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Adiabatic transport of ultracold polarized neutrons for the TUCAN EDM experiment

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The TUCAN EDM experiment at TRIUMF will use polarized, ultracold neutrons (UCNs) to search for the neutron electric dipole moment (nEDM). The discovery of a permanent nEDM would indicate the violation of time reversal symmetry, and thus charge-parity symmetry (given the CPT theorem). This would point to physics beyond the Standard Model of Particle Physics. To achieve the projected sensitivity of the experiment of $1 \cdot 10^{-27} e$cm, a stable and homogeneous magnetic field is required in the inner most experiment region. This is mainly achieved with the use of a magnetically shielded room (MSR). To preserve the polarization of the neutrons between the UCN source and the MSR, magnetic guiding fields must be applied throughout the neutron guides between these two sections. Any losses in neutron polarization will directly affect the statistical sensitivity of the nEDM search. In this presentation I will outline the requirements of the guiding fields based on adiabatic spin transport theory and show my current work towards designing and prototyping this critical subsystem.

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