

# Center for Quantum Science and Engineering (CQSE)

**Weekly Seminar**  
**Dec. 10, 2010 (Friday)**

**TIME** Dec. 10, 14:30 ~ 15:30  
**TITLE** Influences of Asymmetry on Bias Behavior of Spin Torque in  
Magnetic Tunnel Junction  
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**PLACE** Rm716, CCMS & New Physics Building, NTU

## Abstract

We employ the tight-binding method with the non-equilibrium Keldysh formalism to study the effect of band filling (BF) asymmetry between the ferromagnetic leads on the bias behavior of the spin torque and the tunneling magnetoresistance (TMR) in magnetic tunnel junctions. The underlying mechanism for the asymmetry-induced change in the bias dependence of TMR and the spin transfer component is the interplay of charge and spin currents in the ferromagnetic (FM) and antiferromagnetic configurations. The BF asymmetry has a dramatic effect on the low-bias behavior of the field-like component, which can vary from linear to quadratic bias dependence with positive or negative curvature. A novel general expression is derived relating the field-like spin torque with four independent non-equilibrium interlayer exchange couplings associated with the majority- and minority-spin channels solely in the FM configuration. The bias behaviors of the NEIEC components can be selectively tuned with the BF of the free and pinned FM layers, thus opening a new avenue for controlling experimentally the field-like spin torque.

