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Quasiparticle and phase-slip induced excitations in ultracold lithium gases FRANCESCO SCAZZA, GIACOMO VALTOLINA, INO-CNR and LENS, University of Florence, Italy, PIETRO MASSIGNAN, ICFO-Institut de Ciencies Photoniques, Castelldefels, Spain, ALESSIO RECATI, INO-CNR BEC Center, University of Trento, Italy and Ludwig-Maximilians-Universitt Mnchen, Germany, ANDREA AMICO, ALESSIA BURCHIANTI, CHIARA FORT, MASSIMO INGUSCIO, MATTEO ZACCANTI, GIACOMO ROATI, INO-CNR and LENS, University of Florence, Italy — The fine control over interactions in ultracold Fermi gases close to a Feshbach resonance, in combination with tailored optical potentials, provide unique opportunities to explore strongly-correlated fermion phenomena. In our ultracold lithium setup, by superimposing a thin optical barrier to a fermionic superfluid, we realize an atomic Josephson junction, where we recently studied the emergence of dissipation across the BEC-BCS crossover. We directly identify the main source of dissipation with the leakage into the bulk of phase-slip-induced vortex excitations nucleated within the barrier region. In another recent study, we employed radio-frequency spectroscopy to investigate highly polarized spin-mixtures on the repulsive side of the Feshbach resonance. We report on the observation of well-defined repulsive quasiparticles up to unitarity-limited interactions. We characterize the essential properties of repulsive Fermi polarons: their energy, effective mass, quasiparticle residue and lifetime.

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