1. Purpose of Experiments
Include immediate goal of the experiments, scientific importance and/or programmatic relevance. Refer to any relevant program milestones.

The purpose of this experiment is to explore the effect of field reversal on poloidal rotation in the plasma edge. A field reversal would also provide an absolute calibration of the NeSoXs poloidal rotation measurements. In addition, a reversed field would flip the grad B drift direction and allow further study of the up-down asymmetry of impurity emissivity\(^1\).

2. Background
Discuss Physics Basis of the proposed research. Prior results at Alcator or elsewhere, and any related work being carried out separately.

The Neon Soft X-ray Spectrometer (NeSoXs) has recently been installed on Alcator. Initial results suggest that there are strong poloidal flows (~40km/s) in the edge region of the plasma. Neoclassically, reversing the toroidal field and the current should reverse the sign of both poloidal and toroidal flow. Therefore, one way to determine definitively that NeSoXs is in fact measuring poloidal flows is to reverse the field/current and look for an associated reversal in the measured velocity.

3. Approach
Describe the methodology to be employed; explain the rationale for the choice of parameters, etc. Describe the analysis techniques to be employed in interpreting the data, if applicable. If the approach is standard or otherwise self-evident, this section may be absorbed into the Experimental Plan.

The experiment has two phase: Phase I is a \(\frac{1}{2}\) run day with standard field direction and a full Phase II is a full run day with the field reversed (phase II). Phase I, consists of a mix of LSN, DN and USN with and without H-modes. Phase II will consist of repeating the shots from Phase I (1\(^{st}\) half) and a current scan in the second half of the day.
4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field: 5.4 T
Plasma Current: 0.4-1.5 MA
Working Gas Species: D₂
Density: 1~2e20
Equilibrium configuration (if possible, refer to database equilibria): Reversed toroidal field and current in LSN, DN & USN (see 5.2 for specific equilibria)

4.2 Auxiliary Systems

RF Power, pulse length, phasing: 0-4 MW, Flat top pulses
Pellet Injection (species): No
Impurity blow-off injection: No
Diagnostic Neutral Beam: yes
Special gas puffing: Ar, Ne
Non-axisymmetric Coils (Connections, Current);
Other:

4.3 Diagnostics

List required diagnostics, and any special setup or configuration, e.g. non-standard digitization rate.

Hirex, NeSoXs, Thomson, Edge Thomson, GPC, Bolometer arrays, McPherson, Chromex, CXRS

5. Experimental Plan

5.1 Run sequence Plan

Specify total number of runs required and any special requirements, such as consecutive days, no Monday runs, extended run period – 10 hours maximum – etc.

Phase I: Standard Field (1/2 a run day)

A half run-day before the field reversal should be enough to collect shot data to compare with the reversed field data (phase II). Since Hirex and NeSoXs are key diagnostics for these runs, larger than usual amounts of argon and neon will be puffed into the machine. A few shots will be used to ramp up the impurity densities and to find a compromise between NeSoXs/Hirex signal levels and plasma performance.
Phase II: Reversed Field (1 run day)

The first few shots will be dedicated to optimizing impurity density and demonstrating discharge repeatability. Once this is accomplished, shots from phase I of the mini-proposal can be repeated (of course, with the field and current reversed). The second part of the run day will be dedicated to a scan in plasma current. The discharges will be chosen to match a current scan from the previous campaign (June 24th, 2005).

5.2 Shot sequence plan
For each run day, give detailed specification for proposed shot sequence: number of shots at each condition, specific parameters and auxiliary systems requirements, etc. Include contingency plans, if appropriate.

Phase I: Standard Field: 1/2 run days
- 9 shots LSN Load shot: 1050304007 (I=0.8MA, NL04=0.67)
  - 3 shots to optimize neon/argon density
  - 2 shots with RF (H-mode)
  - 2 shots without RF (L-mode)
  - 2 shot in reserve for dud/fizzle
- 6 shots in USN - Load shot: 1050304009 (I=0.8MA, NL04=0.65)
  - 2 shots with RF (H-mode)
  - 2 shots with no with RF
  - 2 shot reserve for fizzle/dud
- If a difference in poloidal rotation is seen between LN & UN (and time permits) run some DN shots.

Phase II: Reversed Field: 1 run day
Effect of Field Reversal on poloidal rotation
- Repeat the shots from phase I

Effect of Current scan on poloidal rotation
- Load shot: 1050304007 (I=0.8MA, NL04=0.67)
- 2 shots at each current level (10 shots)

<table>
<thead>
<tr>
<th>I (MA)</th>
<th>NLO4</th>
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<tbody>
<tr>
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<td>1.1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.2</td>
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</tbody>
</table>
6. Anticipated Results
Discuss possible experimental outcomes and implications. Indicate if the program may be expected to lead to publications, milestone completions, improved operating techniques, etc. Indicate if the experiments are intended to contribute to a joint research effort, or an external database.

Neoclassical theory predicts that reversing the toroidal field and current will reverse both toroidal and poloidal rotation. If NeSoXs detects a reversal of poloidal rotation with the reversed field, this would be a very strong indication that NeSoXs rotation measurements are credible. Reversing the field should also provide a calibration of the velocity offset (zero velocity) for the NeSoXs spectrometer.

Previous results\textsuperscript{2} have demonstrated that there is a large up-down asymmetry in argon edge emissivity. It will be interesting to see if this effect is seen in neon. If the effect is seen, NeSoXs will provide much better spatial resolution than in previous studies.

The current scan in phase II will allow further comparison of the measure poloidal flow with neo-classical theory. Since the current scan will match discharges from a previous campaign (with the standard field direction) valuable comparisons can be made with a number of other diagnostics (most notably pedestal measurement from the edge Thomson diagnostic).

7. References
Include references both to external and internal literature or communications which bear on this proposal. See Section 2.