Enhanced superconductivity in the vicinity of a pressure tuned Lifshitz transition: cases for Febased and chalcogenide superconductors

Kee Hoon Kim^{1,2*}

 Center for Novel States of Complex Materials and Research, Department of physics and astronomy, Seoul National University, Seoul 08826, South Korea

 Institute of Applied Physics, Department of physics and astronomy, Seoul National University, Seoul 08826, South Korea

*E-mail: (khkim@phya.snu.ac.kr)

High pressure has been an important physical parameter, of which applications to solids can lead to findings of e.g., unexplored exotic phases of various quantum matters or their putative quantum mechanical ground states. With such recent developments of techniques, one can now apply conventionally up to ~ 200 GPa in diamond anvil cells and high quality hydrostatic pressure up to ~ 15 GPa at high field and low temperature environment. In this talk, I'll present pressure induced optimization of superconductivitiy, particularly focusing on tuning of electronic states in Fe-based superconductors and chalcogenide superconductors. In the latter, I will point out a possibility that the interplay between charge density wave (CDW) and superconductivity (SC) can exhibit unexpected change of electronic structure to strengthen superconductivity via the increase of electronic density of states and electron-phonon coupling. The enhanced superconductivity obviously seems to involve a Liftshitz transition in one of Fermi surface pockets formed within the commensurate CDW state. In the former, I'll also show how pressure can tune a possible Lifshitz transition of a system and lead to unexpected increase of superconducting transition temperature up to ~ 52 K.