# TAC Target Overview

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| Proposal Number | LOI-12-21-004 |
| Proposal Tittle | Measurement of the Deuteron Tensor Structure Function b1 with SoLID |

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| General | |  | | | |
| Experimental Hall | | A | | | |
| Base Spectrometers | |  | | | |
| Special arms or detectors | | SoliD | | | |
| Custom Equipment | | Tensor-polarized ND3 | | | |
| Beam Requirements | | | | | |
| Max Current | | 100 nA | | | |
| Raster size | | 2 cm dia. | | | |
| Beam Energies | | 6.6 & 8.8 GeV | | | |
| Special characteristics | |  | | | |
| Kinematics | | | | | |
| Spectrometer angles | | N/A | | | |
| Special OOP conditions | | N/A | | | |
| Other special conditions | | N/A | | | |
| Solid Targets | | | | | |
| Std Solid Targets (C, BeO, etc) | | ? | | | |
| Special Solid Targets | | N/A | | | |
| Dummy and optics targets | | N/A | | | |
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| Fluid Targets | | | | | |
| Target fluids | | N/A | | | |
| Operating Temperatures | | 1 K | | | |
| Required currents | |  | | | |
| Raster sizes | |  | | | |
| Target Lengths | |  | | | |
| Max Power | |  | | | |
| Special Requirements (e.g. Parity Boiling) | | N/A | | | |
| Critical Design Conditions | | |  | | |
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| Notes: | | | | | |
| Level 3 effort for Target Group: Installation or modification of a technically challenging, existing target system.    The LOI intends to use the existing UVA polarized target modified for use with SoLID. Data will be acquired alternatively on tensor-polarized and unpolarized samples of ND3. A tensor polarization of 25% is assumed, which is the value that one obtains when the vector polarization is 56%. However, I do not believe 56% vector polarization has been demonstrated in ND3 or 6LiD using a 1K/5T target system under normal experimental conditions. A more realistic value for the vector polarization is probably 40%. This corresponds to a tensor polarization of 12%.  Note that this LOI is very similar in nature to a conditionally approved experiment in Hall C, C12-13-011. PAC40 granted approval on the condition that a tensor polarization “of at least 30% be achieved and reliably demonstrated under experimental conditions.“  The LOI also mentions that the tensor polarization can be enhanced using partial saturation of the deuteron’s NMR line. This technique has been demonstrated with considerable success in the UVa target lab, but it obviates the ability to determine the polarization via the standard NMR techniques described in Section 2.3.1. Instead, a more sophisticated lineshape analysis, also developed at UVa, must be utilized. While on strong theoretical grounds, the absolute accuracy of this analysis has not been established.  The caption of Fig. 8 is in error. The plot on the right-hand side shows a *negative* polarization of about -30% (low-frequency peak > high-frequency peak). It also shows that the larger NMR peak was destroyed by RF saturation. Doing so increases the population of the m=0 spin state, which actually *decreases* the tensor polarization.  Note that the target will acquire radiation damage during the unpolarized as well as polarized runs and will reduce the lifetime of the target samples. The most efficient data-taking sequence to reduce the overhead for annealing is probably Polarized : Unpolarized : Anneal : Polarized, etc. | | | | | |