Retinal polarization-sensitive optical coherence tomography at 1060 nm with 350 kHz A-scan rate using an Fourier domain mode locked laser - DTU Orbit (28/10/2019)

Retinal polarization-sensitive optical coherence tomography at 1060 nm with 350 kHz A-scan rate using an Fourier domain mode locked laser
We present a novel, high-speed, polarization-sensitive, optical coherence tomography set-up for retinal imaging operating at a central wavelength of 1060 nm which was tested for in vivo imaging in healthy human volunteers. We use the system in combination with a Fourier domain mode locked laser with active spectral shaping which enables the use of forward and backward sweep in order to double the imaging speed without a buffering stage. With this approach and with a custom designed data acquisition system, we show polarization-sensitive imaging with an A-scan rate of 350 kHz. The acquired three-dimensional data sets of healthy human volunteers show different polarization characteristics in the eye, such as depolarization in the retinal pigment epithelium and birefringence in retinal nerve fiber layer and sclera. The increased speed allows imaging of large volumes with reduced motion artifacts. Moreover, averaging several two-dimensional frames allows the generation of high-definition B-scans without the use of an eye-tracking system. The increased penetration depth of the system, which is caused by the longer probing beam wavelength, is beneficial for imaging choroidal and scleral structures and allows automated segmentation of these layers based on their polarization characteristics.

General information
Publication status: Published
Organisations: Department of Photonics Engineering, Diode Lasers and LED Systems, Medical University of Vienna, Ludwig-Maximilians-University Munich
Contributors: Torzicky, T., Marschall, S., Pircher, M., Baumann, B., Bonesi, M., Zotter, S., Götzinger, E., Trasischker, W., Klein, T., Wieser, W., Biedermann, B., Huber, R., Andersen, P. E., Hitzenberger, C. K.
Number of pages: 8
Pages: 26008
Publication date: 2013
Peer-reviewed: Yes

Publication information
Journal: Journal of Biomedical Optics
Volume: 18
Issue number: 2
ISSN (Print): 1083-3668
Ratings:
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.87 SJR 1.387 SNIP 1.404
Web of Science (2013): Impact factor 2.752
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
Original language: English
Electronic versions:
JBO_18_2_026008.pdf
DOIs:
10.1117/1.JBO.18.2.026008
Source: dtu
Source ID: n:oai:DTIC-ART:pubmed/379515875::26528
Research output: Contribution to journal › Journal article – Annual report year: 2013 › Research › peer-review