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Non-local spin transport with two coupled channels: Manifestation of the inter-channel tunneling in the shapes of the Hanle curves[1]
MIKHAIL RAIKH, ROBERT ROUNY, MAGAN PRESTGARD, ASHUTOSH TIWARI, EUGENE MISHCHENKO, University of Utah — Dynamics of charge-density fluctuations in a system of two tunnel-coupled channels contains two diffusion modes with dispersion $i\omega = Dq^2$ and $i\omega = Dq^2 + \frac{2}{\tau_t}$, where D is the diffusion coefficient and τ_t is the tunneling time between the channels. The dispersion of corresponding spin-density modes depends on magnetic field as a result of spin precession with Larmour frequency, ω_L. The presence of two modes affects the shape of the Hanle curve, describing the non-local resistance between the injector and the detector. We calculate the shapes, $R_{11}(\omega_L)$ and $R_{12}(\omega_L)$, of the Hanle curves, for geometries in which detector is located, respectively, in the same and in the different channel than the detector. We demonstrate that the relative shapes of $R_{11}(\omega_L)$ and $R_{12}(\omega_L)$ depend on the ratio τ_t/τ_s, where τ_s is the spin-diffusion time. If the coupling between the channels is local, i.e. only at the point $x = 0$, then the difference of the shapes of $R_{11}(\omega_L)$ and $R_{12}(\omega_L)$ curves reflects the difference in statistics of diffusive trajectories which "switch" or do not switch near $x = 0$.

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