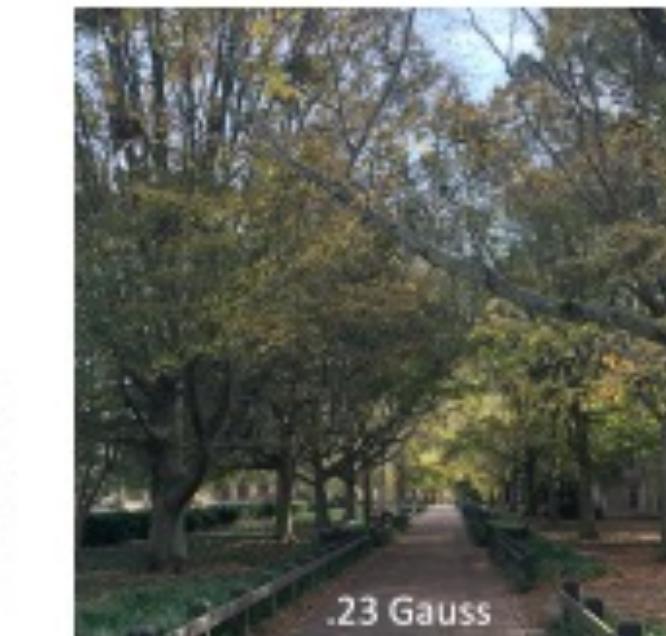
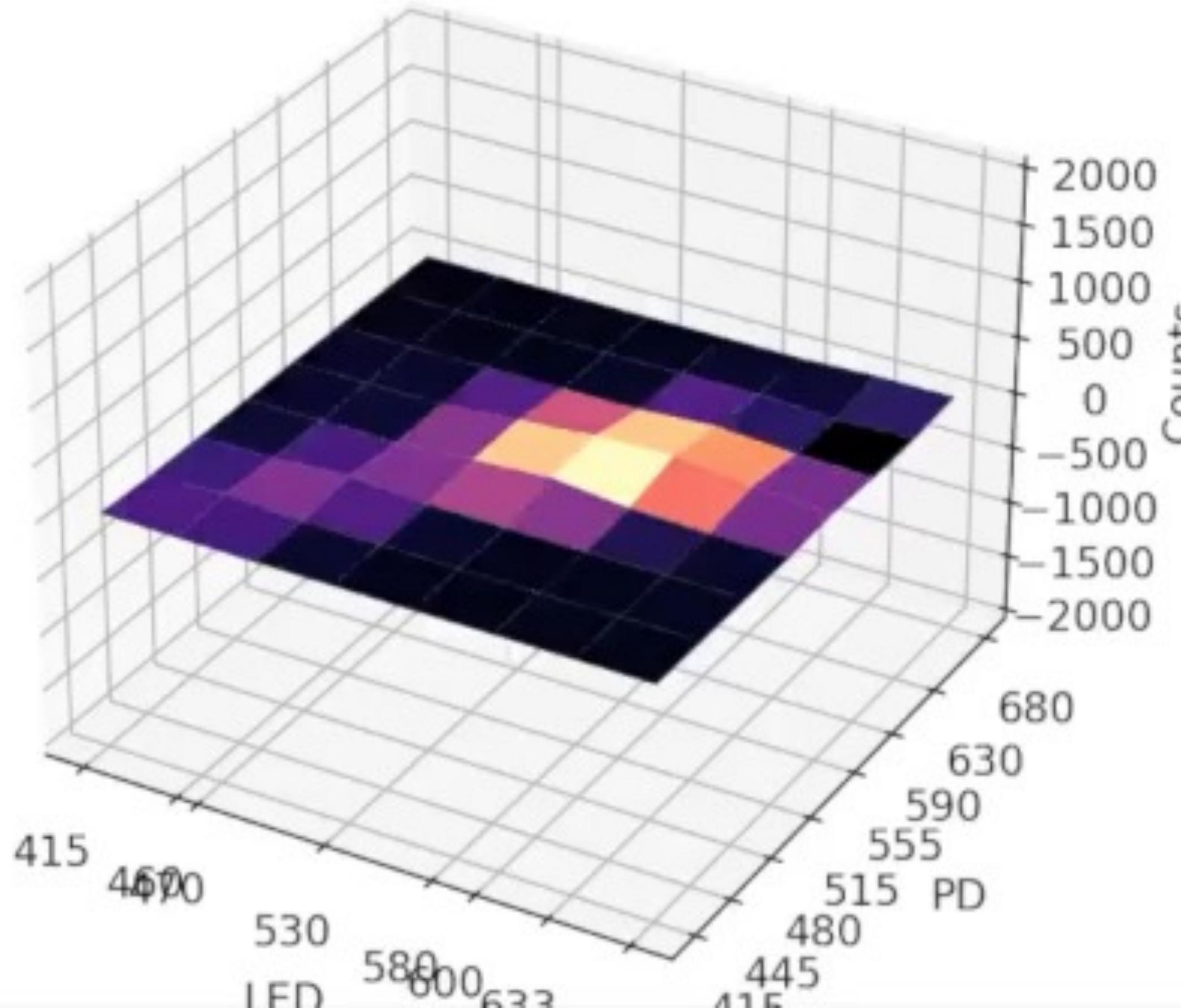
Environment

