Contribution ID: **41** Type: **Poster**

Extending MIEZE spectroscopy towards thermal wavelengths

Friday, 9 December 2022 15:30 (1h 30m)

We propose a Modulation of intensity with zero effort (MIEZE) set-up for high-resolution neutron spectroscopy at momentum transfers up to 3Å^{-1},energy transfers up to\, 20\,meV, and an energy resolution in the μeV-range using both thermal and cold neutrons. MIEZE has two prominent advantages compared to classical neutron spin-echo. The first one is the possibility to investigate spin-depolarizing samples or samples in strong magnetic fields without loss of signal amplitude and intensity. This allows for the study of spin fluctuations in ferromagnets, and facilitates the study of samples with strong spin-incoherent scattering.
The second advantage is that multi-analyzer setups can be implemented with comparatively small effort. The use of thermal neutrons increases the range of validity of the spin-echo approximation towards shorter spin-echo times. In turn, the thermal MIEZE option for greater ranges (TIGER) closes the gap between classical neutron spin-echo spectroscopy and conventional high-resolution neutron spectroscopy techniques such as triple-axis, time-of-flight, and back-scattering. To illustrate the feasibility of TIGER we present the details of an implementation at the beamline RESEDA at FRM II by means of an additional velocity selector, polarizer and analyzer.

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Session Classification: Poster Session

Track Classification: Neutron Methods