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Boson mediated collapse and revival of the Fermi sea in a Bose-Fermi mixture DEEPAK IYER, Penn State University, SEBASTIAN WILL, Massachusetts Institute of Technology, MARCOS RIGOL, Penn State University — The collapse and revival dynamics of quantum fields is one of the most pristine forms of nonequilibrium quantum dynamics. It has so far only been observed in the dynamical evolution of bosonic systems, such as coherent light or matter wave fields. We report on the first experimental observation of the collapse and revival of the Fermi sea in a Bose-Fermi mixture. The dynamics is generated by quenching the mixture to a deep 3D optical lattice and letting it evolve. To describe the observations, we develop an analytical model of the dynamics after the quench based on a spin-polarized Fermi sea that interacts with a coherent Bose-Einstein condensate. A remarkable outcome of the exact analytical solution is the robustness of the collapse and revival dynamics to the presence of an underlying confining potential in the initial state and/or during the time evolution, which suggests that such experiments can be used to accurately characterize interactions between bosons and fermions. Furthermore, the analytical solution makes apparent that the fermonic dynamics are independent of whether one starts with a bosonic coherent state or a collapsed Fock state with random occupation numbers.

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