

Abstract Submitted  
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**Collective Excitations in Bose-Fermi Mixture**<sup>1</sup> CARSTEN ROBENS, YIQI NI, ZOE YAN, ALEXANDER CHUANG, MARTIN ZWIERLEIN, MIT — Low-lying collective excitations are sensitive probes to quantum many-body systems. In particular, quasiparticle properties and the quantum gas equation of state are studied through these elementary excitations. We focus on exploring the Bose-Fermi mixture in the fermionic impurity limit, which exhibits rich many-body phase diagram and dynamics. The mixture is created by immersing fermionic  $^{40}\text{K}$  atoms into a  $^{23}\text{Na}$  Bose-Einstein condensate (BEC). We optically excite dipole and other low-lying collective modes and study the Bose-Fermi mixture response upon varying interspecies interaction strength and temperature. Our experiments reveal a collisionless to hydrodynamic transition of fermionic impurities.

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