



Master of Science – Biomedical Engineering
Thesis Proposal

Characterization of laser-driven plasma emission of biological tissues

In laserosteotomy, the type of tissues being cut has to be identified. Otherwise, critical structures of the body under the focal spot of the laser beam are prone to inadvertently ablation. This limitation can be improved by connecting the laserosteotome to an optical detection system which could differentiate the different type of tissues. LIBS (Laser-induced Breakdown Spectroscopy) is a potential optical method for this application. In LIBS, the light emitted from the ablation spot, which corresponds to the recombination spectra of ionized atoms and molecules, is collected with a spectrometer to resolve the atomic composition of the ablated sample. After collecting the spectrum, some post proceeding analysis are required to classify different group of the samples. This analysis could be based on the line broadening, plasma temperature, electron density, or Ionization degree of specific atomic lines. The student in this project is expected to characterize the plasma emission from different biological samples to differentiate soft and hard tissues or normal and cancerous tissues. Laser-induced thermal damages are expected to be identified as well. Basically, the main task starts with some literature review and will be continued with some time-resolved signal collection and processing (similar to Calibration-Free LIBS and Saha-Boltzmann method). Finally, the outcome of the work is expected to be written in a manuscript format to be submitted to a peer-reviewed journal/ conference proceeding.

Nature of the Thesis

Theoretical: 30%
Experimental: 30%
Programming: 30%
Documentation: 10%

Specific Requirements

Basic knowledge in optics/ signal processing would be helpful
Programming skills (e.g., Matlab, C++ or LabVIEW) are desirable
Prior experience in spectroscopy is a plus (not mandatory)

Supervisor & Contact

Prof. Dr. -Ing. Azhar Zam (Head of BLOG)
Hamed Abbasi (PhD Student)
Biomedical Laser and Optics Groups (BLOG) (<http://blog.dbe.unibas.ch/>)

Contact

Hamed Abbasi: hamed.abbasi@unibas.ch or +41 61 207 54 67-

