

Abstract Submitted  
for the MAR12 Meeting of  
The American Physical Society

**Fano resonances in multigap Fe based superconductors and complexity for material design** ANTONIO BIANCONI, Physics Dept., Sapienza University of Rome — The Fano resonance in the superconducting gaps (or “shape resonance” or “Feshbach resonance” ) in multigap superconductors [A Bianconi *Sol. State Commun.*89, 933 (1994)] has been proposed as the mechanism for high  $T_c$  in Fe-based superconductors and related compounds [D Innocenti et al *Supercond. Sci. Technol.*, 015012 (2011)] near the Lifshitz transition for a vanishing Fermi surface in a superlattice of layers or wires, in the proximity of a lattice, electronic, magnetic instability with competing interactions that give complex systems. The multiscale phase separation from nano-scale to micron scale in  $K_{0.8}Fe_{1.6}Se_2$ . [ A Ricci et al *Phys. Rev.B* 84, 060511 (2011)] has been detected by a mixed real space and momentum space probe: scanning nano focused X-ray diffraction like in  $La_2CuO_{4+y}$  [M. Fratini, et al *Nature*466, 841 (2010) and [N. Poccia et al *Nature Materials*10, 733 (2011)] showing scale free structural organization of dopants favoring in the high  $T_c$  phase. The results on  $KFeSe$  show phase separation, percolating superconductivity, competing with percolating magnetism and shape resonances in the superconducting gaps.

Antonio Bianconi  
Physics Dept., Sapienza University of Rome

Date submitted: 05 Dec 2011

Electronic form version 1.4