Pairing Mechanism of the FeSe- Systems: Dynamical Tuning of Pairing Cutoff Energy + Phonon Boost Effect

Yunkyu Bang
Asia Pacific Center for Theoretical Physics, Pohang University of Science and Technology, Pohang 790-784, Korea

There are a group of FeSe systems: FeSe/SrTiO3 monolayer system (Tc~60-100K) and other heavily electron-doped iron selenide (**HEDIS**) compounds such as $A_xFe_{2-y}Se_2$ (A=K, Rb, Cs, Tl, etc.) (Tc~30-40K), $(Li_{1-x}Fe_xOH)FeSe$ (Tc~40K), etc. These systems have all very high Tc (30K -100K) despite having only the electron Fermi surfaces (FSs) but no hole FS.

Here I propose a unifying pairing mechanism [1,2] based on a new concept: dynamical tuning of pairing cutoff energy + all phonon boost effect. First, I show how the incipient band without a Fermi surface can participate pairing interaction through RG process and the system forms the s_{++}-wave state only with the electron pockets. In this way, the **HEDIS** system can achieve the maximum T_c, stored in the system, and yet avoid the detrimental impurity pair-breaking scattering. Second, I will show that the incipient band can turn all-momentum scattering local phonon into an effective forward-scattering phonon, hence enhance Tc of the incipient band superconductor.

Ref:
[1] "Phonon Boost Effect on the S±-wave Superconductor with Incipient Band"
arXiv:1805.11995
[2] "Pairing mechanism of heavily electron doped FeSe systems"
New Journal of Physics **18**, 113054 (2016)