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 understand triggering mechanism for producing off-axis ICRF internal transport barriers. The question of whether ITB formation can be explained in the framework of suppressing ITG turbulence via increasing ion temperature scale length relative to the critical scale length is the target.

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

Internal transport barriers can be routinely produced on C-Mod in EDA H-mode plasmas by placing the ICRF resonance location outside |r/a| ~ 0.5. Access to these off-axis ICRF heated ITBs may be understood within the paradigm of marginal stability. Moving the RF resonance location outward flattens temperature profile; and if plasma conditions are close to marginal stability (which is predicted for ITG modes), even small flattening can lead to a significant drop in the turbulence level. Therefore, the existence of a ‘critical’ temperature gradient might explain the observed sharp dependence on the magnetic field.

One run day (1050707) was dedicated to this topic. Our measurements of electron temperature profiles suggest that a/L_T decreases in ITB region as ICRF resonance is moved away from the magnetic axis. TRANSP analysis shows the same trend for ion temperature. Furthermore, T_e measurements suggest that the plasma is colder at higher magnetic field (and higher plasma current), though T_i measurements from HIREX (single channel) do not support this trend (see Figure1).
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.

In order to verify trends in $T_e$ and $T_i$ profiles observed for the run 1050707, it is required to repeat and extend $B_T$ scan for 1050707. Therefore, toroidal magnetic field and thus the RF resonance location will be varied on shot-to-shot basis. Obtaining long steady H-modes is crucial for this experiment. Careful measurements of temperature profiles as they evolve will be done with all possible diagnostics: TS and ECE for $T_e$, HIREX for $T_i$. Obtaining measurements from all 3 HIREX channels is crucial to experimentally verify changes in $T_i$ gradients. Having a combination of D+E ICRF antennas working at 80 MHz should enable us to extend $B_T$ scan from 1050707. ICRF total power will be kept constant and the total plasma current will be adjusted according to the changes of the magnetic field to keep $q_{95}$ constant.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

- Toroidal Field: 5.4-6.45 T
- Plasma Current: 0.9-1.075 MA
- Working Gas Species: D2
- Density: $\sim 2 \times 10^{20}$ line averaged
- Equilibrium configuration (if possible, refer to database equilibria): standard good ITB discharge (1050707019)

4.2 Auxiliary Systems

- RF Power, pulse length, phasing: Standard; D+E (80MHZ), 3MW, constant for all discharges
- Pellet Injection (species):
- Impurity blow-off injection:
- Diagnostic Neutral Beam: preferably, for CHERS
- Special gas puffing:
- Non-axisymmetric Coils (Connections, Current):
- Other:

4.3 Diagnostics

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

All standard core diagnostics, especially TS, all ECE diagnostics, HIREX, PCI, etc. + CHERS (if available)

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 Day

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.

Set up standard equilibrium with H-modes: 1-2 shots

Vary magnetic from 6.45 T to 5.4 T with 0.1-0.2 T decrement (adjust plasma current proportionally): 2 shots for each field. Start with the scan around Bt=6.0T and then move to lower fields.

The scan of RF input power at the highest field can be done if time allows.

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.

The measurements of ion and electron temperature should quantify the difference between \( T_i \) and \( T_e \). The analysis of \( T_i \) profile evolution should experimentally verify TRANSP calculations.

7. References
Include references both to external and internal literature or communications which bear on this proposal. See Section 2.
Fig. 1