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Creating quantum many-body scars through topological pumping of a 1D dipolar gas KUAN-YU LI, WIL KAO, KUAN-YU LIN, Stanford University, SARANG GOPALAKRISHNAN, CUNY College of Staten Island, BENJAMIN LEV, Stanford University — Quantum many-body scars, long-lived excited states of strongly correlated quantum chaotic systems that evade thermalization, are of great fundamental and technological interest. We create novel scar states by quantum-quenching the short-range interactions of a repulsively dipolar near-integrable 1D bosonic dysprosium gas from strongly repulsive to strongly attractive. Stiffness and energy measurements show that repulsive long-range interactions render the resulting dipolar super-Tonks-Girardeau gas dynamically stable against collapse and thermalization. As the short-range interactions are subsequently made weak, the system remains in a nonthermal excited state. Cycling the interactions from weakly to strongly repulsive, then strongly attractive, and finally weakly attractive implements a quantum holonomy that offers an unexplored topological pumping method for creating scars.

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