

# Center for Quantum Science and Engineering (CQSE)

## Weekly Seminar Oct. 29, 2010 (Friday)

TIME Oct. 29, 14:30 ~ 15:30  
TITLE Proposed Non-magnetic Stern-Gerlach Experiment using  
Electron Diffraction  
SPEAKER Dr. Chyh-Hong Chern 陳智泓博士  
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PLACE Rm716, CCMS & New Physics Building, NTU

### Abstract

Using the wave nature of the electrons, we demonstrate that a transverse spin current can be generated simply by diffraction through a single slit in the spin-orbit coupling system of the two-dimensional electron gas. The diffracted electron picks up a transverse momentum. The spin-up electron propagates one way and the spin-down electron propagates the other, producing a coherent spin current. In the regime of spin-orbit coupling  $\sim 10^{-13}$  eV $\cdot$ m, an *out-of-plane* component of the electron spin of up to 0.42  $\hbar$  can be generated. Based on this effect, a novel device consisting of a grating to distill spin is designed. Two first diffraction peaks of electron carry different spins, providing a non-magnetic version of Stern-Gerlach experiment. The direction of the spin current can be controlled by the gate voltage with low energy cost.

