Abstract Submitted
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Driving Pure Spin Currents With Dynamic-Nuclear-Polarization Gradients[1] NICHOLAS HARMON, MICHAEL FLATTÉ, University of Iowa — Gradients in dynamic nuclear polarization naturally develop near donor atoms in doped semiconductors, like n-GaAs, that are pumped with electronic spin polarization. Recent work has demonstrated that the nuclear gradients play a role in spin dynamics and spin relaxation [1,2]. We predict a new type of spin current to occur when an external magnetic field is appropriately aligned with the gradient of a dynamically polarized nuclear field. In such cases, a linear spin-split dispersion appears in the Landau Hamiltonian which gives rise to a spin-dependent velocity that separates opposite spins and produces a pure spin current. Unlike the spin Hall effect with spin Hall conductivities much less than the charge conductivity, our gradient-driven spin current utilizes the charge conductivity. We propose optical orientation experiments to demonstrate this outcome. [1] N. J. Harmon, T. A. Peterson, C. C. Geppert, S. J. Patel, C. J. Palmstrm, P. A. Crowell, and M. E. Flatté, Phys. Rev. B 92, 140201(R) (2015). [2] Y.-S. Ou, Y.-H. Chiu, N. J. Harmon, P. Odenthal, M. Sheffield, M. Chilcote, R. K. Kawakami, and M. E. Flatté, Phys. Rev. Lett. 116, 107201 (2016).

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