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Spontaneous increase of magnetic flux and chiral-current reversal in bosonic ladders: Swimming against the tide TEIMURAZ VEKUA, SEBASTIAN GRESCHNER, Leibniz University of Hannover, MARIE PIRAUD, FABAIN HEIDRICH-MEISNER, Ludwig-Maximilians-University of Munich, IAN MCCULLOCH, The University of Queensland, ULI SCHOLLWOECK, Ludwig-Maximilians-University of Munich — The interplay between the spontaneous symmetry breaking and the wave-like nature of quantum particles in lattice produces an extraordinary behavior of the chiral current of interacting bosonic particles in the presence of a uniform magnetic flux defined on a two-leg ladder. While non-interacting as well as strongly interacting particles, stirred by the magnetic field circulate along the system's boundary in the counterclockwise direction, for certain interactions between particles and at sufficiently low temperature, the circulation direction of chiral current can be spontaneously reversed in vortex lattice states. Chiral-current reversal is counter-intuitive many-body effect produced by synthetic magnetism and it can be observed up to temperatures T=0.5J, where J is a hopping rate along ladder. Besides this effect we present first numerical evidence of vortex lattice states in interacting bosonic ladders with flux and a state with spontaneously imbalanced density between the ladder legs.

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