

Inelastic X-ray scattering

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Correlated electron systems display a rich interplay of charge, spin, lattice and orbital degrees of freedom, giving rise to fascinating phenomena such as high-T_c superconductivity in cuprates. Correlation effects also dominate the physics of many 3d, 4d and 5d transition-metal oxides.

Resonant x-ray scattering (RXS) is a powerful photon-in/photon-out technique for investigating the electronic structure of correlated materials with momentum resolution. Resonant inelastic x-ray scattering (RIXS) probes lattice, magnetic, crystal- and ligand-field excitations over a broad energy range, providing quantitative information on the relevant interactions. Energy analysis of the scattered x-rays also isolates the true elastic signal, making resonant elastic x-ray scattering (REXS) a sensitive probe of tiny modulations of the electronic density.

In this talk, I will introduce the principles of RXS and discuss the mechanisms underlying its main spectral features, with particular reference to the simple but instructive case of cuprates. I will also describe experimental approaches for soft- and hard-x-ray RXS.