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Novel magnetic state in d^4 Mott insulators¹ OINAM NGANBA MEETEI, WILLIAM COLE, MOHIT RANDEIRA, NANDINI TRIVEDI, Ohio State Univ - Columbus — We show that the interplay of strong Hubbard interaction U and spin-orbit coupling λ in systems with the d^4 electronic configuration leads to several unusual magnetic phases. While in the atomic limit the system is in a non-magnetic $J = 0$ singlet state, we find that the competition between superexchange and atomic spin-orbit coupling dramatically changes the local moment, which challenges the conventional wisdom that local moments are well-defined in a Mott insulator. Most notably, we find that in the Mott limit at strong U there is a phase transition from a non-magnetic insulator of uncoupled $J = 0$ singlets to an orbitally entangled ferromagnetic insulator. We identify candidate materials and present predictions for Resonant X-ray Scattering (RXS) signatures for the unusual magnetism in d^4 Mott insulators and contrast them with the well-studied d^5 case.

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