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.

   Two goals:

   (1) Measure dependence of edge pedestal width on $dI_p/dt$, and
   (2) Compare top and outboard x-ray edge pedestal profiles.

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

   (1) From last year’s dynamic $I_p$ scans, we know that the x-ray edge pedestal width varies
   strongly with plasma current. However, the rampup and rampdown cases show consistent
   differences, indicating a possible dependence on $dI_p/dt$ as well. One goal of
   this mini-proposal is to determine, in a more controlled and quantitative manner, the
   dependence of x-ray pedestal width on ramp rate. This presumably might infer a
   connection between edge current (or perhaps $\ell_i$) and the edge transport barrier.

   (2) We would like to know how much the x-ray pedestal profile (shape, position, height)
   varies along the flux surfaces, and whether this changes with plasma current. We will
   also be looking for variations in the structure and timing of transient events such as
   H/L transitions, ELMs, x-ray bursts, etc.

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

   During long periods of steady H-mode, dynamically ramp the current up from 0.8 to
   1.2 MA (1.4 MA ?) at two or three different rates (one ramp rate per shot). Do the same
   thing for rampdown shots as well (i.e. 2-3 different rampdown rates). Finally run three
   steady current shots at 0.8, 1.0, and 1.2 MA.
4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field: 5.3 T

Plasma Current: 0.75-1.25 MA (1.4 MA ?)

Working gas species: D₂

Density: anywhere between \( \langle n_e \rangle = 1 \) and \( 2 \times 10^{20} \text{ m}^{-3} \) is acceptable, as long as it’s fairly constant and repeatable during H-modes.

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

Pulse length, typical current & density waveforms, etc. Refer to database or sketch desired waveforms: need long steady-state H-modes (0.5-1.0 s). Plasma current will be dynamically ramped on some shots, and constant on others. See, for example, 980122010, 015, 025. Multiple B-field jogs per ramp required for GPC edge profiles. Keep separatrix shape and position constant (κ, δ, outer gap, etcetera).

4.2 Auxiliary Systems

RF Power, pulse length, phasing: \( \geq 2.5 \text{ MW} \)

Pellet Injection (species): none

Impurity blow-off injection: Sc on some shots

Special gas puffing: none

Other:

4.3 Diagnostics

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

GPC, Edge TS (if available), Helium beam probe (if available), FSP, XUV edge arrays, top and outboard edge x-ray arrays

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.)

< ignition
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.

One-half run day. This will still leave another half-day for additional pedestal scaling
studies later in this campaign.

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 contin-
gency plans, if appropriate.

1 shot: ramp up current from 0.75 to 1.20 MA in 0.6 s (à la 980122010). Ramping
should not start until pedestal has reached equilibrium. Include two or more
B-field jogs (3%) for GPC (for every shot this run).

2-4 shots: ramp up current from 0.75 to 1.20 MA, but at some fraction of the previous rate.
If the slower ramp rate cannot cover the desired current range over the duration
of a single shot, then break the range into two sub-ranges/shots. If time allows,
repeat at a third ramp rate.

1 shots: ramp down current from 1.25 to 0.80 MA in 0.4-0.5 s (à la 980122015/025).
Ramping should not start until pedestal has reached equilibrium.

2-4 shots: ramp down current from 1.25 to 0.80 MA, but at some fraction of the previous
rate. If the slower ramp rate cannot cover the desired current range over the
duration of a single shot, then break the range into two sub-ranges/shots. If time
allows, repeat at a third ramp rate.

3 shots: run three flattop shots (i.e. no ramping) at 0.8, 1.0, and 1.2 MA. Still include B-
field jogs for GPC. The impurity injector can be fired near the end of the flattop
to look for variations in impurity confinement.

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 should be able to quantitatively sort out any explicit dependence of the x-ray and
$T_e$ and $P_{rad}$ pedestal widths on $dI_p/dt$, and re-confirm the lack of an explicit $T_e$ width
dependence on $I_p$. We may also learn about how much the x-ray emissivity varies on flux
surfaces at different currents.

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