

# Ising and Berezinskii-Kosterlitz-Thouless phase transitions of a two-leg boson ladder in flux

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Two chains of bosons coupled by interchain hopping present a transition under flux between a one dimensional analog of the Meissner state and a one dimensional analog of the Vortex state.<sup>1</sup> With only intrachain interactions between the bosons, the Meissner-Vortex phase transition belongs to the commensurate-incommensurate universality class.<sup>2</sup> As interchain interactions are added, an intermediate phase density wave (DW) phase appears between the Meissner and the Vortex phase. The M-DW transition belongs to the Ising universality class, and the DW-V transition to the Berezinskii-Kosterlitz-Thouless universality class. Inside the DW phase, incommensuration with the underlying lattice develops in some correlation functions at the disorder point. We present DMRG calculations of various observables that allow the characterizations of the different phases.<sup>3,4</sup>

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- [2] Kardar, M Physical Review B **33** 3125 (1986); Orignac, E and Giamarchi, T Physical Review B **64** 144515 (2001).
- [3] Orignac, E Citro, R Di Dio, M and De Palo, S Phys. Rev. B **96** 014518 (2017) and arXiv:1802.04997.