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Nematic Liquid Crystals of Bosons in Kagome Lattices with Synthetic Gauge Fields GUANYU ZHU, JENS KOCH, Northwestern University, IVAR MARTIN, Argonne National Laboratory — We consider a family of interacting boson models based on a kagome lattice with local synthetic gauge flux, which can be realized in an optical lattice with ultra-cold atoms. Such models have a lowest flat band in the single particle spectrum. The flat band is spanned by eigenstates forming localized loops on the lattice, with the maximally compact loop states typically breaking the discrete rotational symmetry of the lattice. When populated by locally-interacting particles, the close packing of such maximally compact loop states leads to a nematic loop crystal ground state. We predict that increasing the filling beyond the close packing fraction leads to the formation of quantum liquid crystals including a nematic supersolid and a nematic superfluid phase with broken lattice rotation and $U(1)$ symmetry. We also show how the nematicity can be probed by time-of-flight experiments with ultra-cold atoms.

Guanyu Zhu
Northwestern University

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