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Higher-Order Topology and Defect States in the Charge-Density-Wave Phase of $(TaSe_4)_2I$ MENG HUA, BRIAN KHOR, Univ of Virginia, YICHEN HU, Rudolf Peierls Centre, Oxford University, BENJAMIN J. WIEDER, Department of Physics, Massachusetts Institute of Technology, JEFFREY C. Y. TEO, Univ of Virginia — Recent theoretical and experimental investigations have identified the quasi-1D compound $(TaSe_4)_2I$ as hosting a Weyl semimetal phase that becomes gapped by an incommensurate charge-density wave (CDW) just below room temperature. Though the CDW phase have been shown to exhibit incipient experimental signatures of (valley-) axion electrodynamics, however, the bulk topology of the insulating CDW state remains an open question. In this talk, we present a physically motivated, lattice-commensurate coupled-wire model based on Topological Quantum Chemistry and crystalline symmetry that approximates the CDW phase of $(TaSe_4)_2I$. We demonstrate that our model hosts several higher-order and weak topological phases, depending on the pinned values of several symmetry-allowed mass terms, which we link to independent CDW phase angles ϕ. We also present evidence for helical modes bound to real-space disclinations and mass vortices in the CDW state.

Meng Hua
Univ of Virginia

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