



ANNOUNCEMENT - TALK

Title: Imaging light-induced heterogeneity in ultrafast phase transitions

Abstract:

Phase transitions are complex phenomena. Thermal phase transitions are often heterogeneous first nucleating at some point in the material and then growing and the dynamics of these processes are responsible for the microstructure of the material, which ultimately dictates its physical properties. However, how do non-equilibrium phase transitions occur when driven by light, do phenomena such as nucleation still occur?

In this talk, I will present our recent work on using soft X-ray coherent imaging to track phase transitions in time and space, with ~30 nm spatial resolution and 100 fs time resolution [1-3]. I will show how X-ray imaging, combined with X-ray spectroscopy can be used to both provide contrast between phases, and to identify the properties of each phase and I will show how we can use X-ray imaging to measure the transient properties of the insulator-metal phase transition in VO₂ on the nanoscale.

If time permits, I will discuss our recent work on studying phase transitions at the surface. Surfaces are a source of heterogeneity that can fundamentally change how phase transitions occur. By using ultrafast surface scattering, I will show how optical excitation drives preferential melting of weakly correlated regions at the surface through the formation of polarons. I will also discuss some of the challenges of measuring transient structures with X-rays when there is strong surface heterogeneity [4].

Vidas et al. *Nano Letters* **18**, 3449 (2018)

Johnson et al. *Science Advances* **7**, eabf1386 (2021)

Johnson et al. *Nature Physics* **19**, 215 (2023)

Monti et al. arXiv:2407.03013 (2024)

Date/Time: **THURSDAY, August 22 at 10:00**
Location: **MPSD Building 900, EG 136**
Speaker: **PROF. DR. SIMON ELLIOT WALL** (Department of Physics and Astronomy, Aarhus University)