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Spin Filtering and Dephasing through an Aluminum Nanoparticle FELIPE TIJIWA BIRK, Georgia Institute of Technology, CHRISTOPHER MALEC, Geogia Institute of Technology, DRAGOMIR DAVIDOVIC, Georgia Institute of Technology — Measurements of spin-polarized current through a single Al nanoparticle in weak tunnel contact with two ferromagnets will be discussed. As a function of the bias voltage across the particle, spin polarized current saturates within the first few discrete energy levels above the ground state. The saturation is related to the energy dependence of the spin relaxation time T_1, from which we find that T_1 is about microsecond for the lowest excited state. Spin polarized current is extremely sensitive with respect to the direction of the applied magnetic field relative to magnetization. The discrete levels filter the spin of transmitted electrons along the direction specified by the applied magnetic field, explaining the directional dependence both qualitatively and quantitatively. In zero magnetic field, the filtering direction is determined by the field of the environment, making spin-filtering a new technique to study electron spin-dephasing in single metallic particles and other quantum dots. The spin-dephasing time in the nanoparticle at 4.2K is $T_2 >$8ns.

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