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Spin Orbit Magnetism and Unconventional Superconductivity YI ZHANG, KEVIN BEDELL, Boston College — We find an exotic spin excitation in a magnetically ordered system with spin orbit magnetism in 2D, where the order parameter has a net spin current and no net magnetization. Starting from a Fermi liquid theory, similar to that for a weak ferromagnet, we show that this excitation emerges from an exotic magnetic Fermi liquid (EMFL) state that is protected by a generalized Pomeranchuck condition. We derive the propagating mode using the Landau kinetic equation, and find that the dispersion of the mode has a $q^{1/2}$ behavior in leading order in 2D. We find an instability toward superconductivity induced by this exotic mode, and a further analysis based on the forward scattering sum rule strongly suggests that this superconductivity has p-wave pairing symmetry. We perform similar studies in the 3D case, with a slightly different magnetic system and find that the mode leads to a Lifshitz-like instability most likely toward an inhomogeneous magnetic state in one of the phases.

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