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Comparison of pulsed and continuous neutron sources for MIEZE

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The MIEZE method, a sub-type of the neutron spin echo (NSE) technique, circumvents the coupling of neutron beam phase space and resolution, by using oscillating neutron intensity as an internal clock to record minuscule changes to the energy of a scattered neutron. As a result MIEZE achieves an energy resolution down to the ns range with a bandwidth of $\Delta\lambda/\lambda \approx 10$ %.
This concept has been successfully implemented in the MIEZE spectrometer RESEDA at the reactor source FRM II, studying magnetic dynamics, quantum phenomena and molecular diffusion in soft matter. However, a significant part of the continuously produced neutrons are discarded by the velocity selector, which is why concepts of MIEZE instrumentation at pulsed neutron sources (PNS), which are capable of using the full wavelength spectrum contained in each pulse, are becoming more and more attractive.
We have implemented the polarization shaping components of RESEDA in the McStas framework to investigate the feasibility, data reduction and operation of a MIEZE spectrometer at a PNS. Due to the large wavelength spread of a PNS, the intermediate scattering function can be measured over many points in Fourier time, analogous to a multi-detector option at a triple-axis spectrometer. Simulation of a quasielastic sample allows the comparison of the performance between a continuous neutron source and a PNS, while testing majorly important data reduction algorithms, which have never been addressed in instrument proposals.

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