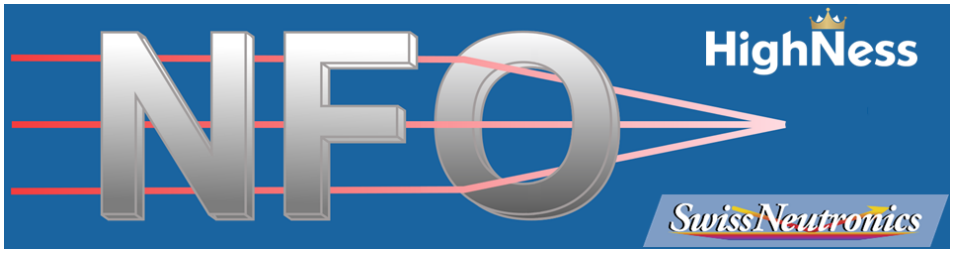

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Phase correction by ellipsoidal focusing mirrors for a high-resolution neutron resonance spin echo spectrometer

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Neutron focusing mirrors can increase the signal-to-noise ratio of neutron scattering experiments by concentrating neutrons with a large divergence angle and controlling the beam trajectory. In addition to this advantage, elliptical focusing mirrors can be useful for phase correction for higher resolution neutron spin echo instruments [1].
Neutron resonance spin echo spectrometers aiming a high SN ratio and high-resolution are being developed at the pulsed neutron source of Materials and Life Science Experimental Facility (MLF) of J-PARC [2, 3]. The conventional solenoid coils upstream and downstream of the sample are replaced by two resonance spin flippers (RSF) and a zero-field space between the flippers. By inserting a pair of ellipsoidal focusing mirror between RSFs, the neutron flight path lengths between RSFs can be kept constant, thereby making neutron phases uniform. We develop 900 mm long ellipsoidal focusing supermirrors with metal substrate with semi-major axis of 1250 mm and semi-minor axis of 65.4 mm. The ellipsoidal mirror is divided into several segments considering the uniformity of supermirror deposition and the size limitation of the polishing equipment. The segments are assembled in a cage-like mirror holder designed to ensure precise positioning [2].
In the presentation we will describe the fabrication of the ellipsoidal focusing mirror and performance evaluation, and discuss experiments and simulations [4] for phase correction by a focusing mirror in a high-resolution neutron resonance spin echo spectrometer.

References:
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