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Helical spacetime density waves in a trimerized kagome lattice BIAO HUANG, University of Pittsburgh, USA, TSZ-HIM LEUNG, University of California, Berkeley, USA, DAN STAMPER-KURN, University of California, Berkeley and Materials Sciences Division, Lawrence Berkeley National Laboratory, USA, W. VINCENT LIU, University of Pittsburgh, USA and Shanghai Jiao Tong University, China — The theoretical discovery and experimental preparation of Floquet/discrete time crystals have triggered heated discussions for ordered phases in a highly non-equilibrium scenario. In previous works, the interesting phenomena chiefly occur in the temporal direction, while the effects of the underlying lattice geometry play little roles. Here, motivated by an ongoing experiment at Berkeley concerning trimerized kagome optical lattice, we show that a helical spacetime density wave breaking spatiotemporal translation symmetry can emerge with rigid periodicity for soft-core bosons, when the lattice is under periodic quenches. Our work paves the way for finding a wide range of spatiotemporally ordered phases in various lattices far away from equilibrium.

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