

# Prizmatix

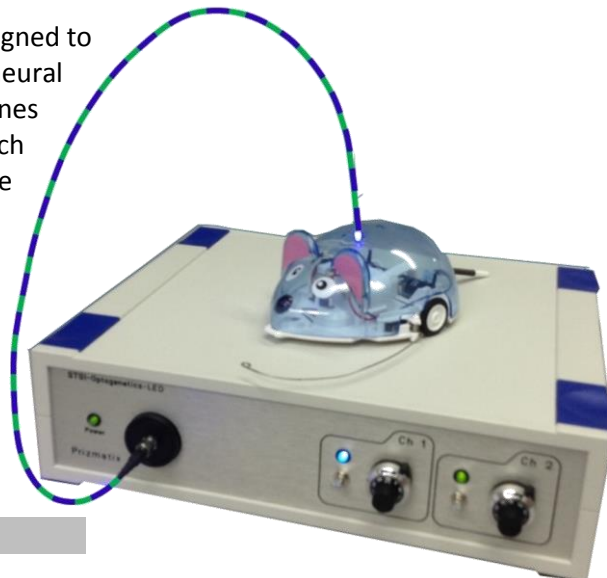
## Optogenetics-LED-STSI

### Fiber Coupled LED for Optogenetics in Freely Moving Animals

Ver. 2

#### Introduction

The Prizmatix Optogenetics-LED-STSI module is specially designed to provide Optogenetics Stimulation / Silencing to the same neural structure in freely moving mammals. The device combines two LEDs of different colors into same single output fiber. Each LED has independent power and switching control. The wavelengths combination can suit widely used Stimulation and Silencing opsin pairs, such as ChR / ArchT, ChR / C1V1, ChR / EnpHR3.0 be Blue / Green, Blue / Yellow and Blue / Red and other wavelengths upon request. The Optogenetics-LED-STSI based system enables bilateral activation / inhibition with single device and single one-channel rotary joint for significant cost saving and without compromising power at implant tip.



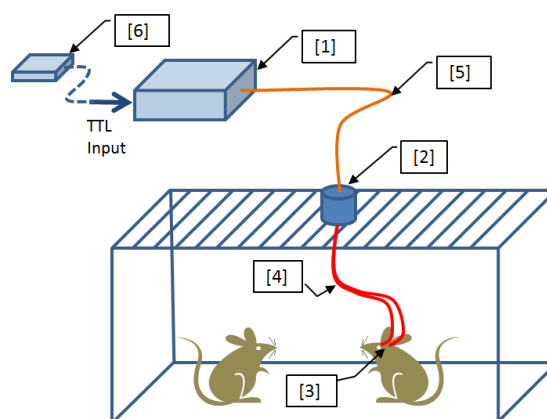
#### Key Features

- High power density (Blue:  $>220 \text{ mW/mm}^2$ ) at cannula's fiber tip following all fiberoptics connections and rotary joint.
- Unique large and powerful LEDs enable bilateral illumination with single LED and rotary joint for significant cost saving and without compromising power at implant tip.
- Extremely Low Torque LED-compatible rotary joint suitable for even the smallest animals
- Precisely adjustable power by 10 turns potentiometers, or electronically controlled by Analog input ports (0-5V)
- TTL inputs with Opto-isolator to eliminate ground-loop
- USB control (optional)
- Instant warm up time. Rise / Fall time  $<3 \mu\text{s}$

#### Optogenetics Toolbox for Free Moving Animals Experiments:

Prizmatix offers a full range of standard and customized items comprising the Optogenetics Toolbox. The most useful items for Optogenetics experiments in free-moving animals are:

- [1] Optogenetics-LED-STSI
- [2] Extremely low friction Rotary-Joint
- [3] Fiber Optics Cannulae
- [4] Single or Dual Fiber for bilateral activation
- [5] Fiber patch cord
- [6] Optional Pulser module with Windows software



For more information on items 2-6 please see Optional Accessories section below.

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## Common LED colors:

| Opsin    | LED Color   | Peak wavelength range (nm) |
|----------|-------------|----------------------------|
|          | UV - Violet | 385 - 410                  |
| ChR      | Blue        | 450-465                    |
| ArchT    | Green       | 515-525                    |
| C1V1     | Green       | 515-525                    |
| Enphr3.0 | Red         | 625-635                    |

### Idea!

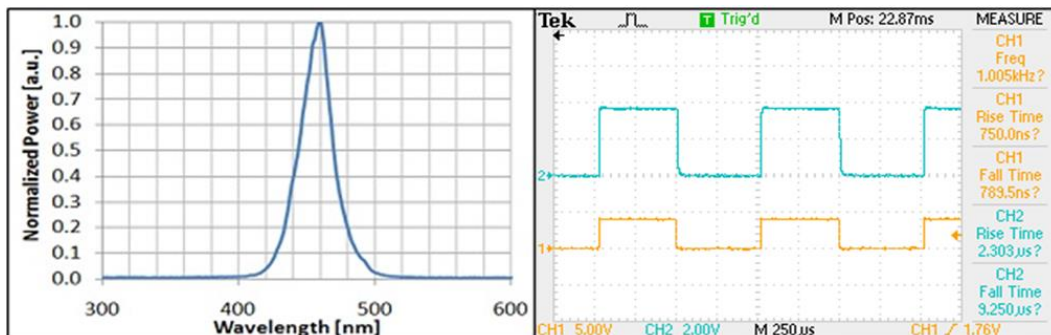


Prizmatix's unique large emitter LEDs enable bilateral stimulation with a single low cost light source and simple one channel rotary joint. Using a simple Y-shaped fiber bundle at the rotary joint will double the amount of light delivered to the brain, each branch, delivering virtually the same power as a single fiber. This results in significant cost saving in setting up bilateral brain activation and silencing systems, compared to alternative light sources.

