Docket #: S13-154

Scanning microscope with very large field of view

Researchers in Prof. Mark Schnitzer's laboratory have developed a two-photon scanning microscope for imaging neural activity in a 2x2mm field of view while maintaining a fast scanning rate (~10Hz image update frequency). In its current form, the microscope employs 16 laser beams, interleaved in time to provide 16-fold improvement in the number of cortical neurons that can be imaged simultaneously. The scalable design could potentially increase the field of view to record 10,000 cortical neurons. Furthermore, the geometry of the microscope enables scanning on a curved surface, which can be used to restrict the area of interest to specific cortical layer of the brain. This technology was created for in vivo brain imaging of live animals and its use could be extended to optical stimulation and more general bioscience imaging.

Related Microscope Technologies from the Schnitzer Lab
“Ultrafast Multifocal Multiphoton Microscope” (Stanford Docket S13-139)
“Robotic microscopy system for simultaneously imaging multiple areas of a sample” (Stanford Docket S13-155)

Applications

- **Two photon microscopy** with end-user applications such as:
  - in-vivo imaging of neurons, muscle or cardiovascular cells
  - neuroscience research - simultaneous neural activity imaging in large areas
  - optical simulation
  - general fluorescence imaging for bioscience research

Advantages

- **Large field of view:**
  - 2x2 mm in prototype configuration
  - 16x larger area than conventional technology
  - scalable design to further increase field of view size
- **High performance:**
  - fast scanning rate (~10 Hz image update frequency)
  - objective lens has is custom coated for maximum transmission at both excitation and fluorescence wavelengths
  - crosstalk between neighboring portions of the field of view can be eliminated
- **Imaging specific cortical layers** is achieved by scanning on a curved surface with adjustable imaging depth

Publications

- "Multi-foci laser scanning microscope and use of same for analyzing samples" (U.S. Patent Application, Publication No. 20150053870)

Patents

- Published Application: 20150053870
- Issued: 9,494,777 (USA)

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