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

This experiment is intended to fulfill the initial calibration, focusing, and alignment requirements of the HiReX Sr spectrometer.

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

HiReX Sr [1] functions by measuring the line broadening and Doppler shift from argon impurities in the Alcator C-Mod plasma. The spherical geometry of the HiReX Sr crystal elements makes the ray tracing through the flange particularly difficult, and small misalignments can lead to major vignetting problems. Furthermore, wavelength alignment and focusing of the emission lines on the detectors have to be accomplished experimentally because no convenient source exists to this and during installation of the spectrometer in the cell, the crystal and detector mounts are likely to move negating the calibration.

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.

Locked mode discharges will be repeated until the system is properly wavelength aligned and focused. After the focusing, a high density, low temperature discharge will be run to attempt to find the instrumental temperature of the device by setting $T_e=T_i$. Finally,
spatial calibration can be confirmed by running a discharge with a limited plasma of decreasing minor radius. Furthermore, argon valve efficiencies will be measured using low density discharges with varying open times of the argon valve. High grade plasmas are not required for this experiment.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

- Toroidal Field: 5.4 T
- Plasma Current: 0.8 MA
- Working Gas Species: D₂
- Density: 8E19 (higher if runaway electron issues)
- Boronization Requested (if yes, specify whether overnight or between-shot, how recently needed, and any special conditions.): No
- Equilibrium configuration (if possible, refer to database equilibria):

4.2 Auxiliary Systems

- ICRF Power, pulse length, phasing: No
- LHCD Power, pulse length, phasing: No
- Pellet Injection (species): No
- Impurity blow-off injection: No
- Diagnostic Neutral Beam: No
- Special gas puffing: Argon
- Cryopump: No
- Non-axisymmetric Coils (Connections, Current):
  - Other:

4.3 Diagnostics

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

Required: HiReX Sr, HiReX Jr, Thomson, standard magnetic suite

5. Experimental Plan

Both sections must be filled in.

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.

1/2 Run Day (assuming near ideal plasma operation)

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.

Part 1: Confirm wavelength alignment
Shots 1-4: Run locked mode discharge (ref #1110329010) until wavelength calibration confirmed

Part 2: Focusing tests
Shots 5-10: Continue running locked mode discharges until focusing curve is completed on all modules.

Part 3: Absolute Ar density tests
Shots 11-13: Low density discharges (ref # 1110128009) with 25 ms, 50 ms, and 100 ms argon injections

Part 3: Instrumental calibrations
Shot 14: High Density(nl04 ~ 1.5), Low Temperature/current (600 kA) discharge
Shot 15: Limited discharge with decreasing minor radius (ref # 1110204013)
Shot 16: Time permitting: high density Ohmic H-Mode (ref #1110105003)

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, an ITER request, or an external database.

Using these results, HiReX Sr will be fully calibrated for the beginning of the experimental run campaign where its data are required. It will be possible for the spectroscopy group to remove errors regarding alignment, vignetting, and focusing without losing time during the physics section of the run campaign.

These repeatable discharges can also be used by other diagnostics for their calibrations.

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