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Orbital and anisotropy effects on the itinerant exchange interaction in 3D Dirac semimetals SERGIO ULLOA, Ohio University, DIEGO MASTROGIUSEPPE, Instituto de Fisica Rosario, NANCY SANDLER, Ohio University — Dirac semimetals are new materials that can be considered analogues of graphene in three dimensions. Their band structure exhibits robust Dirac points that are protected by crystalline symmetry, and strong spin-orbit interaction. These unusual properties suggest that magnetic impurities may reveal exotic behavior with potential technological importance. In metallic hosts, magnetic impurities interact through the electron gas via the Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction that depends strongly on the band structure of the material. We report on the RKKY interaction in 3D Dirac semimetals, such as Na_3Bi and Cd_3As_2 [1, 2]. We discuss asymptotic expressions for the interaction corresponding to settings with magnetic impurities at different distances and relative angle with respect to high symmetry directions on the lattice. We show that the Fermi velocity anisotropy produces a strong renormalization of the magnitude of the interaction, and a correction to the frequency of oscillation in real space. Hybridization of the impurities to different conduction electron orbitals results in interesting anisotropic interactions which can generate spiral spin structures in doped samples. [1] Z. Liu et al., Science 343, 864 (2014); [2] Z. Liu et al., Nat. Mater. 13, 677 (2014)

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