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Metal-Insulator Transition Revisited for Cold Atoms in Non-Abelian Gauge Potentials INDUBALA SATIJA, George Mason University, DANIEL DAKIN, Optical Air Data System, CHARLES CLARK, National Institute of standard and Technology — We discuss the possibility of realizing metal-insulator transitions with ultracold atoms in two-dimensional optical lattices in the presence of artificial gauge potentials. Such transitions have been extensively studied for magnetic fields corresponding to Abelian gauges; they occur when the magnetic flux penetrating the lattice plaquette is an irrational multiple of the magnetic flux quantum. Here we present the first study of these transitions for non-Abelian $U(2)$ gauge fields. In contrast to the Abelian case, the spectrum and localization transition in the non-Abelian case is strongly influenced by atomic momenta. In addition to determining the localization boundary, the momentum fragments the spectrum. Other key characteristics of the non-Abelian case include the absence of localization for certain states and satellite fringes around the Bragg peaks in the momentum distribution and an interesting possibility that the transition can be tuned by the atomic momenta.

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