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Reduced spin injection at high DC current in lateral spin valves¹ MIKHAIL EREKHINSKY, Physics Department, UC San Diego, AMOS SHARONI, Bar Ilan University, Ramat Gan, Israel, FELIX CASANOVA, CIC nanoGUNE, San Sebastian (Basque Country), IVAN K. SCHULLER, Physics Department, UC San Diego — We report on non-local transport measurements in all metal lateral spinvalves with transparent contacts. We use direct current to investigate the symmetry in the injection process between a ferromagnet (FM) and a normal metal (NM). At high currents (around $1-2 \times 10^7 \text{A/cm}^2$) the non-local spin valve (NLSV) signal becomes larger when electrons are injected from the FM into the NM. A systematic study of the NLSV signal for different device lengths as a function of current magnitude and direction reveals the origin of this asymmetry. By fitting the nearexponential decay of the signal with distance the effects of FM polarization and NM spin diffusion length can be separated. These results show that the spin diffusion length of the NM is independent of current direction. However, the effective spin polarization of the FM appears to be larger when electrons are injected from FM into NM and smaller when electrons move in opposite direction. Possible explanations for this behavior will be discussed.

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