Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Unraveling the role of long-range coherence for superfluid dynamics by disorder quenches[1] SIAN CARDOSO BARBOSA, BENJAMIN NAGLER, JENNIFER KOCH, ARTUR WIDERA, Technical University of Kaiserslautern —
Quantum fluids exhibit a well-defined phase, which can be interferometrically measured. The direct connection of long-range coherence with superfluid transport and expansion dynnamics is, however, challenging to access experimentally. I report on experimentally revealing the role of long-range coherence for superfluid flow in an interacting gas of lithium-6 atoms along the BEC-BCS crossover, quenched into and out of optical disorder. I will describe the experimental apparatus including the creation of disorder by laser speckle pattern. Then, I will present our investigations about the density and superfluid-expansion response of a molecular Bose-Einstein condensate after quenching. We measure the breakdown and reoccurrence of superfluid hydrodynamics. We track the response times on which the system relaxes to a new equilibrium and relate the time scales to fundamental energy scales of the system. Our results shed light onto the importance of long-range phase coherence for superfluid flow, and also suggest a possible route of studying complex phase dynamics in superfluids by imprinting disordered phases.

[1]Supported by SFB/TR185 (Project No. 277625399) by DFG; B.N. receives support from a DFG Fellowship through the Excellence Initiative by the Graduate School Materials Science in Mainz (GSC 266)

Sian Cardoso Barbosa
Technical University of Kaiserslautern

Date submitted: 30 Jan 2020 Electronic form version 1.4