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Technical Developments in the Search for a Short-Range Spin-Dependent Fifth Force Interaction[1] MICHAEL PETERS[2], W. MICHAEL SNOW, ERICK SMITH, RAKSHYA KHATIWADA, KE LI, Indiana Univ - Bloomington — Theoretical treatments of the possible interactions between two fermions from boson exchange in the nonrelativistic limit[3] include a short-range monopole-dipole interaction proportional to $\vec{S} \cdot \vec{r}$. This potential would generate an NMR frequency shift in an ensemble of polarized nuclei when an unpolarized mass is brought nearby.[4,5] Techniques to move the mass as close to the polarized nuclei as possible are needed to access sub-millimeter interaction ranges. We describe the preparation of nonmagnetic test masses and a mechanical system to bring the test mass close to an ensemble of polarized ^{3}He nuclei, which are polarized in a spin-exchange optical pumping cell at Duke University. We describe how the masses are prepared to conform to the slightly asymmetric contours of the 100-micron thick glass cell window by a combination of coordinate measuring machine data and a spring-loaded suspension system that allows the mass to slightly rotate.

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