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Spin-orbit induced spin-density wave in a quantum wire SUHAS GANGADHARAIAH, JIANMIN SUN, OLEG STARYKH, University of Utah —
We consider an interacting quantum wire in the presence of a magnetic field and spin-orbit interaction. We show that under a subtle interplay of magnetic and spin-orbit terms, new scattering channels open up when the magnetic field and the spin-orbit axes are orthogonal: two electrons with opposite momentum and in the same spin-subband scatter into a different spin-subband while conserving momentum. This scattering process is relevant and results in a spin-density wave (SDW) state. We next analyze charge transport property in a scenario when the SDW state survives the presence of a single weak impurity. We find that the single particle back-scattering off a non-magnetic impurity becomes irrelevant. The sensitivity of the SDW state, and hence the charge transport, to the mutual orientation and magnitude of the magnetic and spin-orbit terms can be used for the experimental verification of this novel field and spin- orbit induced state.

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