



## 48-well optogenetic stimulation for the Maestro™ MEA platform

### What is optogenetics?

Optogenetics is the genetic integration of fast, light-activated channels (opsins) that allows targeted, precise manipulation of cellular activity. Opsins can be used to stimulate or suppress cell function providing researchers with a tool to control cell behavior for specific experimental needs.

### What does the Lumos system provide?

Axion BioSystems' Lumos optical stimulator is a pioneer in the *in vitro* optogenetics field. It pairs with the Maestro MEA platform enabling simultaneous optical stimulation and artifact-free electrophysiological recordings in a 48-well format. Each well contains the choice of four LEDs that can be used independently or in combination for flexible manipulation of cellular behavior. And Lumos could not be simpler to use; it seamlessly integrates with Maestro control software (AxIS™) for easy operation and streamlined data analysis capability.



Lumos pairs seamlessly with the Maestro system

## THE LUMOS ADVANTAGE

### Increased throughput

48-well plate format

### Use any opsin

4 LEDs per well cover 460-670 nm

### Fully configurable

192 independent LEDs with microsecond precision and adjustable intensity

### Enable new discoveries

Simultaneously stimulate and record



Lumos enables high-throughput optical stimulation in an innovative 48-well format. Each well contains 4 LEDs (inset), used independently or in combination.



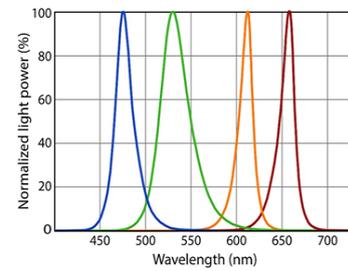
# Unprecedented flexibility and versatility

To facilitate rapid assay development and high-throughput applications, each of Lumos' 48 wells can be independently controlled for:

**Wavelength** – use any of the four LEDs alone or in combination

**Intensity** – adjust as needed for optimal opsin response

**Duration** – microsecond precision, patterning options available



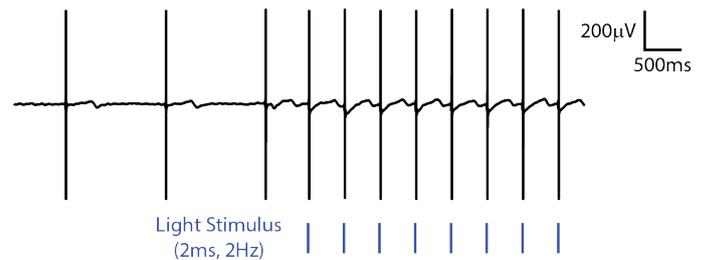
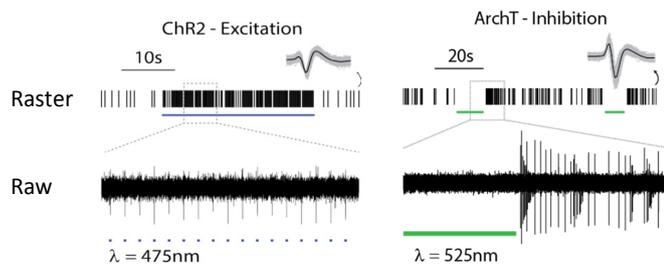
LED Color	Target Opsin	Center Wavelength	Maximum Intensity
Blue	ChR2	470 nm	3.5 mW/mm <sup>2</sup>
Green	ArchT	530 nm	1.7 mW/mm <sup>2</sup>
Orange	eNpHR	612 nm	2.0 mW/mm <sup>2</sup>
Red	Jaws	655 nm	1.3 mW/mm <sup>2</sup>

## AXIS 2.2 – Stimulation Studio

Intuitive, visual stimulation programming in an easily accessible plate map format. Here, each of the 192 LEDs can be independently controlled for both intensity (1-100% max power) and duration (down to 100 microseconds). Additionally, stimulation across the plate can be set-up for pre-defined time courses or regulated



## Optogenetics applied to Neurons and Cardiomyocytes



### Activation and suppression of cortical neuron action potentials

Each "tick" in the Raster indicates the detection of an action potential (see inset). When exposed to pulses of blue light, ChR2 depolarized the neuron, eliciting action potentials. Conversely, when exposed to green light, ArchT hyperpolarized the neuron, suppressing action potential firing which recovers immediately once the light is turned off.

### Artifact-free pacing of cardiomyocytes

Spontaneous beating of cardiomyocyte cultures often varies slightly from well-to-well, complicating data analysis and interpretation. Once transduced with opsin, Lumos provides artifact-free pacing and uniform beat rates across the plate. In this example, cells were paced at 2 Hz with a 2 ms pulse of light bringing uniformity to data recorded across the plate.

