

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

" Noncollinear magnetic structure and multipolar order in $\text{Eu}_2\text{Ir}_2\text{O}_7$ "

Yilin Wang, Institute of Physics, Chinese Academy of Sciences

Abstract: The magnetic properties of the pyrochlore iridate material $\text{Eu}_2\text{Ir}_2\text{O}_7$ ($5d^5$) have been studied based on first principles calculations, where the crystal field splitting Δ , spin-orbit coupling (SOC) λ , and Coulomb interaction U within Ir 5d orbitals all play significant roles. The ground state phase diagram has been obtained with respect to the strength of SOC and Coulomb interaction U , where a stable antiferromagnetic ground state with all-in–all-out (AIAO) spin structure has been found. In addition, another antiferromagnetic state with energy close to AIAO has also been found to be stable. The calculated nonlinear magnetization of the two stable states both have the d-wave pattern but with a $\pi/4$ phase difference, which can perfectly explain the experimentally observed nonlinear magnetization pattern. Compared with the results of the nondistorted structure, it turns out that the trigonal lattice distortion is crucial for stabilizing the AIAO state in $\text{Eu}_2\text{Ir}_2\text{O}_7$. Furthermore, besides large dipolar moments, we also find considerable octupolar moments in the magnetic states.

12:00pm
Tuesday, December 5, 2017
Duboc Room (4-331)

Host: Liang Fu