

Abstract Submitted  
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**Attractive atom-dimer interaction in a mass-imbalanced Fermi-Fermi mixture**<sup>1</sup> MICHAEL JAG, Inst. fuer Experimentalphysik, Universitaet Innsbruck, Innsbruck, Austria, MATTEO ZACCANTI, MARKO CETINA, RIANNE LOUS, IQOQI, Oesterreichische Akademie der Wissenschaften, Innsbruck, Austria, DMITRY PETROV, LPTMS, CNRS, Universit Paris Sud, Orsay, France, JESPER LEVINSEN, Cavendish Laboratory, Cambridge, UK, FLORIAN SCHRECK, RUDOLF GRIMM, IQOQI, Oesterreichische Akademie der Wissenschaften, Innsbruck, Austria — Mass imbalance in strongly interacting mixtures of ultracold fermions is predicted to lead to new pairing phenomena and quantum phases. We report on a striking phenomenon that appears as a unique consequence of mass imbalance, having no counterpart in a mass-balanced case. We investigate a  ${}^6\text{Li}$ - ${}^{40}\text{K}$  Fermi-Fermi mixture in the regime of strong interactions on the repulsive side of an interspecies Feshbach resonance. Using radio-frequency spectroscopy we find that, for a sufficiently strong repulsive  $s$ -wave interaction, the  ${}^{40}\text{K}$  atoms and the  ${}^6\text{Li}{}^{40}\text{K}$  dimers interact attractively, which is in strong contrast to the mass-balanced case. This surprising behavior is related to the existence of a  $\uparrow\uparrow\downarrow$  trimer state in  $\uparrow\downarrow$  Fermi-Fermi mixtures with a mass ratio  $m_\uparrow/m_\downarrow > 8.2$ . For our mass ratio of  $m_{\text{K}}/m_{\text{Li}} = 6.64$ , this trimer state turns into a  $p$ -wave atom-dimer scattering resonance, giving rise to an attractive interaction.

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