Battery Life

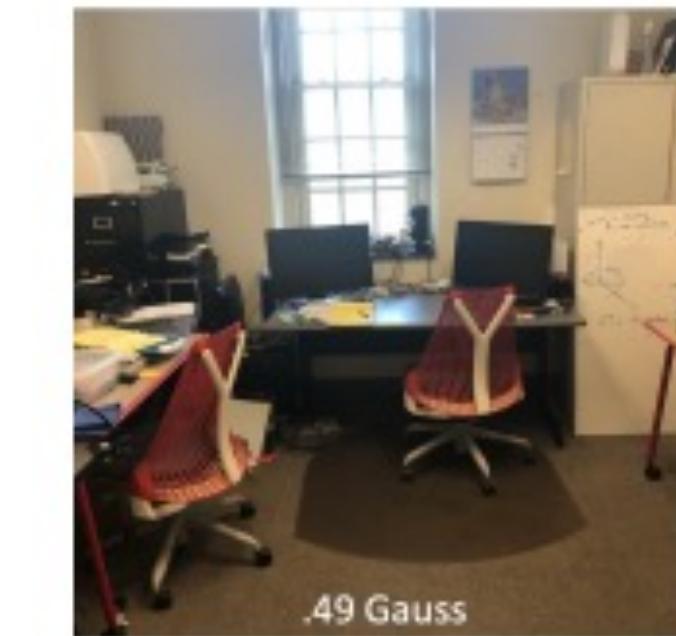
Form Factor

Removal of Environment

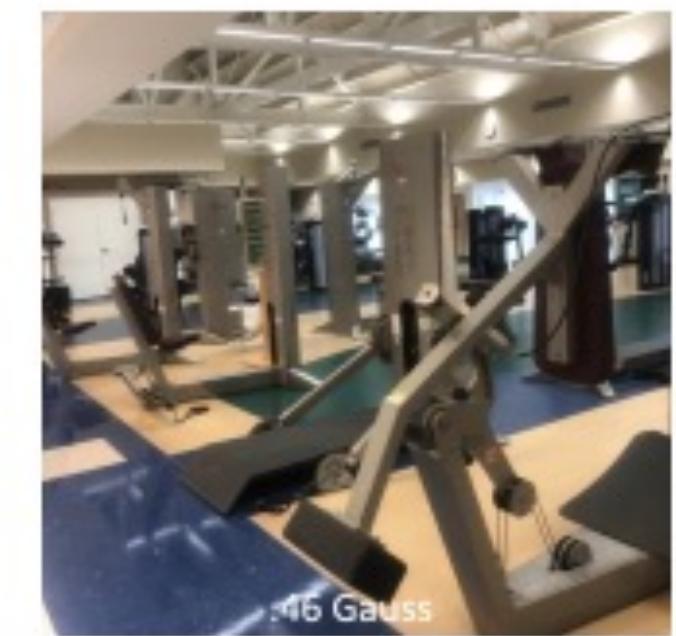
Dynamic Environments



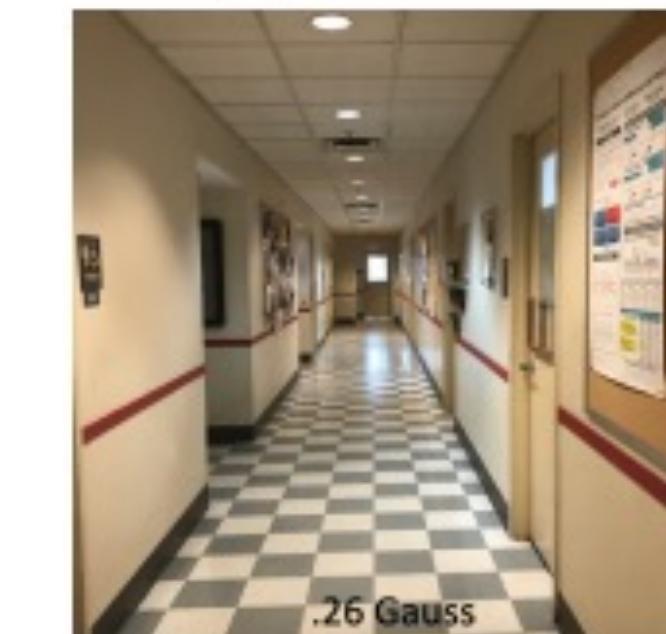
(a) Outside



