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RKKY and Dzyaloshinsky-Moriya Interaction in the Electron Gas MOHAMMAD MAHDI VALIZADEH, SASHI SATPATHY, Department of Physics & Astronomy, University of Missouri, Columbia, MO 65211, USA — We illustrate the origin of the Dzyaloshinsky-Moriya interaction $\vec{S}_1 \times \vec{S}_2$ between two localized spins embedded in a solid by considering the example of the electron gas with spin-split bands, which serves as a simple pedagogical model for the understanding of this interaction. In this case, where symmetry is broken, the magnetic interaction acquires the Dzyaloshinsky-Moriya term in addition to the well-known RKKY interaction term $\vec{S}_1 \cdot \vec{S}_2$, so that the net interaction has the form $H = J\vec{S}_1 \cdot \vec{S}_2 + \vec{D} \cdot \vec{S}_1 \times \vec{S}_2$. For the standard electron gas with spin degenerate states, the DM term vanishes yielding the well known RKKY interaction results. Explicit expressions for the magnitudes of the interactions are obtained for the electron gas in two and three dimensions. This simple model serves as a pedagogical example for the origin of the Dzyaloshinsky-Moriya interaction in a system with broken time-reversal symmetry.

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