Three dimensional polarimetric neutron tomography-beyond the phase-wrapping limit

Three dimensional polarimetric neutron tomography is an emerging method for non-destructive investigation of magnetic field strength and direction distribution in three dimensions. It utilises the Larmor precession of the neutron spin in the presence of an external magnetic field and has so far been restricted to the measurement of magnetic fields weak enough to keep the neutron precession below the phase-wrapping limit at 180°. Through the use of polychromatic time-of-flight information in combination with an iterative forward model reconstruction algorithm we have gone beyond this limit, thereby vastly broadening the potential of the technique. We present the reconstructed magnetic field of a measured current carrying solenoid as a proof-of-principle for this novel method, as well as successfully applying the method to a simulated data set of a sample consisting of multiple magnetic domains.