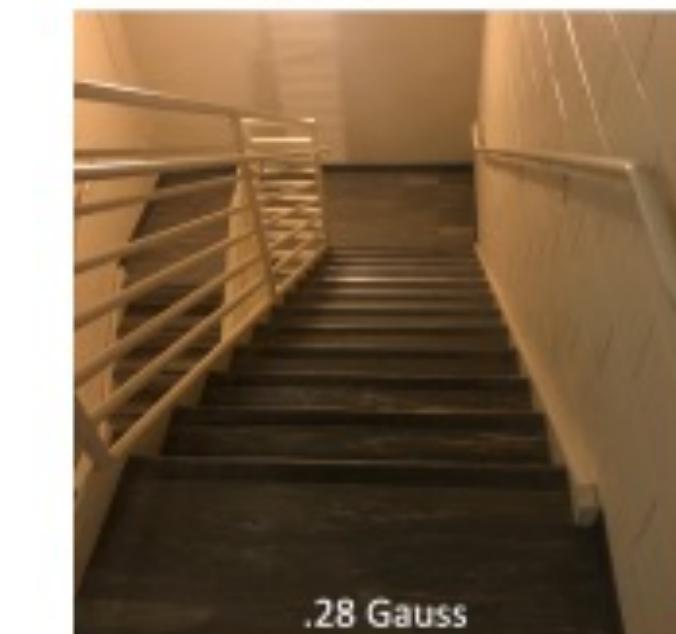
(b) Lab



(c) Gymnasium



(d) Hallway



(e) Stairwell



(f) Elevator

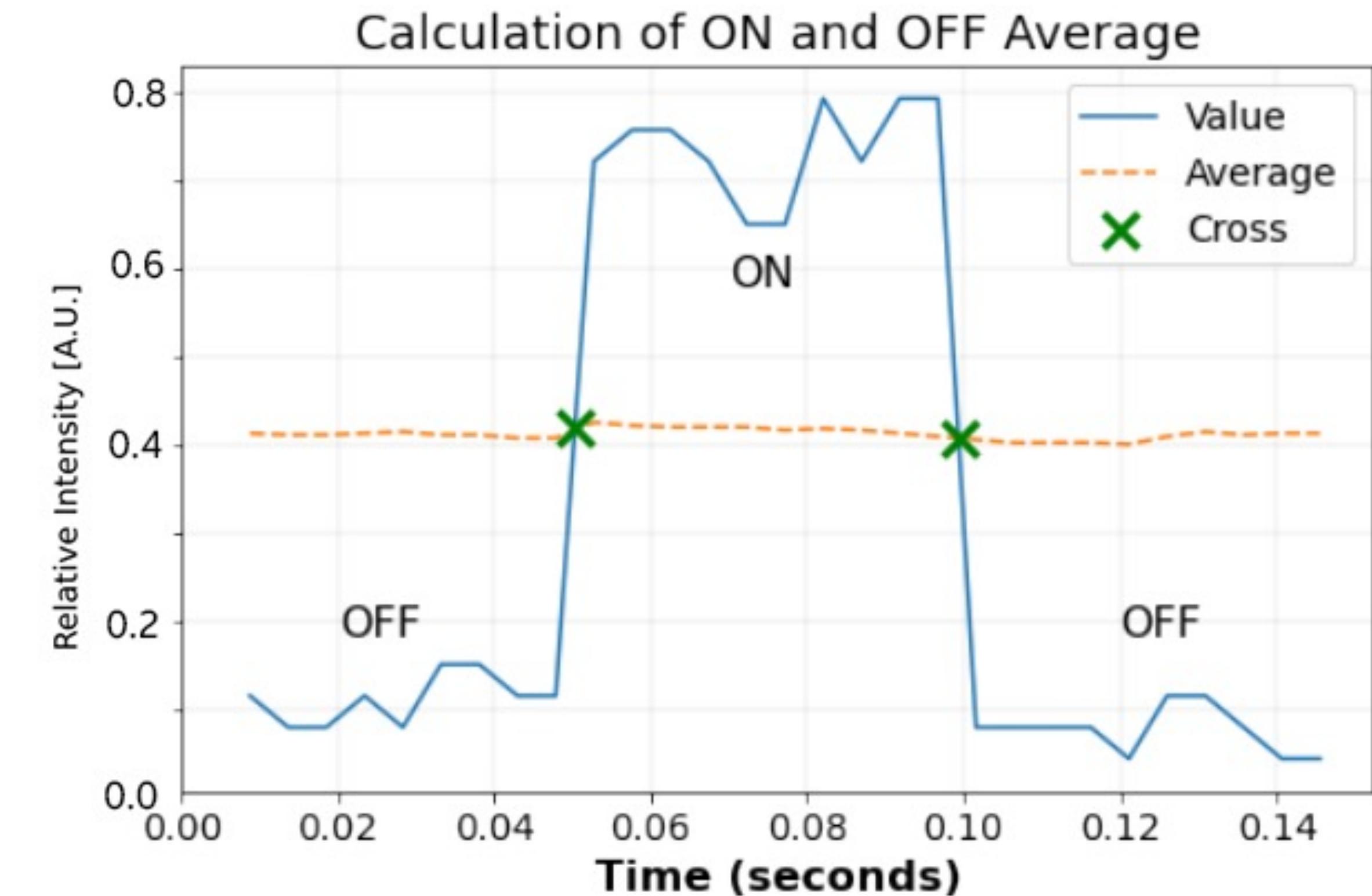
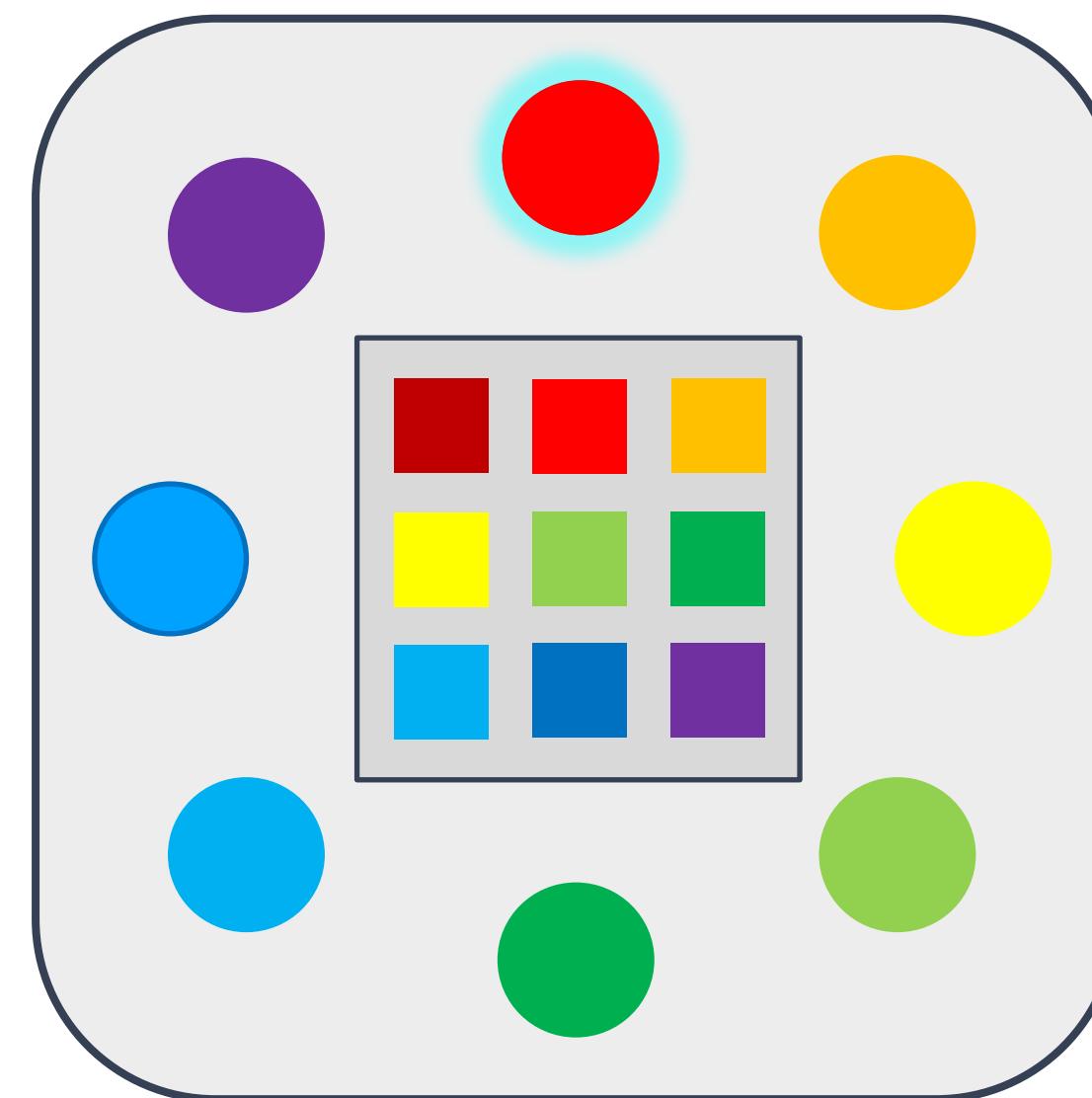
Footprint

