Ph.D. THESIS DEFENSE

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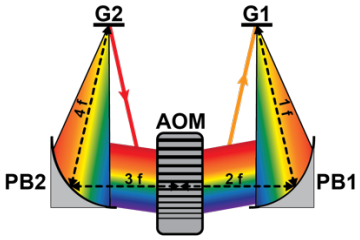
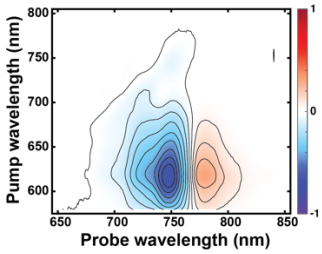
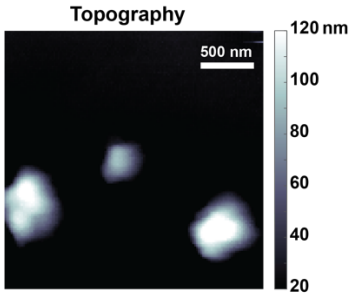
Ultrafast pulse-shaping applied to multi-dimensional spectroscopy and novel microscopy methods

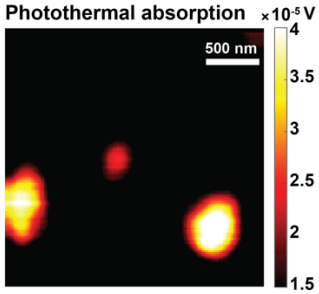
Zanni Group

August 26th, 2022 at 9:00 am in 9341









Ultrafast spectroscopy has become a valuable tool for a variety of fields, including materials science, photo physics, and biophysics. To capitalize on the many advances in ultrafast light sources, the femtosecond pulses must be manipulated for the purpose of the experiment. For instance, two-dimensional electronic spectroscopy (2DES) requires fine control of the time-delay between a pulse pair. In addition, control of the relative phase between the two pulses can isolate specific pathways in the system, and control of the spectral phase of the pulses can generate transform limited pulses; meaning the pulse is as short in time as possible for the given spectral bandwidth. The time-delay, relative phase, and spectral phase are non-trivial parameters to control. A tool that can manipulate all three of these parameters is an acousto-optic modulator (AOM) based pulse shaper. In this dissertation, I will describe the experimental implementation of a quartz AOM pulse shaper, as well as demonstrate its use for two-dimensional white-light (2D WL) spectroscopy and Fourier transform photothermal (FTPT) microscopy.

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