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Chiral spin liquid and kagome physics in transition metal dichalcogenide bilayers

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Bilayers of transition metal dichalcogenides (TMDs) have recently emerged as promising platforms to study strongly correlated electrons in two dimensions. In particular, the low-energy physics of these systems can be described by generalized Hubbard models on the triangular lattice. At certain fillings and parameter regimes, generalized Wigner crystals can occur in which the translational invariance of the charge distribution is spontaneously broken. In this work, we investigate TMD heterobilayers at a filling of 3/4 holes or electrons per moiré unit cell where these are almost entirely localized on a kagome lattice. By expanding the tight-binding model describing the system, we derive an effective spin model on this kagome lattice that includes up to third-neighbor Heisenberg and DzyaloshinskiiâĂŞMoriya interactions. Through a combination of density matrix renormalization group simulations and Schwinger boson mean field analysis, we explore the possibilities of realizing quantum spin liquids in this model in experimentally realistic parameter ranges and show that a chiral spin liquid is a competitive ground state candidate.