

Abstract Submitted
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Large spin accumulation due to spin-charge coupling across a break-junction¹ SHUHAN CHEN, HAN ZOU, SIU-TAT CHUI, YI JI, Dept. of Physics, Univ. of Delaware — We investigate large spin signals in break-junction nonlocal spin valves (NLSV). The break-junction is a nanometer-sized vacuum tunneling gap between the spin detector and the nonmagnetic channel, formed by electro-static discharge. The spin signals can be either inverted or non-inverted and the magnitudes are much larger than those of standard NLSV. Spin signals with high percentage values (10% - 0%) have been observed. When the frequency of the a.c. modulation is varied, the absolute magnitudes of signals remain the same although the percentage values change. These observations affirm the nonlocal nature of the measurements and rule out local magnetoresistive effects. Owing to the spin-charge coupling across the break-junction, the spin accumulation in a ferromagnet splits into two terms. One term decays on the charge screening length (0.1 nm) and the other decays on the spin diffusion length (10 nm). The magnitude of the former is proportional to the resistance of the junction. Therefore a highly resistive break-junction leads to a large spin accumulation and thereby a large spin signal. The signs of the spin signal are determined by the relationship between spin-dependent conductivities, diffusion constants, and density of states of the ferromagnet.

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Shuhan Chen
Dept. of Physics, Univ. of Delaware

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