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Observation of Josephson Oscillations in a Homogeneous 2D Fermi-Gas MARKUS BOHLEN, Laboratoire Kastler Brossel - École Normale Supérieure, Institut für Laserphysik - Universität Hamburg, NICLAS LUICK, LENNART SOBIREY, BERND LIENAU, THOMAS LOMPE, HENNING MORITZ, Institut für Laserphysik - Universität Hamburg — The Josephson Effect is one of the hallmark properties of superconductors. In solid state systems, Josephson junctions have been used for a wide range of applications, such as SQUIDs, single electron transistors and superconducting qubits. In this talk, we report on the first realization of a Josephson junction in a quasi-two-dimensional quantum gas. The atoms are confined in a homogeneous box-potential, which is split by a thin barrier created via a digital micromirror device (DMD). We initialize Josephson oscillations by imprinting a phase difference between the two sides using a second DMD and then observe the oscillations in amplitude and relative phase between the two sides. We perform such measurements for different barrier heights and for different interaction strengths. Since the Josephson Effect relies on the existence of phase coherence across a tunneling barrier this is a perfect tool to study the coherence properties of fermionic Berezinskii-Kosterlitz-Thouless superfluids across the BEC-BCS crossover. The flexibility of our setup also makes it an excellent platform to investigate fluxons, Shapiro resonances and tunnel junction arrays.

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