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Spin dynamics of $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$

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We have used inelastic neutron scattering to determine the spin dynamics in untwinned single crystals of $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ over a wide range of doping levels [1], with particular attention on its in-plane anisotropy [2]. Among other observations, we have found that the spin dynamics in the superconducting and pseudogap states are qualitatively different. The results allow incisive tests of current theories; including in particular theories based on static and fluctuating spin-charge stripes. We will also present initial results of an effort to provide a quantitative description of both the spin dynamics and the charge dynamics (determined by infrared and angle-resolved photoemission spectroscopies [3]) in the same $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ single crystals. [1] S. Pailhes et al., Phys. Rev. Lett. 93, 167001 (2004) ; Phys. Rev. Lett. 96, 257001 (2006).

[2] V. Hinkov et al., Nature 430, 650 (2004); cond-mat/0601048.

[3] S.V. Borisenko et al., Phys. Rev. Lett. 96, 117004 (2006); V.B. Zabolotnyy et al., cond-mat/0608295.