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Injection and extraction of spins in a Silicon lateral transport structure OLAF VAN 'T ERVE, CHAFFRA AWO-AFFOUDA, AUBREY HANBICKI, MICHAEL HOLUB, CONNIE LI, PHILLIP THOMPSON, BEREND JONKER, Naval Research Laboratory, NAVAL RESEARCH LABORATORY TEAM — Significant progress has recently been made on spin injection into the technologically important semiconductor, Si. A nonlocal measurement technique, which excludes spurious contributions from AMR and local Hall effects, was used to show lateral diffusive spin transport through silicon using Fe/Al2O3 surface contacts. The tunnel contacts are used to create and analyze the flow of pure spin current in a silicon transport channel. The nonlocal signal shows that a spin current can be electrically detected after diffusive transport through the silicon transport channel and the signal depends on the relative orientation of the magnetization of the injecting and detecting contacts. Hanle effect measurements up to 125 K demonstrate that the spin current can be modulated by a perpendicular magnetic field, which causes the electron spin to precess and dephase in the channel during transport. By changing the bias on the injector contact we can either inject or extract spin from the Silicon channel. Here we will show using Hanle and lateral spin- valve measurements that we can change the polarization of the spin accumulation by going from the injection regime to the extraction regime and we will compare the efficiency of spin- injection versus spin extraction.

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