

SwissFEL Workshop 2: Scattering and diffraction experiments



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Coherent Control of Microscopic Order: High Field THz and Xray experiments at the SwissFEL

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With the advent of electromagnetic radiation sources in the range from 0.1 to 10 THz, new ways to study fundamental physics phenomena have become accessible. THz sources capable of generating MV/cm transient electric field strengths are beginning to allow the investigation of nonlinear responses, and even coherent control, in a host of materials in a way not possible with other regions of the electromagnetic spectrum. Direct coherent control over collective excitations in systems where ultrafast changes in structure indicate rich physical processes could be insightfully studied with ultrafast Xray diffraction. The high intensity and time resolution of the proposed SwissFEL in tandem with single cycle, broadband THz pulses for non-resonant excitation or multiple cycle, narrowband THz radiation for resonant excitation would make the study of such phenomena possible. Great flexibility in bandwidth (from broadband to narrowband), polarization, and high field strength of the generated THz radiation are all central to the success of such experiments.

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