Emergent spin-orbit physics without relying on atomic spin-orbit coupling

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Abstract:

Spin-orbit coupling (SOC) is one of the most important elements in condensed matter physics, whose relevance is ubiquitously found in recent hot topics, such as spintronics, topological magnets, and magneto-electric cross correlation. Thus, it is often believed that materials with considerably large atomic SOC is more efficient for utilizing above physical phenomena. Unfortunately, such a constraint on the strength of the atomic SOC strongly narrows down the candidate materials with useful functionalities.

Recently, we propose a novel pathway toward a realization of the spin-orbit interplay without the atomic SOC [1,2,3]. The key idea is that sublattice degrees of freedom play a role of momentum-dependent "angular momenta" which couples with a particular spin alignment under antiferromagnetic state. In this talk, we demonstrate a realization of emergent spin splitting with a few examples, and then, we elucidate microscopic conditions for the emergent spin splitting via the concept of augmented multipoles [4,5].

References:

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