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Is magnetism relevant to cuprate superconductivity: lanthanides versus charge compensated 123?

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Many theories suggest that the mechanism for cuprate superconductivity is based on super-exchange interaction between electrons. The most obvious test of these theories is a measurement of the correlation between T_c and the super-exchange parameter J. Alteration of J is achieved by chemical modifications or external pressure. Measurements of J are done with: Neutron scattering, muon spin rotation (muSR), two magnon Raman scattering or resonant inelastic x-ray scattering. However, the experimental data is confusing. A recent Raman study showed an anticorrelation between T_c and J in the set of LnBa2Cu3Oy compounds with Ln=(La,..Lu,Y) [B.P.P. Mallet *et al.*, Phys. Rev. Lett. 111, 237001 (2013)]. On the other hand, experimental measurements on the charge compensated 123 material $(Ca_xLa_{1-x})(Ba_{1.75-x}La_{0.25+x})Cu3O_y$ (CLBLCO) inferred an overall positive correlation between T_c and J [D.S. Ellis *et al.*, Phys. Rev. B 92, 104507 (2015)]. Thus, the effect of J on T_c is not established experimentally. In this talk I will review the experimental situation, mainly from the muSR viewpoint, and shed light on this controversy.