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Spin Hall effect, spin-accumulation, and spin-currents in mesoscopic structures MARIO BORUNDA, Texas A&M University, KENTARO NOMURA, University of Texas, JAIRO SINOVA, Texas A&M University — Spin dependent transport effects in strongly spin-orbit coupled paramagnetic systems, such as the spin Hall Effect, have been studied extensively over the last few years. We explore how spin accumulation in a mesoscopic device could be used to observe the effect through electrical and optical means. We report calculations of spin flow in finite size samples with strong spin-orbit coupling using the non-equilibrium Green's function formalism in both the linear and the non-linear regimes. We explore different geometries and spin-orbit coupling mechanism to understand how spin relaxes near the interfaces. We will also report on the progress made in understanding the spin Hall Effect in the bulk regime and how it connects to the closely related effect of the anomalous Hall effect in ferromagnetic materials.

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