SEMINAIRE DE LA MATIERE CONDENSEE

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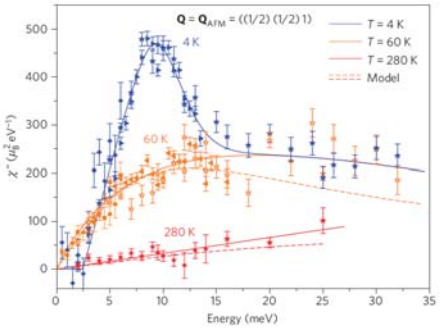
Magnetic excitations in superconducting iron arsenides and cuprates: Analogies and differences

Mardi 13 avril 2010 à 14h 30

Salle de conférence 15 – Bâtiment 563

Starting with the pioneering work of Rossat-Mignod et al. in 1991, the thorough characterization of magnetic excitations in the high-T_c cuprates has contributed much to the understanding of superconductivity (SC) in these compounds. The resonance peak, which was later discovered to form part of the so-called hour-glass dispersion, is also observed in heavy-fermion superconductors, and carries information about the SC order parameter: In cuprates, it is a signature of d-wave superconductivity. An exciting observation in the recently discovered iron-based superconductors is the presence of a resonance peak – in this family, it was shown that the resonance is compatible with a sign-reversed s-wave order parameter.
In my talk, I will first briefly outline the properties of the magnetic excitations in the antiferromagnetically ordered parent compounds of iron arsenides and cuprates. Then, I will discuss the salient features of the excitation spectrum in the superconducting cuprate $YBa_2Cu_3O_{6+x}$, with particular emphasis on the resonance feature and its dispersion. Then I will concentrate on the spin excitations in superconducting $BaFe_{2-x}(Co,Ni)_xAs_2$, present the properties of the resonance and argue that this system is more likely to be explained within the framework of conventional weak-coupling and not too-strongly-correlated approaches. Finally, I will compare the out-of-plane dispersion of the resonance in cuprates and iron arsenides and draw conclusions about the dimensionality of the physics in the two systems.



Imaginary part of the spin susceptibility in the superconducting (T = 4 K) and normal state of optimally electron doped $BaFe_{1.85}Co_{0.15}As_2$.

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