Spin-Hall edge spin polarization in a ballistic 2D electron system

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VESTROV, Bochum University, Germany — Universal properties of spin-Hall effect
in ballistic 2D electron systems are addressed. The net spin polarization across the
edge of the conductor is second order, $\sim \lambda^2$, in spin-orbit coupling constant inde-
pendent of the form of the boundary potential, with the contributions of normal
and evanescent modes each being $\sim \sqrt{\lambda}$ but of opposite signs. This general result is
confirmed by the analytical solution for a hard-wall boundary, which also yields the
detailed distribution of the local spin polarization. The latter shows fast (Friedel)
oscillations with the spin-orbit coupling entering via the period of slow beatings only.
Long-wavelength contributions of evanescent and normal modes exactly cancel each
other in the spectral distribution of the local spin density.

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