1. Purpose of Experiments

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

The purpose of this experiment is to produce an ITB plasma in a reversed magnetic shear configuration. This may have the beneficial effects of lowering the ITB threshold, of allowing the barrier to form at densities below those with EDA targets and of permitting addition of more on-axis heating power without destroying the barrier.

2. Background

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

Previous studies of off-axis ICRF-induced ITBs have been made in plasmas with constant current [1,2,3], and have exhibited monotonic q profiles, undergoing sawtooth oscillations. Application of on-axis ICRF heating during the current rise phase has led to reversed magnetic shear configurations [4].

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 approach of the present experiments is to combine off-axis ICRF heating with strong current ramping, or during the current rise phase, in order to form ITBs in a reversed magnetic shear configuration.

4. Resources
4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field: 4.5 T

Plasma Current: fast ramping from 0.6 to 1.2 MA, and normal current rise

Working gas species: D(H)

Density: \(1 \times 10^{20}/m^3\) for current rise, \(3 \times 10^{20}/m^3\) for current ramping

Equilibrium configuration (if possible, refer to database equilibria):

Pulse length, typical current & density waveforms, etc. Refer to database or sketch desired waveforms.

4.2 Auxiliary Systems

RF Power, pulse length, phasing: 80 MHz, full power and pulse length

Pellet Injection (species):

Impurity blow-off injection:

Diagnostic Neutral Beam: yes

Special gas puffing: argon

Other:

4.3 Diagnostics

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

Thomson, visible bremsstrahlung, ECE, HIREX, soft x-ray, EFIT, LPI, DNB

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 runs

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.

1 run day with ICRF during the current rise, with 2 shots each with varying density, current rise rate and ICRF timing; 20 shots. 1 run day with fast current ramping during the steady state phase; 3 shots each varying timing of ICRF relative to current ramp; 15 shots.
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.

Demonstration of ITBs in reversed magnetic shear configurations in ICRF-only discharges; subsequent publications, IAEA presentation, Davis Lee thesis.

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