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A Novel Approach to Full Incident Beam Polarization at the GP-SANS Instrument at the High Flux Isotope Reactor

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GP-SANS at HFIR is one of the highest flux small angle neutron scattering instruments in the world with high user demand. The user community has expressed interest in GP-SANS obtaining full beam polarization to help build out the range of experiments that could be performed. In 2020, the GP-SANS team developed a polarization concept for a v-cavity, magnetic housing for the v-cavity, magnetic guide field, RF flipper and He-3 analyzer. The He-3 analyzer needed to be unlike other SANS instruments due to the GP-SANS collimators being seismically restrained. The traditional approach of putting the guide field outside of the SANS collimator boxes is prohibited due to the excessive weight. Instead, “mini-internal guide fields” were designed to reduce the size, weight, and cost of the guide fields by only creating a magnetic field around the beam instead of throughout the whole collimator box. This requires the guide field components to be compatible with the vacuum of the collimator box. Funding for this project was given approval in early 2025. Testing on prototype mini guide fields and a concept for the v-cavity magnetic housing is scheduled for September 2025. The goal is to install the polarizer, mini-internal guide fields, RF flipper, and mounting provisions for an analyzer by the end of 2026. This presentation will review the design process and testing results for the GP-SANS full incident beam polarization project.

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