

Docket #: S13-139

Ultrafast Multifocal Multiphoton Microscope

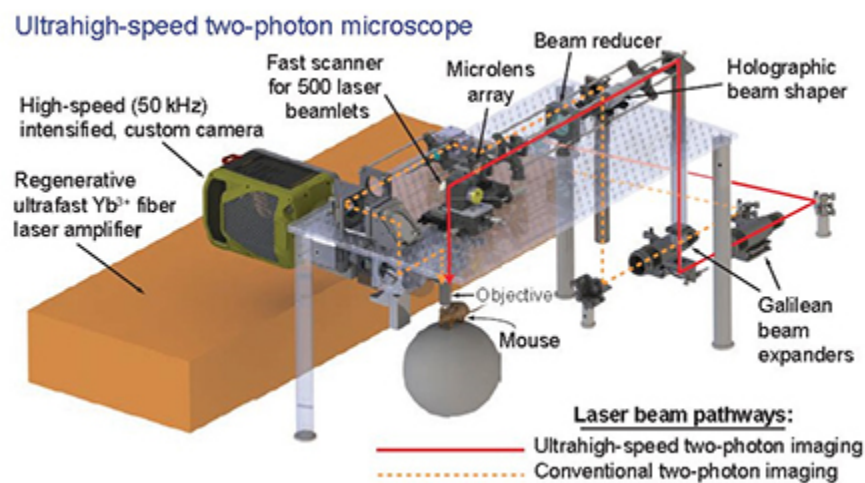
Stanford researchers have developed an ultrafast multi-foci two-photon microscope system that aims at 1 kHz full frame rate with 500x500 μm^2 field of view (FOV). It utilizes a 2D foci-array pattern and 1D scanning mechanism to achieve full FOV excitation coverage. A customized high-speed intensified CMOS camera is used for parallel detection of fluorescence signals from all laser foci. A custom image processing algorithm is then performed to reconstruct a complete image frame from its multiple sub-frames while correcting for optical cross talk between nearby foci. This invention advances state-of-the-art in vivo microscopy to match the recent progress of fluorescent voltage indicators with higher imaging speeds and large FOV.

Related Microscopy Technologies from the Schnitzer Lab

Stanford docket S13-155: "Robotic system for simultaneous multiple-area optical microscopy of a three-dimensional sample"

Stanford docket S13-154: "Very large curved field of view two-photon multi-foci raster scanning-microscope"

Figure



Overview of the main frame of the optomechanical design of the system

Applications

- General two-photon / Confocal imaging
- Electrophysiology imaging
- In-vitro / In-vivo imaging

Advantages

- **Ultrafast imaging speed** - from 10-20 Hz to 1kHz full frame
- **Large FOV**
- 2D tilted foci array pattern and 1D scanning mechanism
- Customized intensified camera system as the photon collection device for two-photon imaging
- Customized deconvolution algorithm to recover image quality
- Conventional two-photon / one-photon imaging capability included
- Advances state-of-the-art in vivo microscopy to match the recent progress of fluorescent voltage indicators with higher imaging speeds and large FOV

Publications

- [US Patent application US 20150157210](#) "MULTI-PHOTON MICROSCOPE HAVING AN EXCITATION-BEAM ARRAY"

Patents

- Published Application: [20150157210](#)
- Issued: [9,820,652 \(USA\)](#)

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