ETH zürich

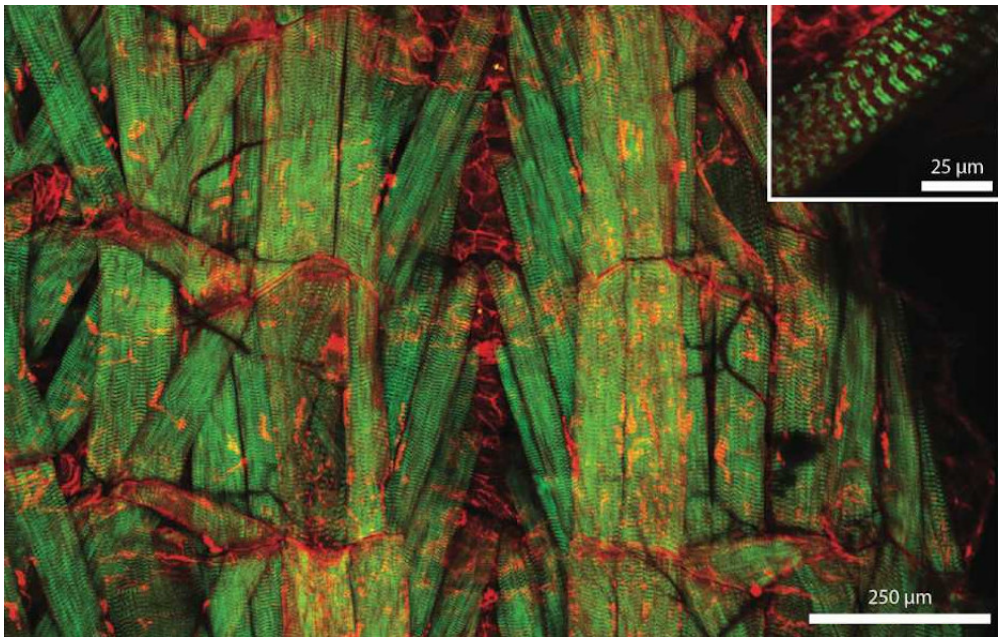
Department of Physics

Biomedical optical imaging made simpler

D PHYS

22.10.2017

The groups of Ursula Keller (ETH) and Fritjof Helmchen (University of Zurich & ETH) have demonstrated that small, reliable and cost-effective femtosecond semiconductor disk lasers can compete with more complex Ti:Sapphire lasers in *in vivo* multiphoton imaging experiments.



Multiphoton image of a Drosophila larva. As light source the ultrafast semiconductor disk laser developed at ETH was used.

In a paper published recently in *Biomedical Optics Express*, **Florian Emaury** (Institute for Quantum Electronics, ETH Zurich) and Fabian Voigt (Brain Research Institute, University of Zurich and Neuroscience Center Zurich, University of Zurich & ETH Zurich) reported a series of experiments they have undertaken together with co-workers. They established that *in vivo* multiphoton microscopy can be performed with considerably cheaper and more compact laser sources that has so far been possible.

Multiphoton microscopy is an important imaging modality for developmental biology and neuroscience. A main reason why its use is currently not more widespread is the high cost for the laser systems involved, typically Ti:Sapphire lasers. The Zurich team now used ultrafast semiconductor disk lasers and performed structural and functional multiphoton *in vivo* imaging in both drosophila larvae and mice, including, for example, structural and functional imaging of the mouse brain, where both the location of neurons and their electrical activity can be tracked (**video**). Importantly, the researchers found that the image quality obtained with their cost-effective lasers is comparable to what can be achieved with more expensive Ti:Sapphire lasers. These results should therefore pave the way towards the wider use of multiphoton microscopy.

In a next step, Florian Emaury and his colleagues will further develop the semiconductor disk lasers toward commercialization in the field of biomedical imaging. That work is supported through a **SNSF BRIDGE grant** that Emaury has been awarded earlier this year.

Reference

Fabian F. Voigt, Florian Emaury, Philipp Bethge, Dominik Waldburger, Sandro M. Link, Stefano Carta, Alexander van der Bourg, Fritjof Helmchen, Ursula Keller
Multiphoton in vivo imaging with a femtosecond semiconductor disk laser
Biomed. Opt. Express, **8**, 3213–3231 (2017). **doi: 10.1364/BOE.8.003213**

Accompanying **Spotlight article**

Links

Website Ultrafast Laser Physics group (ETH)

Website Laboratory of Neural Circuit Dynamics (UZH)

SNSF BRIDGE projects

Page URL: https://www.phys.ethz.ch/news-and-events/d-phys-news/2017/10/biomedical-optical-imaging-made-simpler.html
31.10.2017