Driven quantum dot in a topological insulator: 
On-demand spin-particles source.

We use the concepts of scattering matrix theory and recent progress in theory and experiment on topological insulators in order to investigate the feasibility of a single-particle spin-source. The basic concept of such a device has been realized by Féve et al. as a single electron source (SES) [1]. They used a driven quantum dot in a quantum Hall device to allow for the controlled emission of quantized charges into the edge-states of a quantum well. The conducting edge-states exhibit interesting features such as insensitivity to (strong) disorder, providing mainly dissipationless transport. However, these SES require high magnetic fields. Recently, spin-polarized edge-states were theoretically predicted and experimentally observed in two- and three- dimensional topological insulators in the absence of magnetic fields [2]. Such a source could provide quantized spin-currents and become one of the key components for spintronic devices. Further investigations involve the characterization of the emitted spin-currents with respect to current-noise and entanglement of the counter-propagating electrons.