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Spin Meissner Effect and Chiral Mott Insulators in Quantum Ladders ALEXANDRU PETRESCU, Yale University USA and Center for Theoretical Physics, Ecole Polytechnique, France, KARYN LE HUR, Center for Theoretical Physics, Ecole Polytechnique and CNRS, France — We introduce generic bosonic models exemplifying that chiral Meissner currents can persist in insulating phases of matter. We first consider interacting bosons on a two-leg ladder. The total density sector can be gapped in a bosonic Mott insulator at odd-integer filling, while the relative density sector remains superfluid due to interchain hopping. Coupling the relative density to gauge fields yields a pseudospin Meissner effect [1]. We show that the same phase arises if the bosons are replaced by spinful fermions confined in Cooper pairs, and find a dual fermionic Mott insulator with spinon currents [2]. We propose two experimental realizations, one with ultracold atoms in the setup of [3], and another with Josephson junction arrays. Finally, we discuss the possibility to explore Laughlin phases in these systems by tuning the magnetic flux and the density of bosons [4].

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