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High performance in-situ ^3He polarizers for neutrons

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In-situ polarization can provide the highest performance over time for polarized ^3He over time where ^3He polarizations in excess of 80% can be maintained. The polarization rates and magnitude achieved are aided by using high performance ^3He cells produced all in house and techniques such as hybrid spin-exchange optical pumping and chipped volume Bragg grating narrowed laser diode array bars. For the magnetic environments we normally use so called magic boxes which give very high ^3He lifetime performance and good isolation from external magnetic fields due to their geometry that creates a magnetic field transverse to the beam propagation direction which also allows decoupling of the the optical pumping light path to the orthogonal neutron beam path. As an example, recently for a user experiment on the ROT effect in ^{235}U one of our polarizers gave a ^3He polarization in excess of 81% for over 20 days with a polarization build rate of 7 hours, this corresponded to a neutron polarization of 99.3% at 22% neutron transmission at 1.15 Å.

Summary

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