

Abstract Submitted  
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**Vortex and Meissner phases of strongly-interacting bosons on a two-leg ladder**<sup>1</sup> MARIE PIRAUD, FABIAN HEIDRICH-MEISNER, LMU Munich, Germany, IAN P. MCCULLOCH, Univ. Queensland, Brisbane, Australia, SEBASTIAN GRESHNER, TEMO VEKUA, Leibniz Univ. Hannover, Germany, ULRICH SCHOLLWOCK, LMU Munich, Germany — We present the phase diagram of the strongly-interacting Bose-Hubbard model defined on a two-leg ladder geometry in the presence of a homogeneous flux. Our work was motivated by a recent experiment [1], which studied the same system, in the complementary regime of weak interactions. Based on extensive density matrix renormalization group simulations and a bosonization analysis, we have fully explored the parameter space spanned by filling, inter-leg tunneling, and flux. As a main result, we demonstrate the existence of gapless and gapped Meissner and vortex phases, with the gapped states emerging in Mott-insulating regimes [2]. We calculate experimentally accessible observables such as chiral currents and vortex patterns and study their dependence on model parameters.

[1] Atala et al., Nature Phys. **10**, 588 (2014)

[2] Piraud et al., arXiv:1409.7016

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