Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Symmetry analysis of 2D four-six-enes (group-IV metal monochalcogenides): electrons, holes, spin and excitons PENGKE LI, IAN APPELBAUM, Univ of Maryland-College Park — Band-edge states in group-IV metal monochalcogenide (four-six-enes such as SnS, GeSe, etc.) - a class of 2D indirect-gap semiconductors - inherit the properties of nearby points of high symmetry at the Brillouin zone boundary. Using group theory and the method of invariants to capture these essential symmetries, we derive concise effective spin-dependent Hamiltonians of the relevant zone edge states at high-symmetry points. Perturbation theory is used to shed light on the nature of the band-edge states, including the selection rules of direct optical transitions across the band gap, interactions responsible for subtle features of the local dispersion relations, momentum and spin transport properties for both conduction electrons and valence holes, and intriguing features of indirect excitons.

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Date submitted: 11 Nov 2016 Electronic form version 1.4