

Abstract Submitted  
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**Anisotropic spin exchange between electrons mediated by spin-orbit interaction** SUHAS GANGADHARAIAH, JIANMIN SUN, OLEG STARYKH, University of Utah — It is well known that the exchange coupling between electrons in the presence of Rashba spin-orbit interaction (SOI) is anisotropic. In particular, due to the SOI, electron spins are not conserved during a tunneling process as a result anisotropic exchange terms of the Dzyaloshinskii-Moriya (DM) type are generated. In this talk, we re-visit and clarify the role of spin-orbit interaction in lowering the symmetry of the exchange coupling between spins. We point out that the exchange Hamiltonian, despite of its anisotropic appearance, retains spin-rotational ( $SU(2)$ ) invariance to the second order in the spin-orbital coupling. We argue that spin-rotational symmetry is broken only in the fourth order in SOI coupling. To capture this, we calculate the exchange problem along the lines of the Heitler-London approach

Suhas Gangadharaiah  
University of Utah

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