Environment

Battery Life

Form Factor

Removal of Environment



Off: Environmental Reading

On: Environmental + Lumos Reading

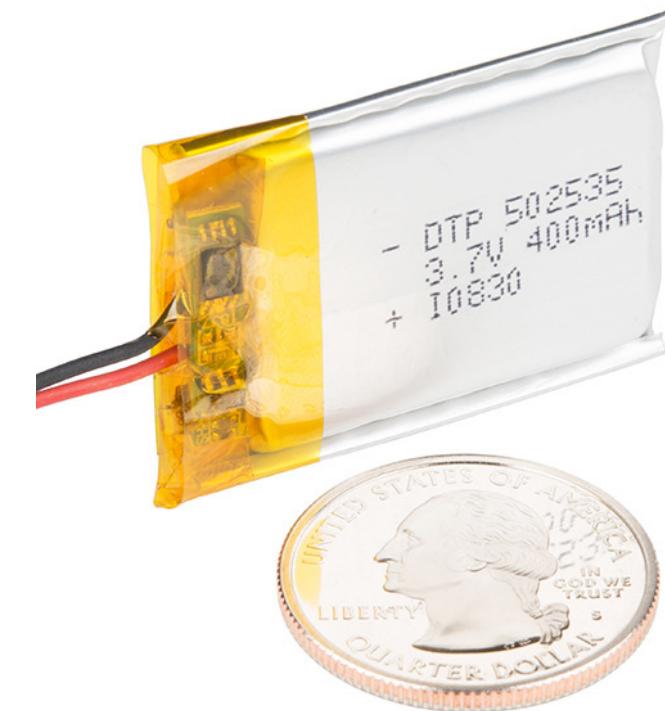
Footprint

Environment

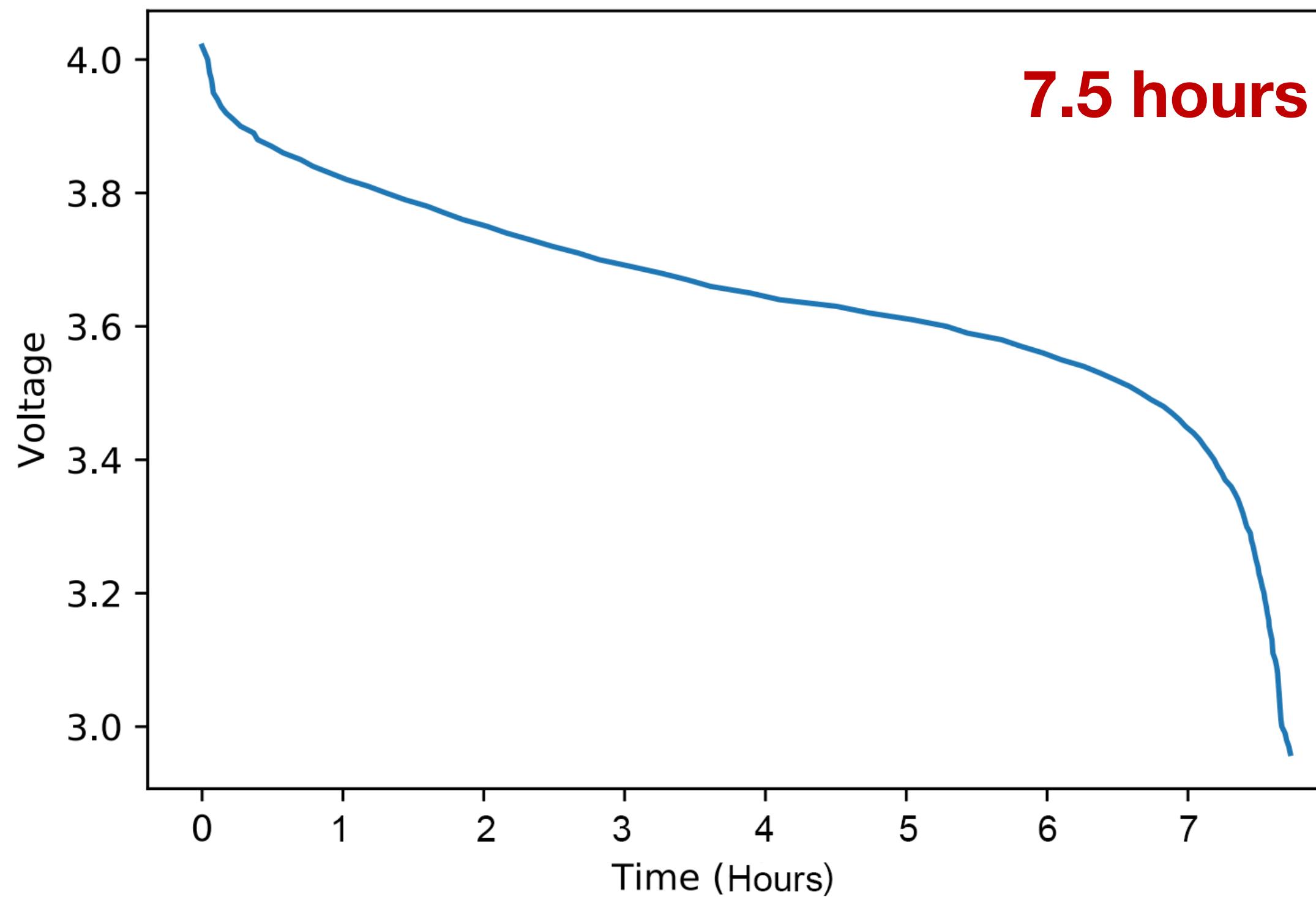
Battery Life

