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Artificial Magnetic Field Quenches in Synthetic Dimensions[1] FIRAT YILMAZ, Bilkent Univ, MEHMET OKTEL, Bilkent Univ. — Recent cold atom experiments have realized models where each hyperfine state at an optical lattice site can be regarded as a separate site in a synthetic dimension. Precise control over the hopping matrix elements in the synthetic dimension makes it possible to dynamically create an artificial magnetic field much faster than atomic motion. We consider such a magnetic flux quench scenario in synthetic dimensions. We first study the difference between a time varying real magnetic field and an artificial magnetic field using a minimal six site model. We then investigate the dynamics of a wavepacket in an infinite ladder following a flux quench and find that the gauge choice has a dramatic effect on the packet dynamics.A packet splits into smaller packets moving with different velocities. Both the weights and the number of packets depend on the implemented gauge. If an initial packet, in a n–leg ladder, is quenched to Hamiltonian with a vector potential parallel to the ladder; it splits into at most n smaller wavepackets. The same initial wavepacket splits into up to n^2 packets if the vector potential is implemented to be along the rungs. Finally, we show that edge states in a thick ribbon are robust under the quench only if there is an edge state in the gap after the quench.

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