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Spectroscopy at the European Spallation Source

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Abstract

The European Spallation Facility (ESS) will be operational before the end of the decade with world leading spectroscopic instrumentation in the cold neutron regime. The long pulsed nature of the ESS will offer a high time integrated neutron flux that can be tailored to specific resolution and dynamic range. Optimal use of the peak flux will enable generic spectroscopic instruments at the ESS to outperform their steady state reactor equivalent. The novel nature of long pulsed sources provides the neutron community an opportunity to redesign, optimise and develop new spectroscopic techniques.

The science case for neutron inelastic spectroscopy encompasses a multitude of disciplines as diverse as strongly correlated electron physics, bio-physics, hydrogen storage or soft matter assembly to name a few. The aim of the ESS is to optimise all instruments for a strong and specific science case and thus to cover the scientific landscape with high quality instrumentation. The versatility of spectroscopic instrumentation in conjunction with advanced computational techniques will ensure that these instruments will have a great impact. Neutron spectroscopic instrumentation that are currently under consideration comprise:

- Cold chopper TOF spectrometer
- Bispectral chopper TOF spectrometer
- Thermal chopper TOF spectrometer
- Crystal monochromatic TOF spectrometer
- Other (alternative) crystal optics based spectrometers using multi-analyser systems and phase space transformers
- Indirect geometry spectrometer for the study of vibrational dynamics
- High resolution neutron spin echo
- Wide angle neutron spin echo
- Neutron resonant spin echo and further Larmor encoding
- Backscattering spectrometer with optimized energy resolutions using state of the art crystal analyzers.

The challenges, current status and ideas will be presented with the aim to inform and obtain constructive input from the community at large.