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**An ideal Josephson junction in an ultracold two-dimensional Fermi gas**[1] NICLAS LUICK, LENNART SOBIREY, University of Hamburg, MARKUS BOHLEN, University of Hamburg, LKB-ENS Paris, VIJAY PAL SINGH, LUDWIG MATHEY, THOMAS LOMPE, HENNING MORITZ, University of Hamburg — Two-dimensional structures are present in almost all known superconductors with high critical temperatures, but the role of the reduced dimensionality is still under debate. Recently, ultracold atoms have emerged as an ideal model system to study such strongly correlated 2D systems. Here, we present our realisation of a Josephson junction in an ultracold 2D Fermi gas. We measure the frequency of Josephson oscillations as a function of the phase difference across the junction and find excellent agreement with the sinusoidal current phase relation of an ideal Josephson junction. Furthermore, we determine the critical current of our junction in the crossover from tightly bound molecules to weakly bound Cooper pairs. Our measurements clearly demonstrate phase coherence and provide strong evidence for superfluidity in a strongly interacting 2D Fermi gas.

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