Electronic structure in $EuFe_2As_2$

B. Zhou[1], Y. Zhang[1], L. X. Yang[1], H. W. Ou[1], J. F. Zhao[1], J. Wei[1], M. Xu[1], C. He[1], F. Chen[1], T. Wu[2], G. Wu[2], M. Arita[3], K. Shimada[3], H. Namatame[3], M. Taniguchi[3], X. H. Chen[2] and D. L. Feng[1*]

[1]Department of Physics, Surface Physics Laboratory (National Key Laboratory) and Advanced Materials Laboratory, Fudan University, Shanghai 200433, P. R. China

[2]Hefei National Laboratory for Physical Sciences at Microscale and Department of Physics, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China

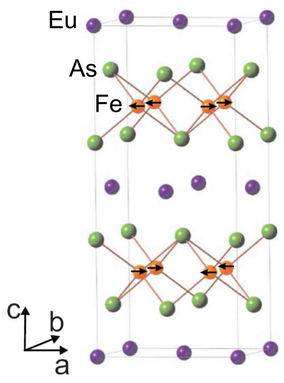
[3]Hiroshima Synchotron Radiation Center and Graduate School of Science, Hiroshima University, Hiroshima 739-8526, Japan

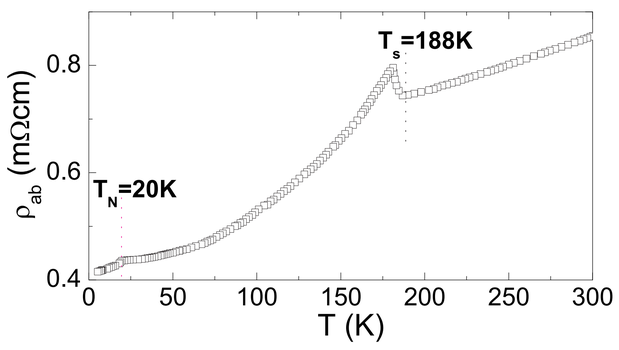
Motivation

- Magnetic properties are often related to the mechanism of superconductivity
- Eu^{2+} moment: 7.94μ_B **!**
- It was suggested that there's strong coupling between SDW in FeAs layer and magnetic ordering of Eu^{2+}

May shed light on the underlying physics of iron-based superconductors

Crystal structure and transport properties





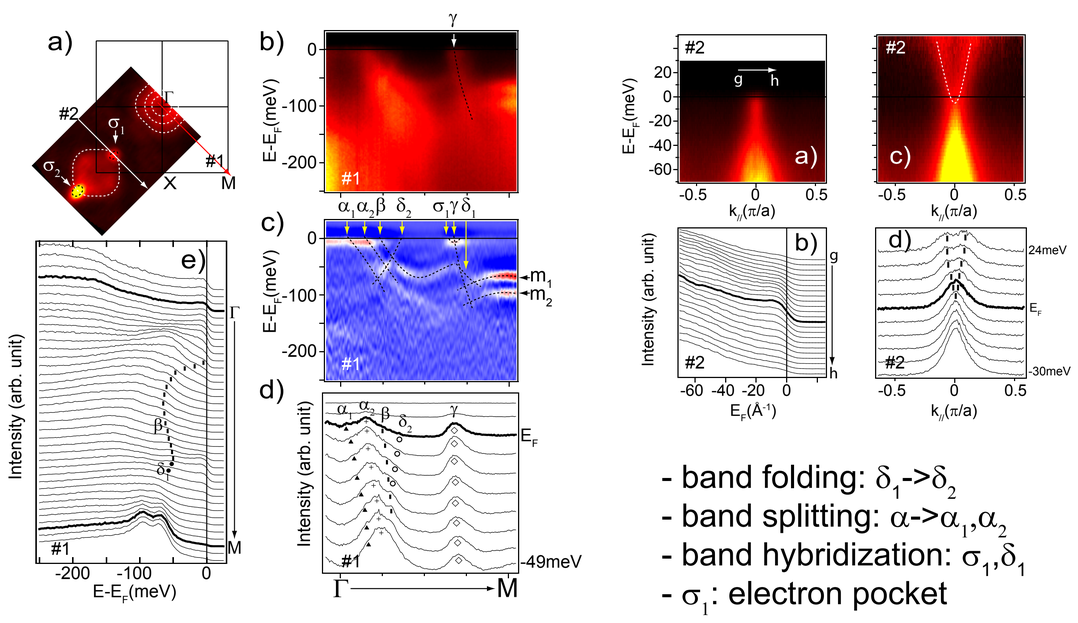
T_s: spin density wave(SDW) order of Fe
T_N: antiferromagnetic(AFM) order of Eu^{2+}

Ref: T. Wu, G. W., H. Chen, Y. L. Xie, R. H. Liu, X. F. Wang, X. H. Chen, arXiv:0808.2247

