The observable of interest is the normalized difference of two cross sections (σtgtpol – σtgtunpol)/σunpol. (Henceforth we’ll refer to this as an asymmetry.) The target will be operated for ~12 hours in a tensor polarized state followed by ~12 hours in an unpolarized state, repeating such pairs for the entire experiment. The goal for the uncertainty on the asymmetry roughly +-0.001.

Our major finding is that typical drifts in Hall C in factors used to normalize the scattering rate will create relatively large false asymmetries of +-O(0.01) so need to be mitigated. We believe this is possible with a combination of upgrades to Hall C infrastructure *and sufficient commitment by the collaboration to control the unusual systematic issues of this experiment.* The latter presents a challenge since a significant team is always needed simply to install and operate this polarized target.

The error propagation presented in the proposal is definitely on point but neglected a few contributions to false asymmetries such a beam position drifts which are easily be removed by regression. The following table summarizes our estimates for drifts in important parameters used for normalization (and how to mitigate them):

|  |  |  |
| --- | --- | --- |
| Normalization Parameter | Expected Magnitude of Unmitigated Drift | Mitigation |
| Charge | 0.1%-1%/12 hrs  (setup dependent) | 1. Significant modification to present BCM setup to make it more temperature stable. (Then monitor and correct for remaining temperature dependence.) 2. New low power   Faraday Cup.  (contact person: D. Mack) |
| Trigger/Cuts/Tracking Efficiency | 1%/12 hours | 1. Set detector thresholds conservatively. 2. Use loose PID cuts. 3. Carefully measure relative changes in tracking efficiency between slugs. |
| Dilution f  and the related  ρt (“length”) | 0.1%? (WAG)  (there may be occasional step-like changes from target beads shifting) | 1. Reverse target polarization as frequently as dead-time permits. 2. Depolarize using a technique that won’t jostle the target beads. Eg, emptying He from the nose sounds suspicious. 3. Develop a luminosity monitor based on e+e🡪e+e coincidences or target radiometry. (contact persons: D. Mack and   C. Keith) |
| ΔΩ | 0.1%/12 hours  (assuming O(1)%/mm sensitivity and 0.1mm drift in beam position) | 1. Always have the MCC restore to a golden orbit with fixed position and angle on target. 2. Correct for dependence of yield on beam position. 3. Correct for dependence of yield on various magnet currents. |

Finally, this experiment requires effectively unpolarized beam to cancel large effects from A1 and, at the highest x and Q2 settings, not-insignificant effects from parity violating asymmetries. Although JLab’s beam is always polarized, this experiment can construct unpolarized beam in software by adding matched numbers of + and – helicity states.