Title: FiberScope-An Optical Fiber Laser Based, Handheld 3D Nonliner Microscope System for In Vivo Diagnostic Applications in Dermatology and Nanomedicine

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Nonlinear microscopy, such as two-photon excitation fluorescence microscopy (2PEF), and second-harmonic generation (SHG) microscopy is being increasingly used to perform *in vivo* studies in dermatology. These techniques enable us to investigate the morphology and monitor the physiological process in the skin by the use of femtosecond lasers (such as a broadly tunableTi-sapphire laser) operating in the near-infrared spectral range (680-1060 nm). Recent years brought revolutionary progress in development of femtosecond pulse, all-fiber laser oscillators and amplifiers being suitable for nonlinear microscopy. Fiber lasers are of great interest not only because of their considerably lower price but the ease with which they can be combined with endoscopy, which would greatly increase the utility of nonlinear microscopy for pre-clinical applications and tissue imaging. In our presentation we introduce our novel, handheld nonlinear microscope system named *FiberScope* comprising a ~2MHz repetiton rate Yb-fiber laser as a pulsed light source for nonlinear imaging. Among others, our novel microscope system is capable of high quality *in vivo* 3D SHG imaging of the collagene content of murine skin at average power levels as low as ~5 mW, which value is measured directly above the skin. (Note this power level corresponds to that of a laser pointer.) Using SHG imaginging of the collagene, we investigated and followed the effects of obesity on dermal collagen alterations for instance. Additionally, using 2PEF microscopy, we could also visualize and monitor the *in vivo* the uptake of Alexa Fluor 546 labelled nanomedicine by Langerhans cells for 24 hours.

Biography

Róbert Szipőcs received the M.Sc. degree in electrical engineering at the Technical University of Budapest, Hungary, in 1987 and his Ph.D. degree in physics at the University of Szeged, Hungary, in 2001. From 1987 to 2013, he has been working for the Institute for Solid State Physics and Optics of the Wigner Research Center for Physics of the Hungarian Academy of Sciences. From 1997, he is the managing director of R&D Ultrafast Lasers Ltd. He is the author of nearly 50 articles, and a few patents. His research interests include dispersive properties of optical coatings and fibers, ultrafast solid state and fiber lasers, nonlinear microscopy and its applications in dermatology, neuroscience and nanomedicine. He is a member of the Optical Society of America.

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