

Abstract Submitted
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Magnetic control of spin-orbit fields: a first principles study of Fe/GaAs junctions¹ JAROSLAV FABIAN, MARTIN GMTIRA, ALEX MATOS-ABIAGUE, Institute for Theoretical Physics, University of Regensburg, Germany, CLAUDIA DRAXL, Institute for Physics, Humboldt University Berlin, Germany — The possibility to control the spin-orbit fields in semiconductor heterostructures by electric fields has been used to influence the spin dynamics of itinerant electrons. We show that the spin-orbit fields can also be controlled by magnetic fields. On the example of Fe/GaAs junctions we illustrate how the electronic band structure of ferromagnet/semiconductor interfaces, here calculated from first principles for a slab geometry using the FLEUR code, can be mapped to effective spin-orbit field Hamiltonians whose parameters are extracted directly from the band structure, without requiring a priori knowledge of the functional form of the spin-orbit fields, as has been the standard up to now. We show that the spin patterns resulting from the spin-orbit fields change qualitatively as the magnetization orientation of the junction changes in the plane of the interface. The magnetic control of spin-orbit fields is important for transport and optical magnetoanisotropies of ferromagnet/non-magnetic conductor junctions.

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