Abstract Submitted
for the 4CS20 Meeting of
The American Physical Society

Interaction contributions to the spin Hall effect in the Kane-Mele-Hubbard model SIHENG WANG, CHRISTOPHER ARD, HUA CHEN, Colorado State University, HUA CHEN'S GROUP TEAM — Different from the charge Hall effect in which Coulomb interaction is necessary for establishing steady states, the spin Hall effect (SHE) has usually been understood as a non-interacting effect, where the steady state is reached by spin-orbit-coupling-induced intrinsic or extrinsic spin relaxation. However, in nonmagnetic systems proximate to a magnetic instability, interaction may play a significant role in the SHE. Here we study the interaction contributions to the SHE by using the nonequilibrium Green function approach in a concrete model: the Kane-Mele-Hubbard model. The model involves nearest-neighbor spin-independent hopping and 2nd nearest-neighbor spin-dependent hopping of s electrons on a honeycomb lattice. The on-site Hubbard interaction is treated by an unconstrained Hartree-Fock decoupling self-consistently. By solving the non-equilibrium Green function of a finite system coupled to two leads, we calculate the spin accumulation on the lateral edges which is a direct experimental observable. We compare the cases with and without the Hubbard interaction, and study the connection between the SHE and local spin susceptibility at the edges.

Siheng Wang
Colorado State University

Date submitted: 30 Sep 2020 Electronic form version 1.4