SPIN DYNAMICS IN ORBITALLY DEGENERATE MAGNETIC INSULATORS

B. Keimer*
Max-Planck Institute for Solid State Research, Stuttgart, Germany

The interplay between spin and orbital degrees of freedom in transition metal oxides has been a subject of investigation since the 1950's. Recent advances in materials preparation have made it possible to go beyond the *static* spin and orbital arrangements that have been studied for many years, and to investigate the spin and orbital *dynamics* in d-electron systems. Because of the high orbital degeneracy and the weak lattice coupling, the coupled quantum dynamics of spins and orbitals is expected be particularly interesting for systems with partially occupied t_{2g} orbitals such as titanium and vanadium oxides. Indeed, we show that recent neutron scattering experiments on insulating versions of these systems are inconsistent with conventional models of orbital order in magnetic insulators. We discuss the outcome of these experiments and outline some steps towards a quantum many body description of the coupled spin and orbital dynamics of insulators with orbital degeneracy.
If time permits, we will also briefly discuss recent experimental progress on the spin dynamcis of the superconducting copper oxides.

* Collaboration with C. Ulrich, G. Khaliullin, J. Sirker, S. Okamoto, M. Reehuis, A. Ivanov, S. Miyasaka, Y. Taguchi, and Y. Tokura