Magnons in an edge-sharing 2D cuprate: tetragonal CuO

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The advent of high-resolution RIXS has revamped the interest for the magnetic excitations in the cuprates. The AFM spin waves have been mapped over the whole Brillouin zone in paradigmatic parent compounds such as La_2CuO_4 (LCO) or $Sr_2CuO_2Cl_2$ (SCOC), revealing the importance of extended range interactions beyond the standard Heisenberg model. At the microscopic level, the extended Hubbard model provides a consistent description of the electronic and magnetic properties of the insulating cuprates.

The recent discovery of a tetragonal form of the simple binary oxide CuO, containing edge-sharing rather than corner-sharing CuO layers, raises new questions. ARPES experiments have demonstrated the propagation of quasiparticles with properties similar to the Zhang-Rice singlets of the cuprates [1]. Here we present Cu L3 RIXS data that reveal a spin wave excitation dispersing on two corner-sharing antiferromagnetic sublattices. Its energy at the zone boundary is smaller by $\sim$30% than typical values for cuprates. We perform a spin wave expansion of the extended Hubbard model to address these observations.

References

[1] S. Moser et al., Phys. Rev. Lett. 113, 187001 (2014).

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