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Large Scales - Long Times: Adding High Energy Resolution to SANS

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The Neutron Spin Echo (NSE) variant MIEZE (Modulation of IntEnsity by Zero Effort), where all beam manipulations are performed before the sample position, offers the possibility to perform low background SANS measurements in strong magnetic fields and depolarising samples. However, MIEZE is sensitive to differences ΔL in the length of neutron flight paths through the instrument and the sample. In this article, we discuss the major influence of ΔL on contrast reduction of MIEZE measurements and its minimisation. Finally we present a design case for enhancing a small-angle neutron scattering (SANS) instrument at the planned European Spallation Source (ESS) in Lund, Sweden, using a combination of MIEZE and other TOF options, such as TISANE offering time windows from ns to minutes. The proposed instrument allows studying fluctuations in depolarizing samples, samples exposed to strong magnetic fields, and spin-incoherently scattering samples in a straightforward way up to time scales of μs at momentum transfers up to 0.01 $\AA^{-1}$, while keeping the instrumental effort and costs low.

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