Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Second-order optical susceptibility of a pure spin current[1] REN-BAO LIU, Department of Physics, The Chinese University of Hong Kong, JING WANG, Department of Physics, Tsinghua University, BANG-FEN ZHU, Department of Physics and Institute of Advanced Study, Tsinghua University — Spin currents are an essential element of spintronics. A pure spin current, formed by opposite spins moving in opposite directions with the same amplitude, bears neither net magnetization nor charge current and therefore is difficult to be detected by traditional electromagnetic induction method. While indirect measurement of a spin current via the inverse spin Hall effect or spin accumulation at stopping edges is possible, a fundamental question remains: How can a pure spin current be directly seen? By a systematic analysis of the peculiar symmetry properties of spin currents and microscopic calculations, we show that a pure spin current can have sizable second-order nonlinear optical susceptibility. This forms the basis of direct, non-destructive measurement of pure spin currents by standard nonlinear optical spectroscopy.

[1]Supported by Hong Kong RGC HKU 10/CRF/08, Hong Kong GRF CUHK 402207, the NSFC Grant Nos. 10774086, 10574076 and the Basic Research Program of China Grant No. 2006CB921500.

Ren-Bao Liu
The Chinese University of Hong Kong

Date submitted: 20 Nov 2009 Electronic form version 1.4