



**Abstract**

**Neutron Spectroscopy – Cross Sections, Instruments and Examples**

Christian Rüegg, Paul Scherrer Institut, Villigen

Inelastic neutron scattering (INS) is one of the key experimental tools for the study of elementary excitations in solids and liquids. These include for example magnons and phonons in ordered structures, complex fluctuations in strongly correlated electron systems, and rotons in quantum fluids. The energy and momentum resolution, exactly known cross sections for magnetic and nuclear scattering, and applicability in combination with heavy sample environment like pressure cells and high-field magnets are some of the major advantages of the technique. The latter is especially true for studies of phase transitions, which may be controlled by such devices and driven by the softening of characteristic excitations. The theoretical foundations of INS will be introduced together with state-of-the-art instruments installed at both continuous and pulsed neutron sources and examples for quantum phase transitions occurring at high pressures and at high magnetic fields in model magnets.