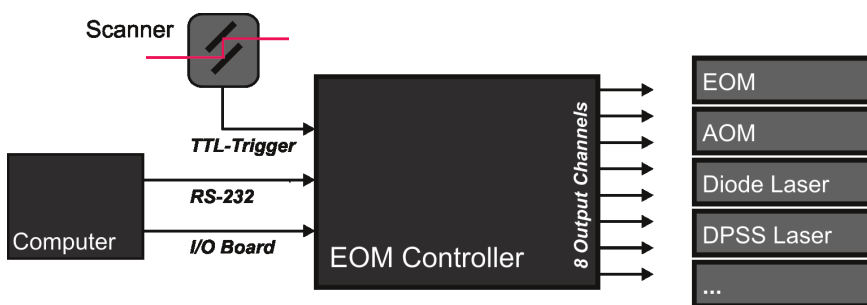


## Power Modulation Package

LaVision BioTec's Power Modulation Package for the TriM Scope family provides extended capabilities for experiments that are based on:

- Laser Induced Injuries
- FRAP
- Optogenetics
- Photo Activation

Applications. The Power Modulation Package includes hard- and software to modulate the laserpower in dependence of the scanner position and the Targeted Path Scanning Module to control the exact spatial laser focus position.



### Hardware

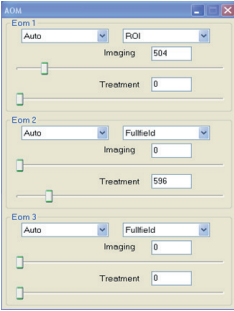
Heart of the package is the EOM controller that modulates or switches the output power of up to 8 lasers by EOM, AOMs, shutter or directly.

### Software

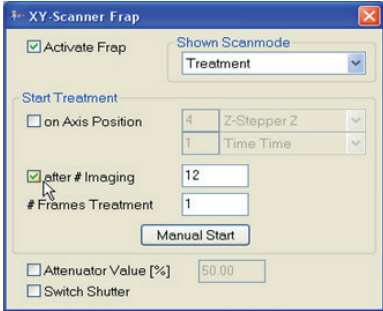
Most photo treatment experiments, like FRAP, laser induced injuries, optogenetics, and photoactivation follow this chronological order:

1. Imaging  
Taking n images (frame, line, free line, point) with specific laser settings [wavelength, laser type, laser power]
2. Photo Treatment  
Photo-treating predefined areas (could be a point, a region, or line) with specific laser settings [wavelength, kind of laser, laser power]
3. Imaging after Photo Treatment  
Taking n images with specific laser settings [wavelength, laser type, laser power]

The software module provide easy to use dialog boxes to define the photo treatment scheme and to set the laser configuration for imaging and photo treatment.



*Dialog Box:  
Laser Settings*



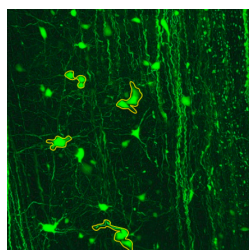
*Dialog Box:  
photo treatment scheme*

The quality of the photo treatment depends fundamentally on spatial and temporal precision and speed. The Targeted Path Scanning module resolves the exact position of the galvo-scanner to guarantee that the pre-defined pathway of the laser focus in the specimen is correct. Next, it allows the fast switch between imaging and treatment mode. It takes less than 30  $\mu$ s to switchover from image mode to treatment mode and less than 130  $\mu$ s to restart the imaging mode.

The Power Modulation Package provides two fundamental modes of operation.

### 1. EOM Treatment Mode

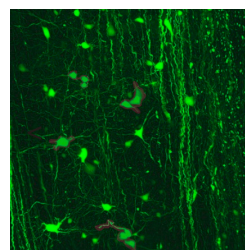
In this mode the scanner always scans the whole but set field of view. When it comes to treatment mode the predefined laser sources will only be activated in the regions that have to be photo treated. The user can choose unlimited numbers of arbitrary formed regions for photo treatment. This method can also be combined with LaVision BioTec's imaging 64 beam Camera 2-photon setup.



< 30 ms



< 130 μs



#### Imaging Mode

Imaging the sample before photo treatment and defining the region that will be photo treated

#### Treatment Mode

Photo treating single or multiple regions of interest

#### Imaging Mode

Imaging the sample after photo treatment

### 2. Pathway Treatment Mode

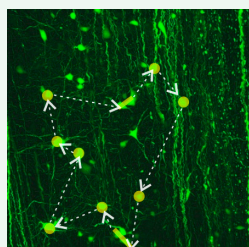
In Pathway Treatment Mode the scanner only follows the predefined pathways or scans up to 6 individual regions. The most common mode is:

1. Getting n images, could be a standard full field image or a predefined line scanning pathway
2. Switchover to Treatment Mode and follow a pathway of points and/or lines, or up to 6 regions of interest; in combination with LaVision BioTec's 6x spectral detector the PMTs will be mechanical shuttered to avoid any PMT saturation.
3. Getting back to imaging mode and take n images

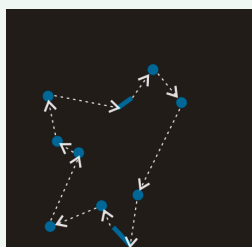
The following parameter can be chosen in treatment mode:

1. Dwell time during point treatment
2. Scanning speed during line treatment [max speed >0.5 m/s when using a 20x objective lens]
3. Scan frequency in ROI treatment [the switchover from ROI to ROI takes less than 330 μm]
4. Number of pathway cycles

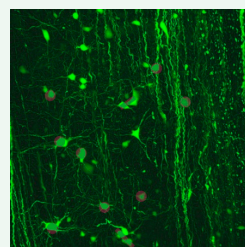
It takes less than 120 μs to jump from one point or line to the next one. Therefore, more than 3000 points within an area of interest of 150 μm<sup>2</sup> can be photo treated while using a 20x objective lens.



< 30 ms



< 130 μs



#### Imaging Mode

Imaging the sample before photo treatment and defining the pathway that will be photo treated

#### Treatment Mode

Photo treating points and lines, the laser is turned off while the scanner jumps from point/line to point/line

#### Imaging Mode

Imaging the sample after photo treatment

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