Abstract Submitted
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Direct and non-demolition optical detection of pure spin currents in semiconductors[1] R.-B. LIU, Department of Physics, The Chinese University of Hong Kong, J. WANG, Department of Physics, The Chinese University of Hong Kong and Department of Physics, Tsinghua University, B.-F. ZHU, Department of Physics, Tsinghua University — We put forward a scheme of direct and non-demolition measurement of a pure spin current in a direct-gap semiconductor by a polarized light beam, which may be view as a "photon spin current" [1]. The effective coupling between the "hoton spin current" and the electron spin current is realized via the spin-orbit coupling in valence bands, but involves neither Rashba effect from structure inversion asymmetry nor Dresselhaus effect from bulk inversion asymmetry. Thus a pure spin current, though bearing no net magnetization, induces Voigt and Faraday rotation of a polarized light beam. For the pure spin current studied in Ref. [2], a light beam, if oblique instead of normal incident, would present Voigt and Faraday rotation in the order of 1 millionth rad in the center region of the sample where the spin current flows without spin accumulation. [1] J. Wang, B. F. Zhu, and R. B. Liu, cond-mat/0708.0881. [2] Y. K. Kato, R. C. Myers, A. C. Gossard, and D. D. Awschalom, Science 306, 1910 (2004).

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