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Interferometric detection of spin-polarized transport G. SALIS, S. F. ALVARADO, IBM Research, Zurich Research Laboratory, 8803 Rüschlikon, Switzerland — It is shown that in addition to its sensitivity to spin polarization, the magneto-optic Kerr effect strongly depends on the spatial distribution of spin-polarized charge carriers. Using time-resolved Kerr rotation, the dynamics of spin-polarized electrons can thus be monitored on the nanometer length scale. This is demonstrated experimentally for optically- excited electron spins in the depletion layer of n-doped GaAs close to a metallic electrode. The Kerr rotation exhibits fast oscillations that originate from an interference of the light reflected at the electrode with that reflected at the front of the electron distribution moving into the semiconductor. From these oscillations, the dynamics of the electron front is obtained, which is strongly screened by the space-charge field of the excited electron-hole pairs and can be controlled by an electric bias across the Schottky barrier. In addition, the dynamics provides information on the Schottky-barrier height, the depletion-layer thickness and the doping concentration.

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