Electronic structure in normal state

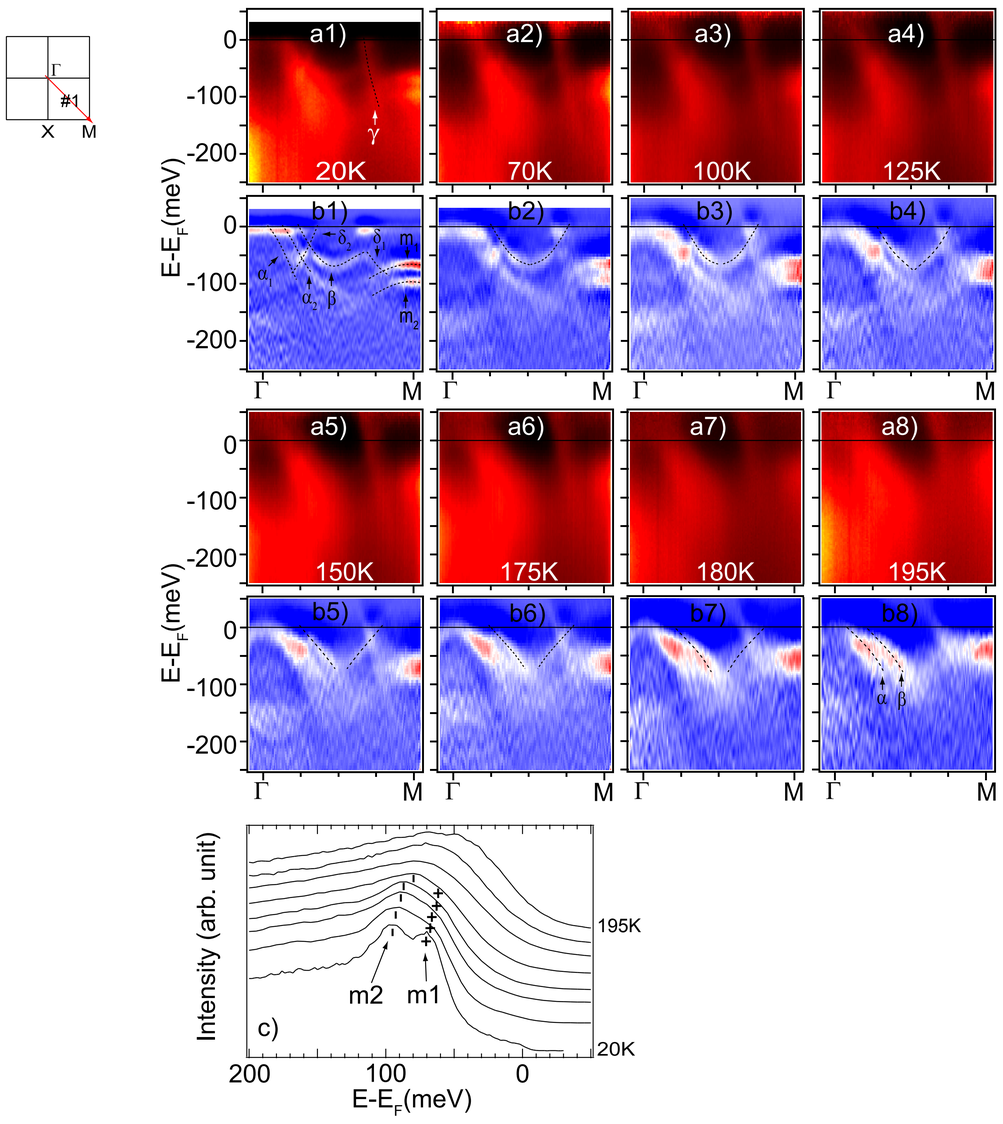
- two hole pockets around Γ
- one electron pocket around M similar to other 122 iron-based parent compounds

Electronic structure in SDW state



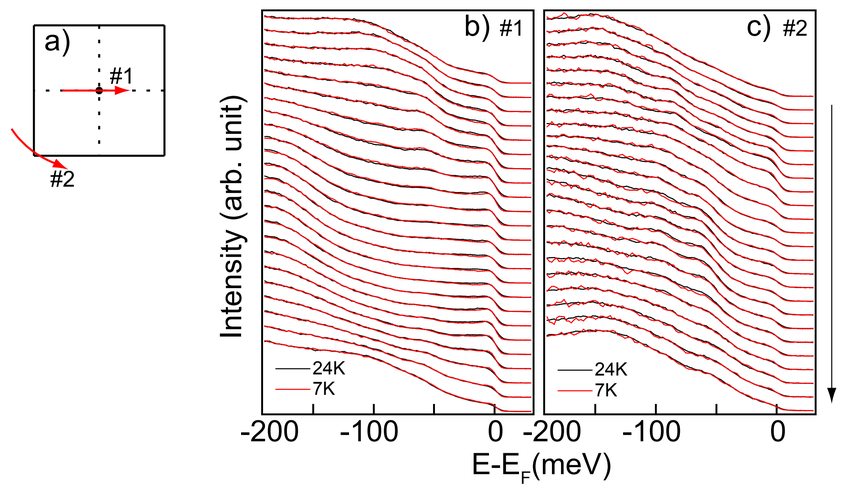
- band folding: δ_1->δ_2
- band splitting: α->α_1,α_2
- band hybridization: σ_1,δ_1
- σ_1: electron pocket

Electronic structure with temperature dependence



- Evolution of band splitting, folding and hybridization.
- Bands m_1, m_2 move towards Fermi level as increasing temperature.

Below and above T_N



No observable change except thermal broadening within the energy resolution. It may suggest mild interaction between d electrons of Fe and magnetic moments of Eu^{2+}.

Summary

Electronic structure of EuFe2As2 has been measured by high resolution angle-resolved photoemission spectroscopy (ARPES). The electronic structure in normal state is similar to other 122 parent compounds. In SDW state, our results show the band splitting, folding and hybridization, however, no gap formed at Fermi level is observed. Across T_N, no observable change within the energy resolution is observed, suggesting a mild interaction between the d electrons of Fe and the magnetic moments of Eu^{2+}.