



Bern University  
of Applied Sciences

## Research Group HuCE – optoLab

### Competences

The main activities of the research group Optics (**HuCE-optoLab**) focus on optical coherence tomography (OCT). We develop modern Frequency Domain OCT systems with the newest optical components and laser systems. The infrastructure of the **HuCE-optoLab** allows short term realization of feasibility studies or test measurements in the field of optical sensing. Opto-mechanical and opto-electronic design are among our core competences. A team of specialized and well trained engineers, mainly with an industrial background, is available for industry project processing.

### Key Projects

Founded by the Commission for Technology and Innovation (CTI):

- Eye scanner for topology measurement (CTI Nr 10268.1 PFLS-LS)
- Miniaturized Swept Source Optical Coherence Engine (CTI Nr. 11668.1PFNM-NM)
- Seeing Surgical Laser (CTI Nr. 12984.1)
- Development of an Optimized Laser Head for Contact-Free Laser Osteotomy with real time automatic Depth Control for increased safety (CTI Nr. 15824.1 PFLS-LS)

Founded by the Swiss National Foundation (SNF)

- Characterization of choroidal changes in children and its temporal response to optical defocus (SNF 320030\_146021/1)

Industry or direct funded project

- Tolerancing assessment for spectrometer
- Monitoring of teeth erosion, collaboration with Zahnklinik, Inselspital Bern
- Ray tracing simulation for indicator illumination

### Publications

2015

P. Steiner, et al, "Automatic estimation of noise parameters in Fourier-domain optical coherence tomography cross sectional images using statistical information," *Appl. Opt.*

2014

P. Steiner, et al, "Retinal Laser Lesion Visibility in simultaneous Ultra-High Axial Resolution Optical Coherence Tomography", *IEEE Photonics Journal*,

Stefan Remund et al, "Fiber optically integrated cost-effective spectrometer for optical coherence tomography", *Biophotonics: Photonic Solutions for Better Health Care IV*,

D. Ernst et al, "Multi-channel near-infrared spectrometer for functional depth-resolved tissue examination and positioning applications", *SPIE BiOS*,

2013

E. Rakhmatullina, A. Bossen et al "Optical pen-size reflectometer for the monitoring of early dental erosion in native and polished enamel", *Biomed. Opt.*

A. Unterhuber, B. Považay et al., "Simultaneous dual wavelength eye-tracked ultrahigh resolution retinal and choroidal optical coherence tomography", *OPTICS LETTERS*

D. Täschler, et al, "MEMS-based scanning head with variable focus for retinal and vitreous imaging", *OSA European Conferences on Biomedical Optics*.

A. Holzer, et al, "Spectrally Balanced Polarization-Encoded Full-Range Detection Unit for Swept Source OCT", *OSA European Conferences on Biomedical Optics (ECBO)*,

### Infrastructure

The modern infrastructure of the **HuCE-optoLab** includes:

- Spectral Domain OCT systems at different wavelengths
- Swept Source and Polarization Sensitive OCT
- HYDRA dual wavelength OCT on Spectralis platform from Heidelberg SA.
- Interferometer, vibrometer, confocal microscope
- Optical spectrum analyzer and different spectrometers
- Laser beam analyzer systems etc

### Contact

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