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Pressure induced magnetic order in high-temperature superconductor FeSe: Unusual enhancement of quantum fluctuation with larger local moments WEI KU, Tsung-Dao Lee Insittute, China Shanghai Jiao Tong University, China, YU-TING TAM, Sun Yat-Sen University, China, TIANYU ZHANG, Shanghai Jiao Tong University, China, T. ZOU, Michigan State University, USA, A. M. DOS SANTOS, Oak Ridge National Laboratory, USA, DAO-XIN YAO, Sun Yat-Sen University, China, XIANGLIN KE, Michigan State University, USA — We investigate the microscopic mechanisms of pressure induced magnetic order recently observed in high-temperature superconductor FeSe, via experimental high-pressure X-ray structural refinement and a theoretical ordered-state stability anaalysis withing the realistic spin-fermion model that incorporates both the itinernat carriers and the large local moments. Opposite to the common lore on insulating magnetism, the larger local moment in FeSe (in comparison with other Fe-pnictides) turns out to suffer even stronger long-range quantum fluctuation that deminishes its ordering at ambient pressure. Upon applying pressure, the itinerancy-induced quantum fluctuation reduces systematically and eventually allows long-range order to emerge. We further illustrate the role of ferro-orbital order and address the current debate on its interplay with the magnetism concerning the origin of the strong nematicity. Our work clarifies the nature of magnetic order/disorder and its interplay with nematicity in FeSe with a consistant framework that unifies all Fe-based superconductors, and establishes the strongly correlated building blocks for high-temperature superconductivity in these systems.

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