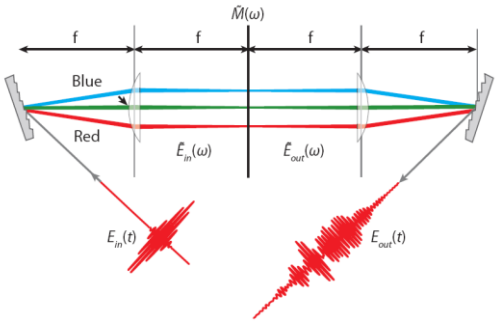
MASTER THESIS

ULTRASHORT LASER PULSE SHAPING FOR APPLICATION IN COHERENT CONTROL EXPERIMENTS



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Research topic	Time-resolved experiments performed with sufficient spectral and temporal resolution are a powerful research tool. They can be used to study chemical reactions or biological macrocomplexes with very complex dynamics. However, often the complexity cannot be disentangled by conventional ultrafast spectroscopy and new approaches need to be employed. Amplitude and phase shaped laser pulses can be used in coherent control experiments to explore the potential energy surfaces of the excited molecules. Such pulses can drive the molecular wavepackets along different coordinates, and therefore enhance or suppress the probability of a given reaction pathway. In this way, new knowledge about the reaction mechanisms can be gained.
Literature	Rabitz *et al.*, Whither the Future of Controlling Quantum Phenomena?, Science, 288 (2000) 824-828. H. Rabitz and Zhu, Optimal Control of Molecular Motion: Design, Implementation, and Inversion, Acc. Chem. Res., 33 (2000) 572-578. Nuernberger *et al.*, Femtosecond quantum control of molecular dynamics in the condensed phase, Phys. Chem. Chem. Phys., 9 (2007). Antoine *et al.*, A newcomer's guide to ultrashort pulse shaping and characterization, J. Phys. B, 43 (2010) 103001.
Working project	The Master thesis work will be focused on the development and implementation of algorithms for control, feedback and optimization of pulse shaped laser pulses. Significant part of the work will involve programing in Matlab and Labview. However, within the project you will also gain hands-on experience in laser spectroscopy, laser pulses characterization and shaping.
Previous knowledge	Mathematics. Basic knowledge of optics and laser spectroscopy.
Language	English
Starting date	Autumn-Winter, 2017