Form Factor

Battery Life

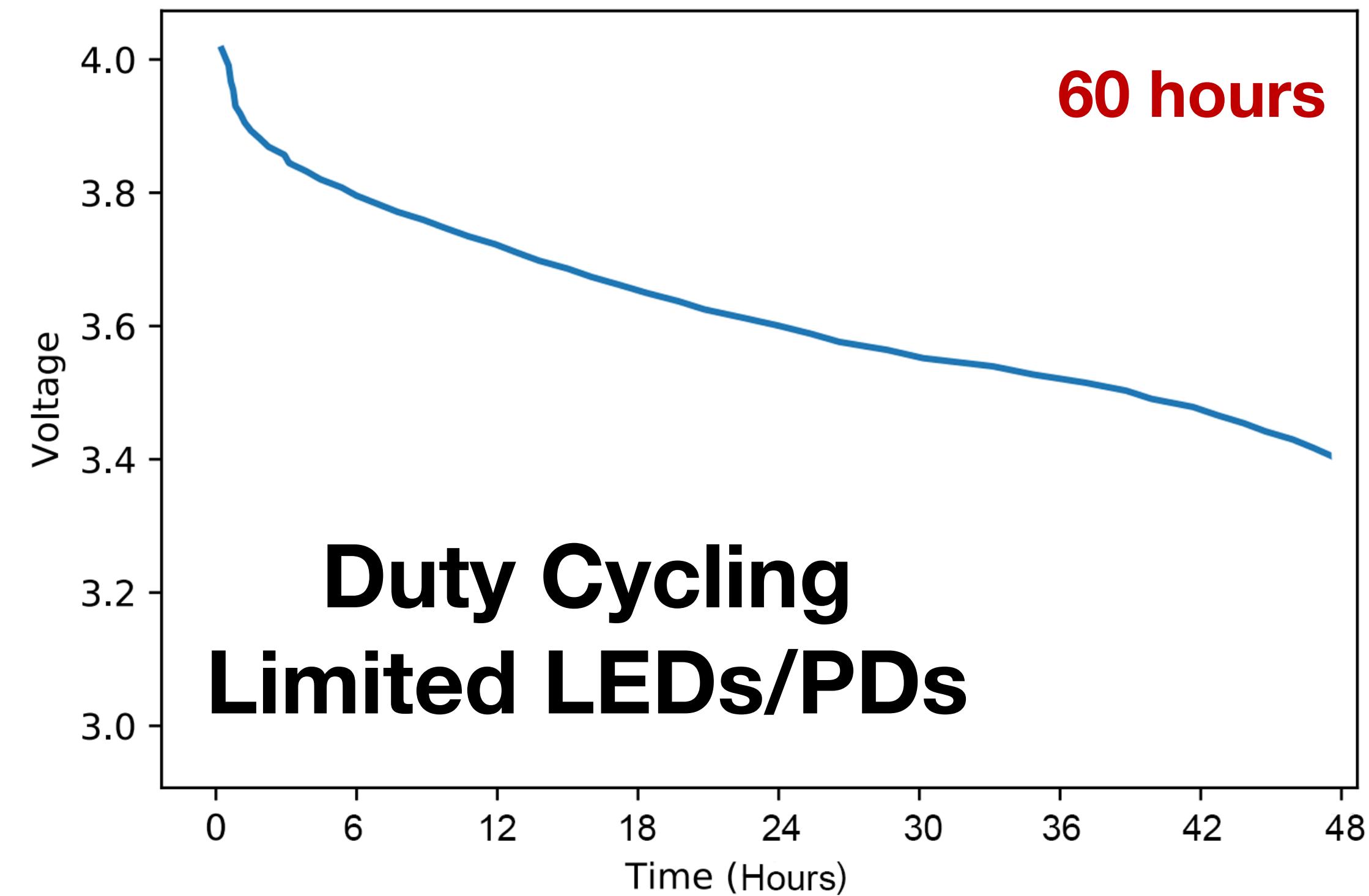


Max LED/PD Usage



7.5 hours

Max Battery Life



Duty Cycling
Limited LEDs/PDs

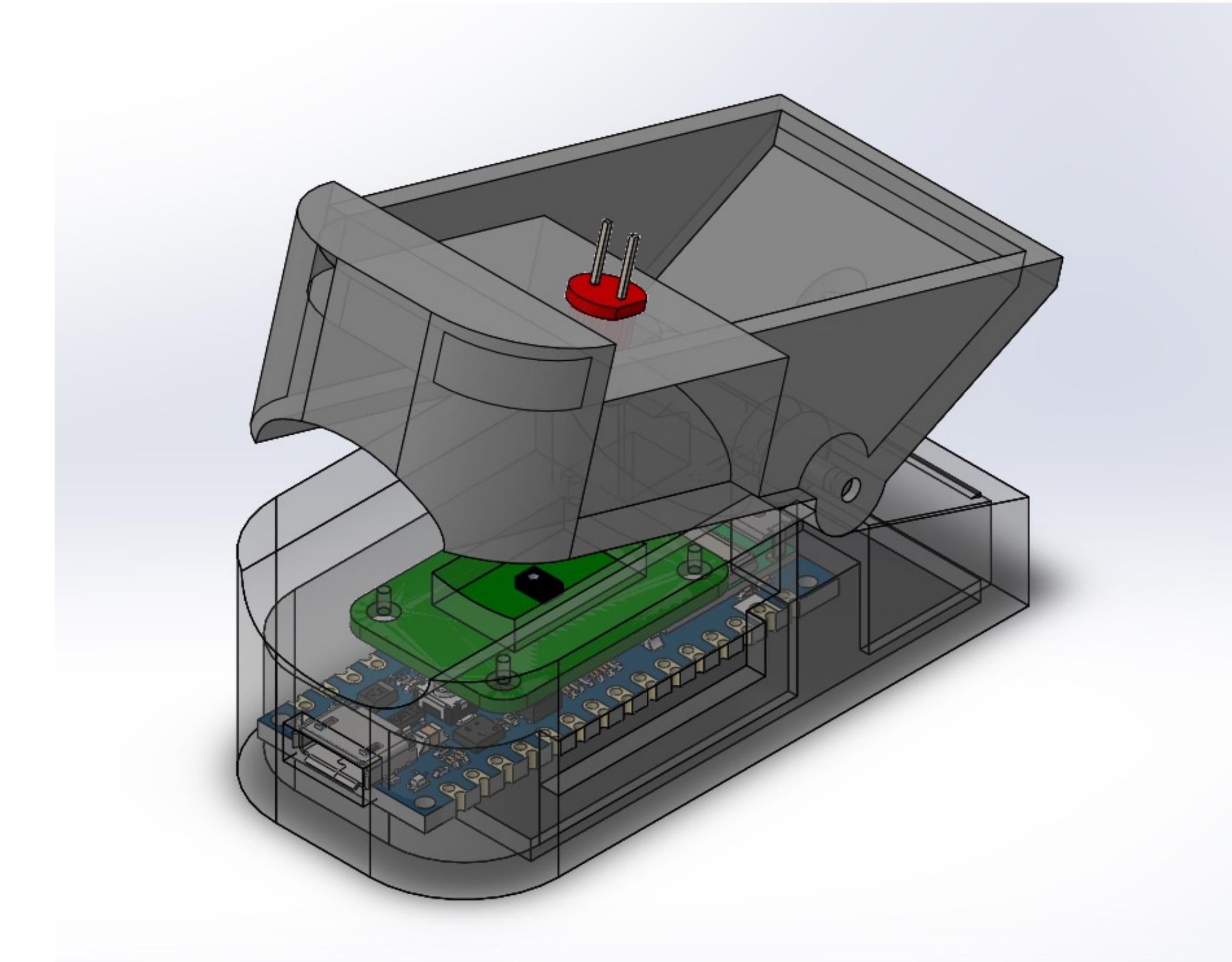
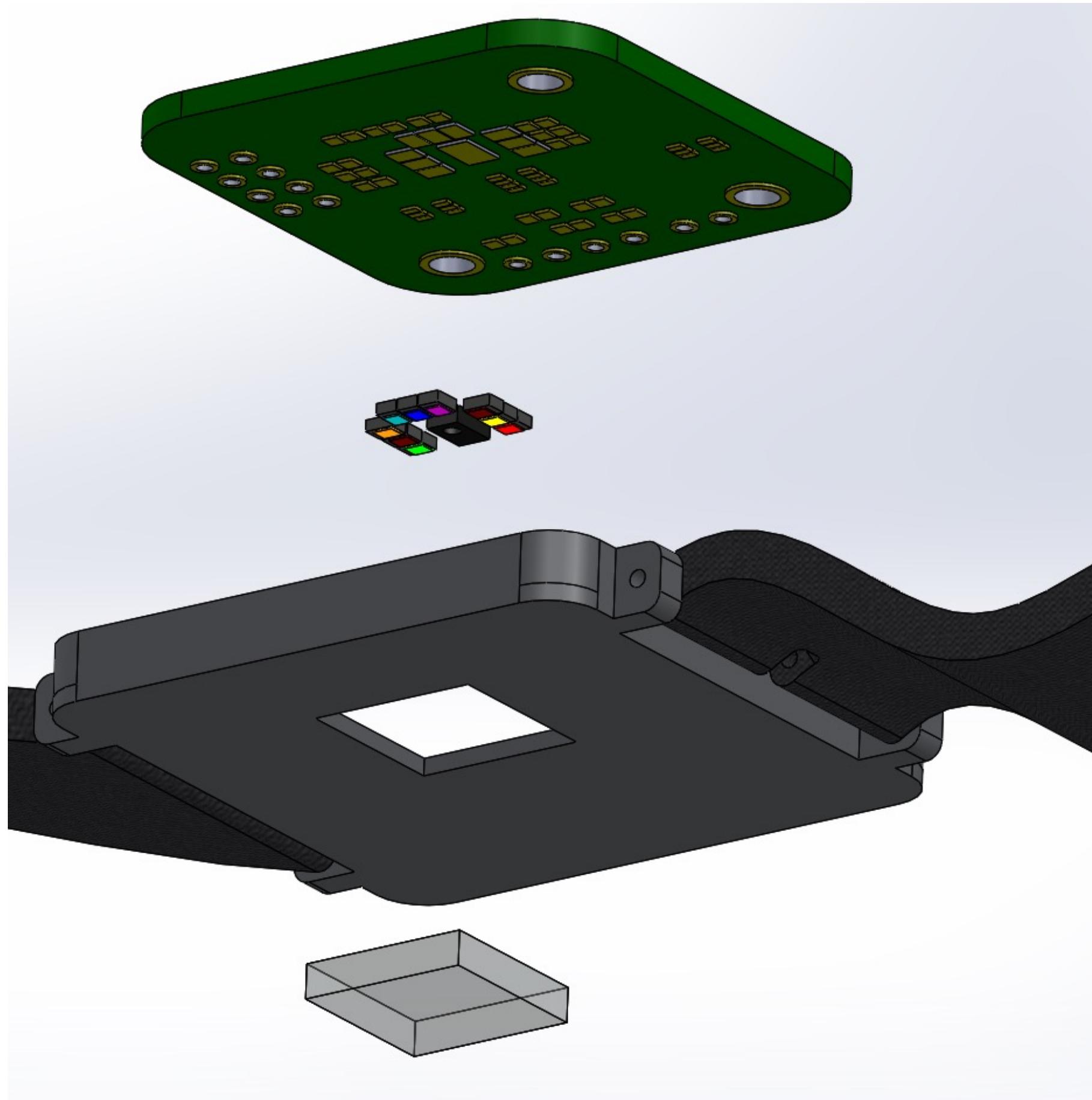
Footprint

