Numerically exact simulations of strongly interacting fermions in an optical lattice MICHAEL WALL, LINCOLN CARR, Colorado School of Mines — We present large scale variational matrix product state (MPS) simulations of the Fermi-Bose Hubbard model, which is an effective two-channel resonance model for a strongly interacting two-component Fermi gas in an optical lattice. The Hubbard parameters appearing in this model are determined from the exact solution of the two-fermion problem including interband couplings and renormalization of the molecular energy in the closed channel.[1] This approach allows us to quantitatively determine the phase diagram of alkali atoms interacting via a Feshbach resonance in a quasi-1D geometry as a function of the experimental parameters. The applicability of this model to describe dynamics across a Feshbach resonance will also be discussed.

[1]H. P. Büchler, *Phys. Rev. Lett.* **104** 090402 (2010)

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