Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Collective modes of a BEC immersed in a Fermi sea[1] BO HUANG, RIANNE S. LOUS, ISABELLA FRITSCHE, FABIAN LEHMANN, MICHAEL JAG, EMIL KIRILOV, RUDOLF GRIMM, MIKHAIL A. BARANOV, Inst. for Quantum Optics and Quantum Information (IQOQI), Austrian Academy of Sciences, and University of Innsbruck, Austria — The collective dynamics of a trapped Bose-Einstein condensation(BEC) can change significantly when the BEC is strongly interacting with a degenerate Fermi gas. We realize such a quantum mixture with a ^{41}K BEC immersed in a large single-component degenerate Fermi gas of ^{6}Li, and both elements are trapped in an elongated optical dipole trap while the interspecies contact interaction is manipulated by a magnetic Feshbach resonance between the lowest spin state of both elements near 335.08 G. When the interspecies repulsive interaction increases, the two components start to repel each other, i.e. the BEC density is enhanced while the fermions are depleted at the trap center, and finally become spatially separated when the interaction is sufficiently strong. Across this transition, we measure the frequencies of BEC collective oscillations and observe a substantial change of the frequency of the radial breathing mode. We interpret our observations with a mean-field model beyond the local-density approximation.

[1]This work is supported by the Austrian Science Fund FWF within the collaborative research grant FoQuS.

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Date submitted: 28 Jan 2017 Electronic form version 1.4