Environment

Battery Life

Form Factor

Form Factor Design



Footprint

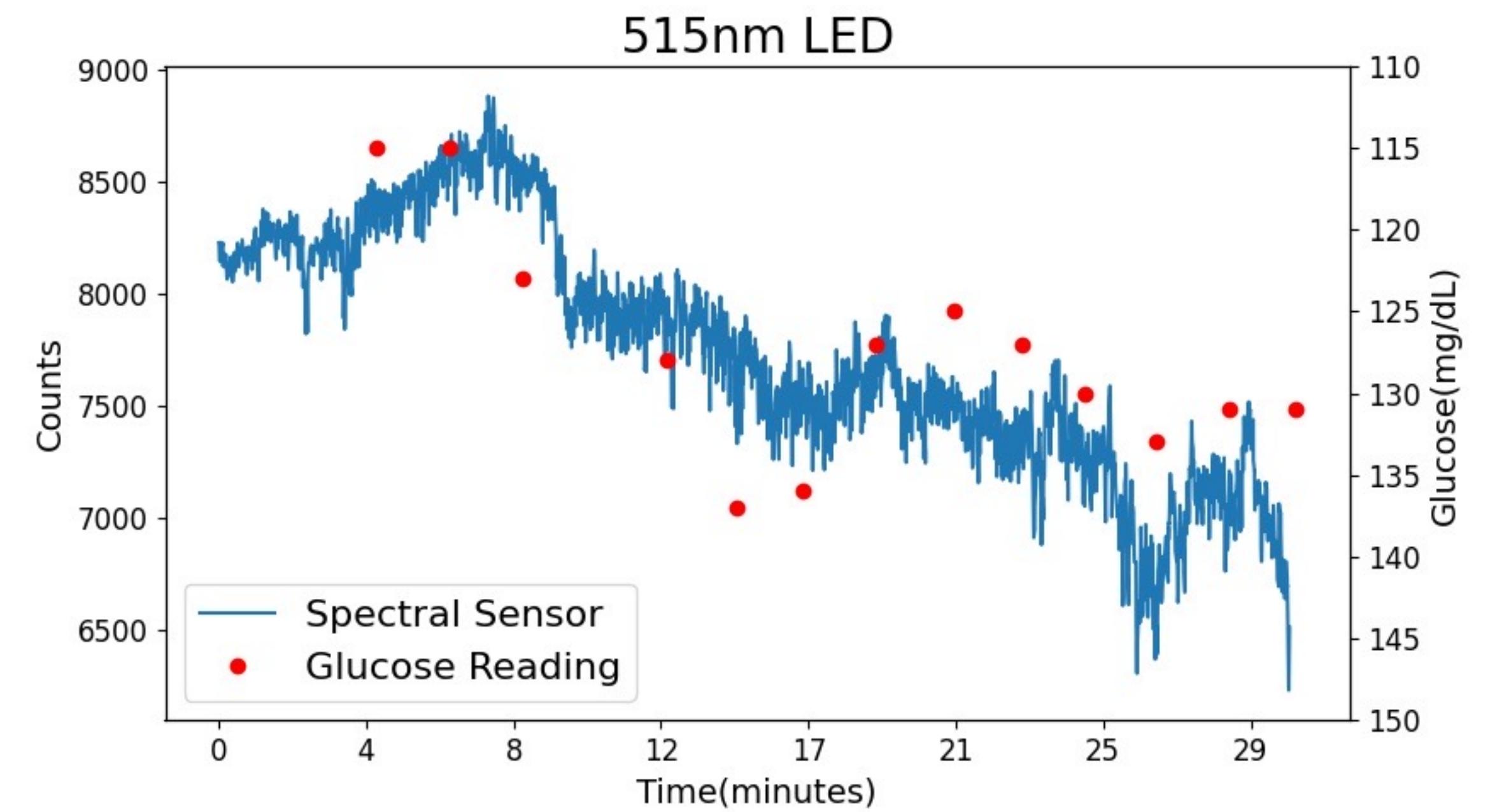
