

凝縮系物理学ゼミナール

Condensed Matter Seminar

Date: 13:30-15:00, Wednesday, 24 May 2023

Title: Electronic structure and superconductivity of electron-doped FeSe intercalates

Speaker: Dr. Makoto Shimizu (Condensed Matter Theory Group)

Abstract:

The van-der-Waals gap of FeSe-based superconductors can be intercalated with a variety of inorganic and organic compounds that modify the electron doping level of the iron layers. Parts of these electron-doped FeSe-based materials show high- T_c superconductivity. However, the microscopic mechanism has been controversial; whether it is spin fluctuations, nematic fluctuations or combinations of them. Especially in $\text{Li}_x(\text{C}_3\text{N}_2\text{H}_{10})_{0.37}\text{FeSe}$ where a wide range of doping level, $0.06 \leq x \leq 0.68$, is realized. T_c shows maximum at $x = 0.37$ ($T_c = 46$ K), and it shows a dome. We study the electronic structure by performing DFT calculations. We analyze the superconductivity both from itinerant electron and localized moment perspectives. As results, sign-changing s-wave is enhanced by stripe type AFM spin fluctuations, and T_c grows by the electron doping. In high-doping region, the stripe type AFM fluctuations are destabilized toward bicollinear AFM, which explains why T_c decreases for $x > 0.37$.