Abstract Submitted for the DAMOP11 Meeting of The American Physical Society

Lattice Induced Resonances in One Dimensional Bosonic Systems JAVIER VON STECHER, JILA, University of Colorado and National Institute of Standard and Technology, Boulder, CO 80309, VICTOR GURARIE, LEO RADZI-HOVSKY, Department of Physics, University of Colorado, Boulder, Colorado 80309, ANA MARIA REY, JILA, University of Colorado and National Institute of Standard and Technology, Boulder, CO 80309 - Feshbach resonances and optical lattices offer a unique opportunity for achieving new ways to control and explore novel manybody phenomena in strongly correlated atomic systems. To deal with such complex systems a natural prerequisite is a full understanding of the underlying two-body physics. Here, we investigate the lattice induced resonances produced when dimers formed with atoms in excited bands become resonant with the atoms in the lowest band. We first obtain accurate two-body solutions and demonstrate that the resonant effects depend strongly on the parity properties of the dimer. Then, we develop a novel two-channel effective lattice Hamiltonian with a parity dependent atom-dimer coupling that provides a starting point to analyze the many-body behavior of the resonant lattice system. We conclude that the lattice induced resonances significantly affect the behavior of the atoms in the lowest band and can be used to tune lattice systems to novel many-body regimes.

> Javier von Stecher JILA, University of Colorado and National Institute of Standard and Technology, Boulder, CO 80309

Date submitted: 04 Feb 2011

Electronic form version 1.4