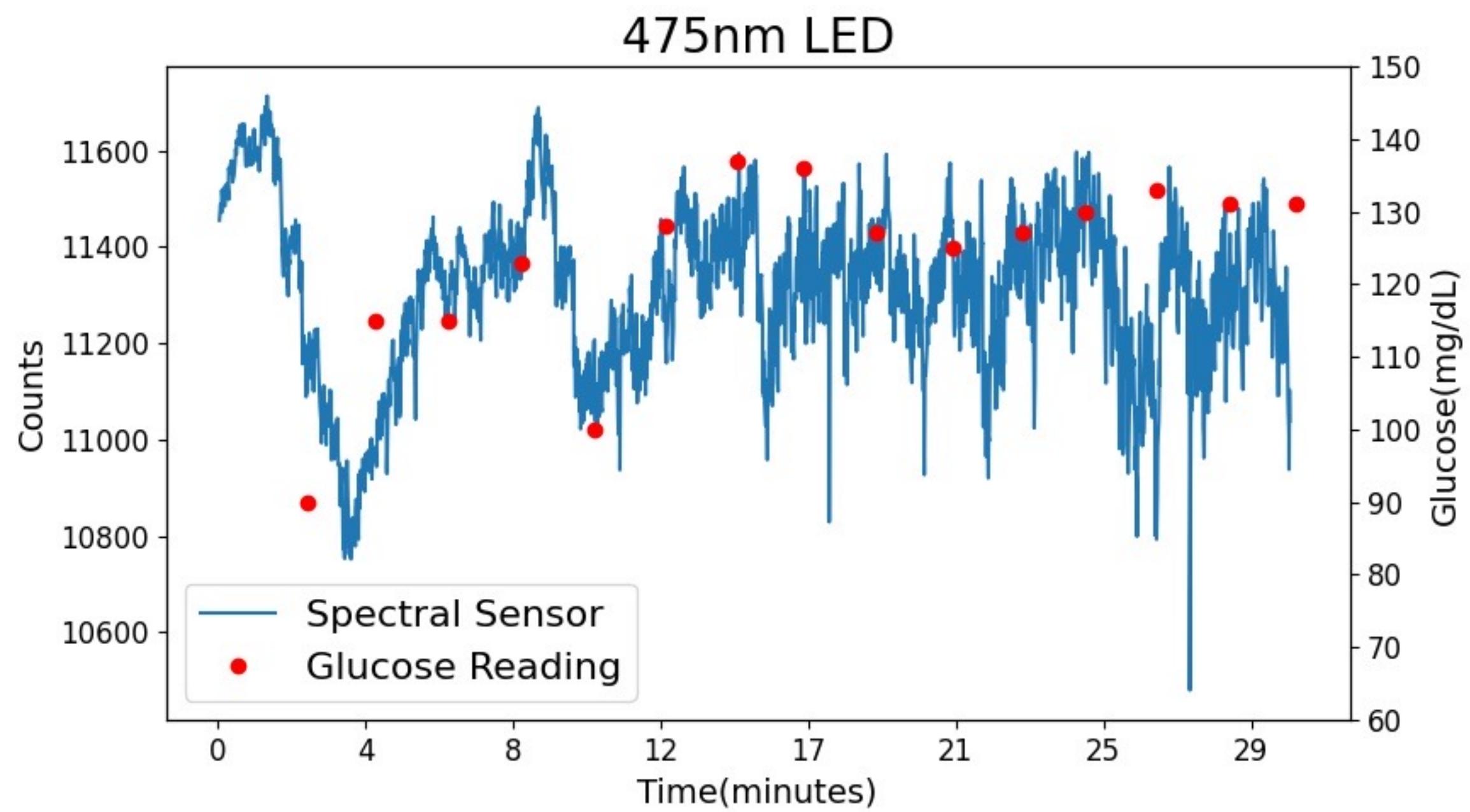
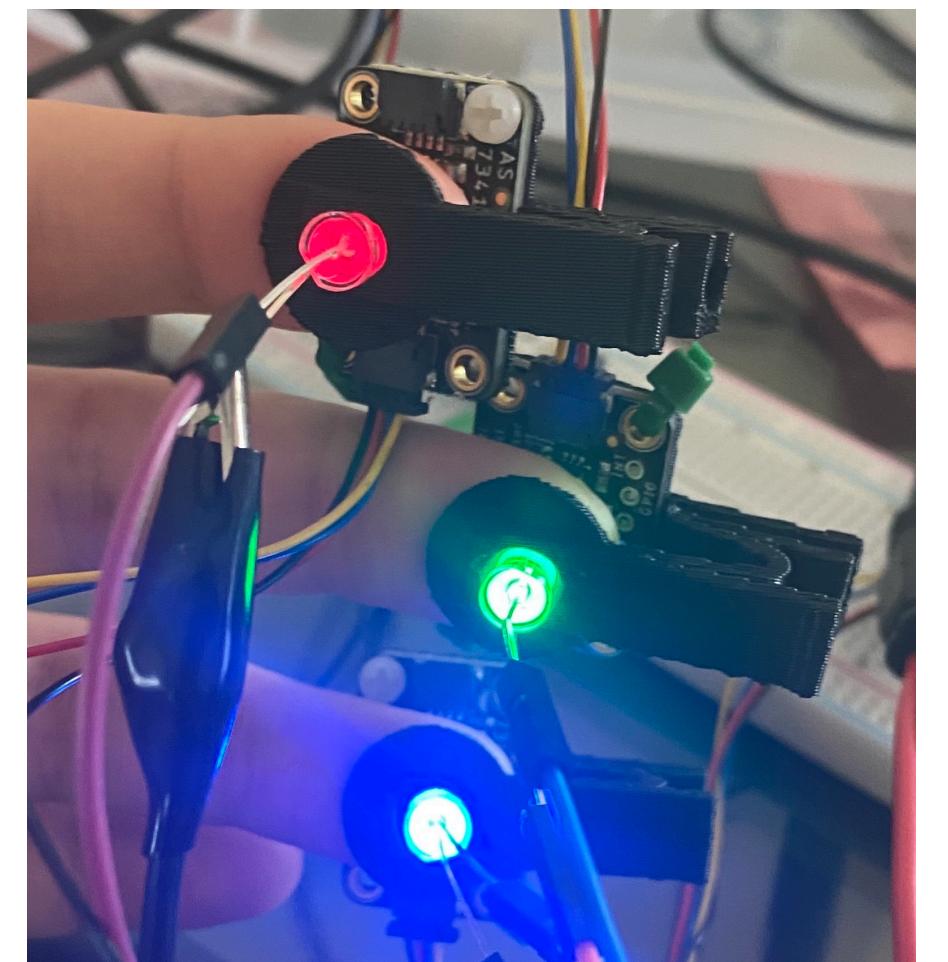
Environment

