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Inelastic x-ray scattering with high and very high energy resolution

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X-ray inelastic scattering (IXS) is a spectroscopic technique to investigate fundamental properties of matter. This is accomplished through the study of those elementary excitations that couple to the x-rays. The relevant quantities are, therefore, the energy and momentum transfer from the x-rays to the examined material. Experiments with very high energy resolution (1 - 5 meV) are aimed to study collective excitations in energy and momentum transfer regions complementary to those of neutron spectroscopies; in particular in systems without long range order and with a high speed of sound as simple liquids and glasses, as well as in the study of systems under high pressure. Experiments with high energy resolution (0.1 - 2 eV) are aimed to study electronic excitations and comprise valence electron excitations, core electron excitations (non-resonant and resonant Raman scattering) and Compton scattering.

We will present a selection of experiments that reflect the research activities on the inelastic scattering beamline at the ESRF, comprising results of collective excitations in liquid and solid water, glasses and neon under high pressure, non-resonant Raman scattering, and polarization dependent resonant Raman scattering at the L2 and the L3 edge of gadolinium.