## Typical Optical Specifications (Blue):

| Optical power and irradiance data for Optogenetics system including Optogenetics-LED-STSI (Blue channel), fiber patch cord, Single fiber and fiber optic cannula (implant): |    |         |
|---|----|---------|
| LED Color   | nm | Blue    |
| Peak wavelength range   | nm | 450-465 |
| Spectrum half width   | nm | 27      |
| Optical Power from 200um NA0.66 fiber   | mW | >10     |
| Optical Power from 250um NA0.66 fiber   | mW | >15     |
| Optical Power from 500um NA0.63 fiber   | mW | >60     |
| Optical Power from 1000um NA0.63 fiber  | mW | >250    |

| Optical power and irradiance data for full Optogenetics system including Optogenetics-LED-STSI (Blue channel), fiber patch cord, Rotary Joint, Dual / Single fiber and fiber optic cannula (implant): |                    |      |
|---|--------------------|------|
| Optical Power from 200um cannula  | mW                 | >7.5 |
| Optical Power from 250um cannula  | mW                 | >10  |
| Optical Power from 500um cannula  | mW                 | >40  |
| Irradiance from 200um cannula   | mW/mm <sup>2</sup> | >220 |



- Optogenetics-LED-STSI typical Blue spectrum
- Optogenetics-LED-STSI Rise/Fall Time. Ch1 – TTL input , Ch2 – LED output

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## Electrical Specifications:

|                                    |    |                           |
|------------------------------------|----|---------------------------|
| Digital modulation inputs          |    | Optically isolated TTL    |
| Connector for TTL and Analog input |    | BNC                       |
| Digital modulation frequency       | Hz | DC-30000                  |
| Rise / Fall time (10% - 90%)       | µs | <3 / <10                  |
| Analog input voltage range         | V  | 0-5                       |
| Input Voltage                      | V  | 12                        |
| Max Input current                  | A  | 5                         |
| Power Adaptor Input                |    | 85-264 VAC, 47-63Hz, 1.5A |

## General Specifications

|  |     |   |
|--|-----|---|
| Operation temperature range                  | °C  | 10 - 35   |
| Storage temperature range                    | °C  | -10 - 55  |
| Operating relative humidity (Non-condensing) | %   | <90   |
| Dimensions (L x W x H)                       | mm  | 197 x 174 x 80  |
| Weight                                       | g   | 750   |
| Power adaptor dimensions (L x W x H)         | mm  | 175 x 72 x 35   |
| Power adaptor weight                         | g   | 270   |
| Power Adaptor Safety                         |     |  |
| Fan noise                                    | dBA | 28.4  |

## Optional Accessories

For more details on optional accessories please see:

<http://www.prizmatix.com/Optogenetics/Prizmatix-in-vivo-Optogenetics-Toolbox.htm>

Please refer to the in-vivo Optogenetics system diagram at 1st page:

### Rotary Joint [2]:

Prizmatix's Rotary Joint has very low torque and friction, with minimal impact on behavior. Prizmatix's Rotary Joint is specially designed for Optogenetics experiments with High NA detachable fibers equipped with FC connectors. Rotary Joint can be used with single or multiple output fibers simultaneously, enabling concurrent delivery of light to separate areas of the brain without loss of power or brightness. For more details please see:

<http://www.prizmatix.com/optogenetics/rotary-joint.htm>

### Fiber Optic Cannulae [3]:

Prizmatix Implantable Fiberoptic Cannulae / Ferrules allow direct light stimulation of certain deep brain regions in living animals. Each Cannula (implant) consists of a zirconia ferrule accommodating a high NA Silica/POF fiber, protruding from the zirconia ferrule at the specified length. For more details please see:

<http://www.prizmatix.com/optogenetics/OG-Cannulae.htm>

### Single or Dual Fiber for bilateral activation [4] and Fiber Patch cords [5]

Prizmatix provides diverse fiber optics solutions for Optogenetics in-vivo. Made of silica, glass or polymer, these high NA fibers can be constructed to fit any research set-up with various combinations of connectors, ferrules, core diameters and lengths. Examples include single stainless steel coverings of bare tipped fibers, or Y-shaped fibers for simultaneous stimulation of two hemispheres. For more details please see: <http://www.prizmatix.com/optogenetics/Fiberoptics-for-Optogenetics.htm>

### Pulser module with Windows software [6]:

The Pulser - USB pulse train generator with user friendly software is an easy way to generate trains of pulses for Optogenetics activation directly from your computer. The Trigger-In input enables synchronization of Optogenetics activation with various experimental events. For more details please see:

<http://www.prizmatix.com/optogenetics/Pulser.htm>

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