SEMINAR: A phase microscope for quantum gases

JUSTUS BRUGGENJURGEN

January 27, 2025
15:00 to 16:00
Seminar Room

Coherence properties are central to quantum systems and are at the heart of phenomena such as superconductivity. Here we study coherence properties of an ultra-cold Bose gas in a two-dimensional optical lattice across the thermal phase transition. To infer the phase coherence and phase fluctuation profile, we use direct matter-wave imaging of higher Talbot revivals as well as a new phase microscope based on a site-resolved mapping of phase fluctuations to density fluctuations during matter-wave imaging. We use these tools to probe the phase coherence across the Berezinskii-Kosterlitz-Thouless phase transition in the lattice and extract the critical exponent from single-site resolved phase measurements. These tools will be vital for studying coherence properties in strongly correlated quantum systems in a spatially resolved manner, e.g., for detecting phase domains or resolving superfluid domains in inhomogeneous systems.

Hosted by: Prof. Dr. Leticia Tarruell