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Mott-insulator mediated Josephson physics[1] COURTNEY LANNERT, Wellesley College, SMITHA VISHVESHWARA, University of Illinois, Urbana-Champaign — We investigate the phenomenon of Josephson tunneling between superfluid regions separated by Mott insulating regions in the context of the Bose-Hubbard model. Such systems can be realized when bosons on a lattice close to a commensurate filling are subject to a random potential or when bosons of sufficiently small hopping strength are trapped in an applied confining potential (i.e. in cold-atomic systems). Using a pseudospin approach valid at small t/U (large interaction strength or small hopping), we derive the equations of motion of the system and show that they lead to Josephson coupling between disjoint superfluid regions. We find expressions for the bulk energy and the Josephson tunneling energy and evaluate them numerically for realistic experimental parameters in a radially-symmetric parabolically-confined cold atom system.

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