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

Since the installation of the high resolution edge x-ray array there have been no ohmic H-modes. Therefore there are no high resolution soft x-ray pedestal data available for ohmic H-modes. We wish to investigate if the pedestal position and width is the same for ohmic H-modes as for those obtained with RF heating.

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

From last year’s campaign, we know that the x-ray pedestal width is sensitive to the type of H-mode (EDA, ELM-free or ELMy) [1]. In the early days of RF heating (on other machines), significant edge perturbations were induced by the RF antennas, due to the formation of rectification sheaths. Such effects are now suppressed by the use of Faraday shields and by avoiding monopole antenna phasing. However, it is still an open question if the RF wave or antenna sheath changes the H-mode pedestal character. If so, we should be able to measure differences on the order of 1 mm in pedestal width, or about 2-3 mm in pedestal position. We need ohmic H-modes of at least 100 msec duration in order to make this comparison, since it takes about that long for the pedestal to fully develop.

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.

Obtain breakdown at 4 Tesla, ramp down TF to get into H-mode.

4. Resources
4.1 Machine and Plasma Parameters

Give values or range for:

**Toroidal Field:** 2.8-4 T

**Plasma Current:** 0.6 MA - 1.0 MA (if possible)

**Working gas species:** D$_2$

**Density:** 8.0 x 10$^{19}$ m$^{-3}$ (target before H-mode)

**Equilibrium configuration** (if possible, refer to database equilibria): Lower single null diverted, eg. 970625020

**Pulse length, typical current & density waveforms, etc.** Refer to database or sketch desired waveforms: Pulse length $\geq$ 1 s, constant target density. Subsequent flattopping and/or rampup of current and toroidal field may be considered.

4.2 Auxiliary Systems

**RF Power, pulse length, phasing:** none

**Pellet Injection (species):**

**Impurity blow-off injection:** none required

**Special gas puffing:** standard A and B valves, neon puffing if the soft x-ray emission is low

**Other:** This run requires a very clean machine that is running well.

4.3 Diagnostics

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

- Edge x-ray arrays
- Edge XUV array
- Full H$_\alpha$ coverage
- Fast H$_\alpha$ for ELMs up to 500 kHz or even 1 MHz sampling
- Fast magnetic pick-up coils for ELMs up to 1 MHz sampling
- Scanning probe
- Langmuir probes
- ECE polychromator with grating set to look at edge profiles at 3.5 T
- Edge Thomson Scattering if available
- Bolometers
- Visible bremsstrahlung
- Helium beam edge diagnostic
4.4 Neutron Budget

Estimate the neutron dose rate at the site boundary. Give basis for estimate. (Once some experience has been gained a standard formula will be provided for estimating dose rates.)

Negligible

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.

1 day. Could run piggyback on John Rice’s ohmic H-mode toroidal rotation run.

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.

Start out with a constant current around 0.7 MA and \( n_e = 0.8 \times 10^{20} \). Get breakdown at 4 T, ramp TF down to see if we can get H-mode. Vary density and/or current in subsequent shots if not successful. Once we have H-modes, we will program the TF to flattop after having reached the H-mode threshold to get as long H-modes as possible. If this is successful, we will try to get H-modes at a couple of other values of plasma current. We have to be careful to avoid disruptions by keeping \( q_{95} \) above 2.

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.

We will be able to see any significant difference in the H-mode barrier character by looking at the soft x-rays. The results should lead to a publication.

7. References

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