Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Observation of Phase Coherence and Superfluidity in a Strongly Interacting Two-dimensional Fermi Gas THOMAS LOMPE, NICLAS LUICK, LENNART SOBIREY, University of Hamburg, MARKUS BOHLEN, University of Hamburg, LKB-ENS Paris, HAUKE BISS, HENNING MORITZ, University of Hamburg — We present our studies of phase coherence and superfluidity in strongly interacting two-dimensional Fermi gases. We observe phase coherence by creating a tunnel junction in a homogeneous 2D Fermi gas and measuring the frequency of Josephson oscillations as a function of the phase difference across the junction. We find excellent agreement with the sinusoidal current phase relation of an ideal Josephson junction. We probe superfluidity by dragging a periodic potential through a homogeneous 2D gas and observing the characteristic onset of dissipation above a critical velocity v_c. We measure the excitation spectrum of a low-temperature system as a function of interaction strength and find that for a gas of tightly bound molecules there is a well-defined phononic excitation at the speed of sound, as expected from the Landau criterion. This phononic excitation persists into the crossover regime until pair breaking becomes the primary mechanism of dissipation on the BCS side of the resonance. We also present our progress towards studying the temperature dependence of the excitation spectrum to determine the critical temperature for superfluidity of a 2D Fermi gas as a function of interaction strength.

Thomas Lompe
University of Hamburg

Date submitted: 31 Jan 2020 Electronic form version 1.4