Spin-orbital separation in the 1D cuprates

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In contrast to magnetic excitations, the dispersive orbital excitations (orbitons) are very hard to detect [1]. Nevertheless, recent advancements in resonant inelastic x-ray scattering [1] have allowed for a rather unambiguous detection of orbitons in various transition metal oxides [1, 2, 3, 4] – in particular the quasi-1D copper oxides [2, 3, 4]. Strikingly, a closer investigation of the observed 1D orbiton dispersion suggested that this dispersion could not be understood using a simple orbital wave picture [2, 5]. Instead it occurred that the orbitons are in general very strongly coupled to spin excitations. It is then only in 1D that they can decouple leading to a particularly strong dispersion which is due to a phenonemonen called spin-orbital separation: the initial orbital excitation fractionalizes into an independent orbiton and spinon excitation.

References:

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