Battery Life

Form Factor

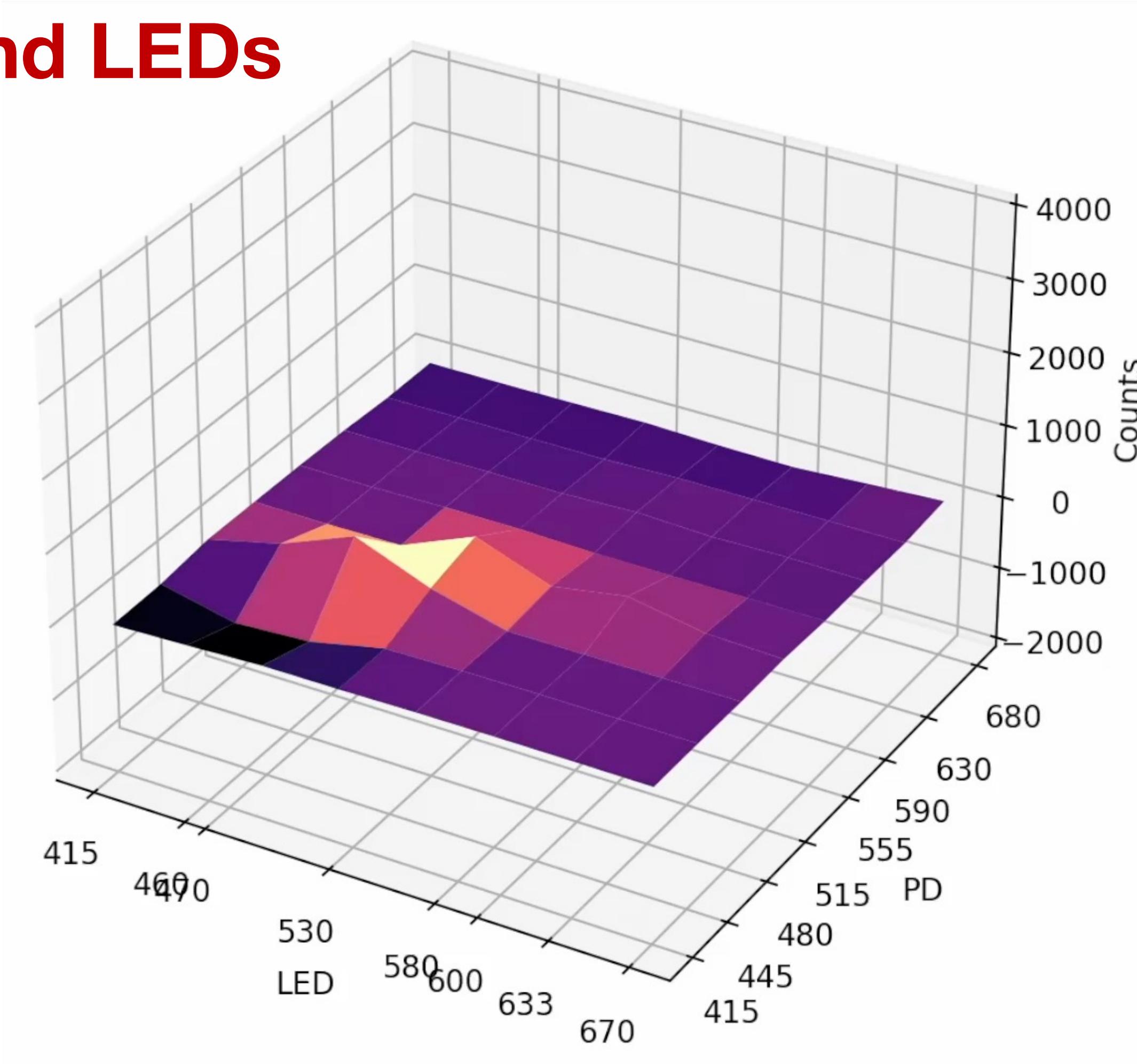
Applications – Glucose Monitoring

Using Individual LEDs



Applications – Glucose Monitoring

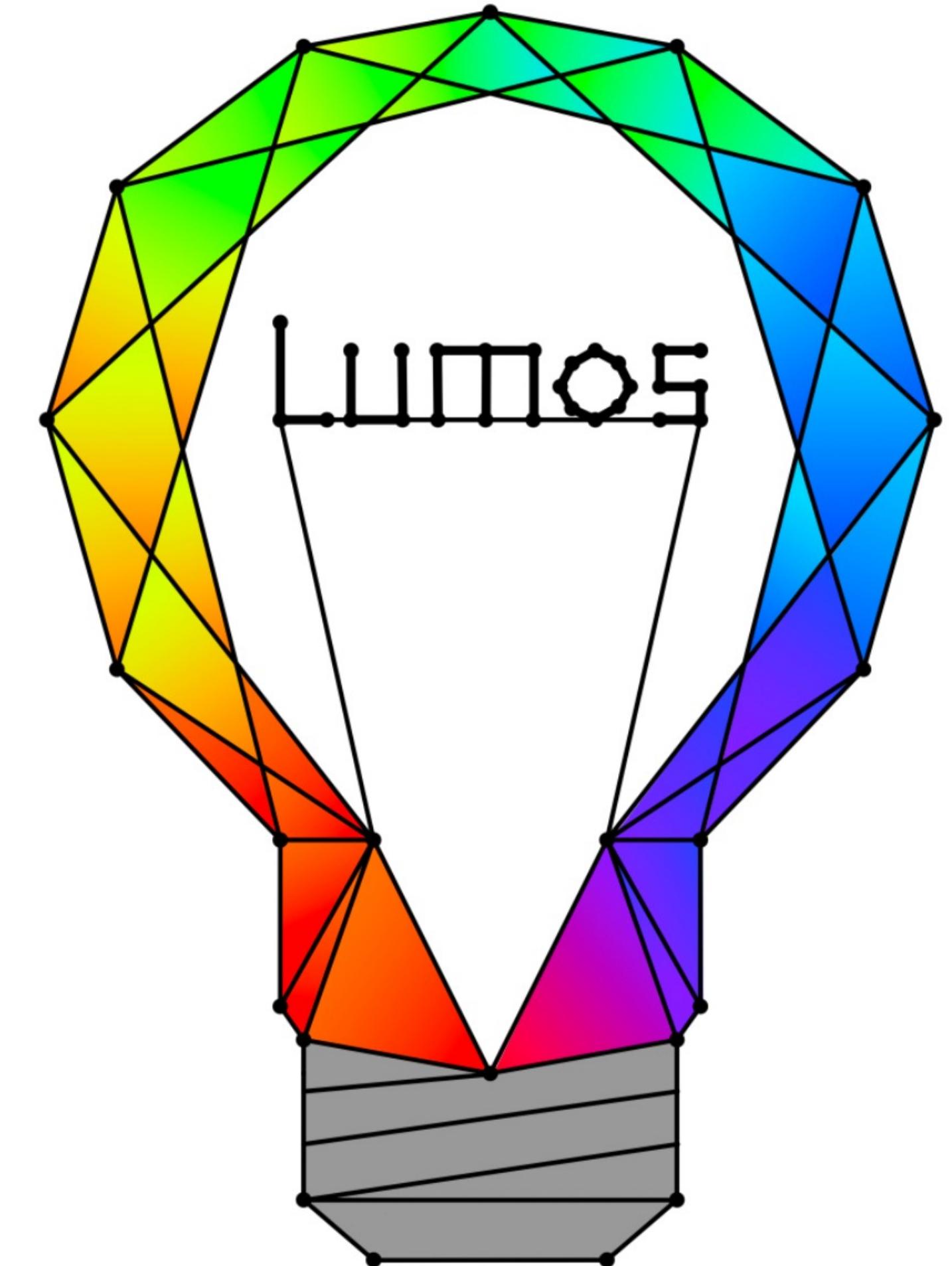
Using all PDs and LEDs



1.25 Hour Timelapse

Conclusion and Future Work

- Lumos is a wearable optical spectrometer that is enabling noninvasive biomarker monitoring
- Future Work:
 - Optimization of battery life vs sensing fidelity
 - Simultaneous sensing of biomarkers
- Applications:





Thank You!

UVA ENGINEERING
LINK LAB