Masterthesis **21.02.2020**

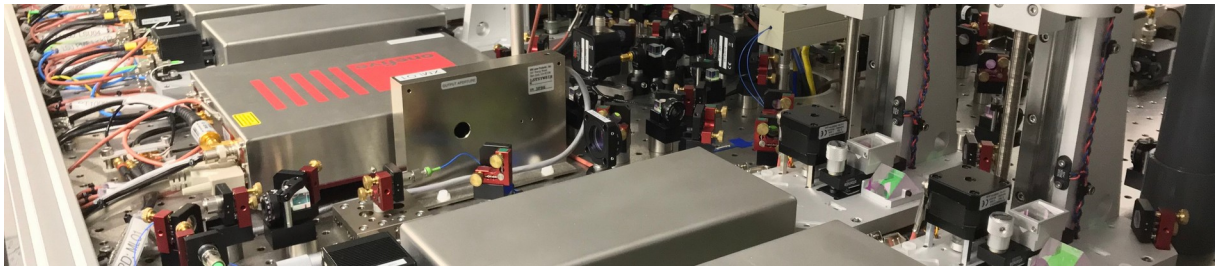
Titel **Control Performance Optimization for the Optical Synchronization System at European XFEL**

Project description:

The optical synchronization system for the European XFEL and FLASH accelerators at Deutsches Elektronen Synchrotron (DESY) provides stable timing signals in the femtosecond domain over a distance of several kilometers and thus ensures high quality results in the temporally resolved accelerator experiments. This system combines highly sensitive optical devices and setups with fast computation hardware to achieve unprecedented levels of timing stability.

One limitation is currently given by the performance of the heuristically tuned PI controller that synchronizes client mode-locked laser oscillators to upstream timing sources. At a very basic level, improving timing stability even further requires a controller with improved tracking performance while keeping oscillations from the resonant frequencies of the piezoelectric actuator element in check. Goals may include the design and comparison of various model based state-space control schemes and more recent data-driven solutions. If deemed necessary, a verification of the developed white-box model with novel identification methods can also be part of the project's outcome. A concrete proposal will be developed on an individual basis in accordance with the students interests and background.

This project can benefit from quick understanding and adaptation to new application environments as well as practical thinking. A background in control systems is required and previous experience with MATLAB/SIMULINK is a strong plus. An interest in particle accelerators and or optical technologies is welcome.



This master thesis will be performed as cooperation of the Institute of Control Systems, TUHH, and the Machine Control Group at DESY.

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