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Direct geometry time-of-flight spectrometers for ESS

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Abstract

Direct geometry time of flight spectrometers benefit especially from pulsed spallation sources. It has been shown that in particular instruments using cold neutrons profit strongly from the long pulse at ESS [1,2].

Reviewing recent publications from world class TOF spectrometers shows that often one uses high energy and low energy neutrons for comprehensive studies of the dispersion in novel functional materials. As an example, the excitation spectrum in high temperature superconductors extends well above 200 meV, while interesting features of the spectrum require good resolution and therefore lower energies.

We discuss the implications for a spectrometer at a long pulse spallation source using a wide wavelength range. The high peak flux in combination with the long pulse allows to achieve the highest energy resolution ranging to the area of backscattering, while the same instrument can be used as a high intensity spectrometer e.g. for kinetic or parametric studies that are limited by the flux of current sources. We present ideas for instrument components such as choppers, neutron guides or spin polarizsers/analyzers that keep up with the flexibilty offered by the source.

[1] K. Lefmann, H. Schober, F. Mezei, Meas. Sci. Techno. **19**, 034025 (2008).

[2] H. Schober *et al.*, NIM A **589**, 34-46 (2008).