# Properties of Dirac Fermions in Kondo lattice systems

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Topological insulators are bulk insulators with symmetry protected metallic surface states which exhibit Dirac cone like band dispersions representing particles with no rest mass. The properties of these Dirac fermions in the presence of electron correlation is an interesting emerging area of research as electron-electron Coulomb repulsion usually enhances the effective mass of the particles. We studied the fermionic behavior in novel Kondo lattice system employing ARPES. $SmB_6$, identified to be a Kondo insulator, exhibits exceptional properties [1]. Another Sm-based binary system, SmBi exhibits signature of multiple gapped and un-gapped Dirac cones in the band structure [2,3]. Employing ultra-high-resolution ARPES, we discover destruction of a surface Fermi surface across the Neel temperature while the behavior of Dirac cones survives across the magnetic transition. HAXPES data of a non-symmorphic Kondo lattice system, $CeAgSb_2$ and $CeCuSb_2$ exhibit unusual spectral features; the typical Kondo feature is not observed in the electronic structure though the bulk properties show Kondo-type behavior. Instead, we find a new feature in the core level spectra [4,5]. The ARPES data of $CeAgSb_2$ show distinct Dirac cones as well as diamond-shaped nodal lines; the slope of these linear bands is unusually high, larger than that in graphene and maintains its high value in a wide energy range indicating robust high velocity of these relativistic particles [6]. The slope becomes smaller in the vicinity of strongly correlated Ce 4*f* bands forming a kink providing an interesting example of kink due to correlation induced effects.

References:
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