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

This experiment will extend the studies of ELMs and pedestal structure to H-modes with grad-B drift directed away from the active X-point. This will extend the data used for testing of the EPED class of models [1] for pedestal structure, and would thus contribute significantly to the FY11 Joint Research Target (JRT) [2] on building a predictive model for the pedestal.

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

Type I ELMy H-mode is a common regime which can be studied on C-Mod, DIII-D and NSTX as part of the JRT on pedestal physics. Recently we have expanded our data set in ELMy H-mode over an increased range of current, field and other parameters. We continue to find it a challenge to obtain Type I ELMs on C-Mod. Their appearance is favored in discharges with very high lower triangularity, yet with weak shaping of the plasma crown (the “JFT-2M shape”). This shaping is not preferred, since it requires non-standard edge Thomson scattering setup, and limitations on the EF2L power supply preclude high-$I_p$ (>1MA) operation.

ELMy access could potentially be enhanced in more typical shapes by accessing reduced-collisionality regimes. By way of example, ELMs have been seen in I-mode. Also, some older data show ELMs in reversed-field H-modes with typical shaping and lower H-mode collisionality (e.g. on run 1001115)

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.

We will operate LSN with reversed field and current, and use take advantage of the reduced collisionality that tends to be observed in H-modes with unfavorable grad-B drift. We will run a series of discharges with varied shaping, beginning with the JFT-2M shape (5.4T, 0.9MA). This has been attempted in LSN in reversed field once, on 1070724029. From there we will scan shape and too some degree current to determine the operational space for ELMs, in a similar fashion to the sessions with normal $B_T$ under MP578). Thus we will find out whether there is a more desirable shape for obtaining a regular ELMing condition. If there is, then we can exploit it to raise $I_P$ and generate additional data for testing peeling-ballooning stability with ELITE and the pedestal structure model of EPED.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field:  5.4T, reversed  
Plasma Current:  0.9MA—1.2MA, reversed  
Working Gas Species:  D2  
Density:  nebar from 1 to 2e20 m$^{-3}$  
Boronization Requested (if yes, specify whether overnight or between-shot, how recently needed, and any special conditions.):  yes, previous night  
Equilibrium configuration (if possible, refer to database equilibria):  any recent JFT2M case (e.g. 1101214029)

4.2 Auxiliary Systems

ICRF Power, pulse length, phasing:  0.7s, 2—4MW, 78+80MHz heating  
LHCD Power, pulse length, phasing:  none requested  
Pellet Injection (species):  none  
Impurity blow-off injection:  none  
Diagnostic Neutral Beam:  yes, for CXRS  
Special gas puffing:  diagnostic Ar, Ne seeding available  
Cryopump:  no  
Non-axisymmetric Coils (Connections, Current):  standard error-field correction

Other:

4.3 Diagnostics

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

Thomson, core and edge. All available ECE diagnostics, optimized for pedestal top. TCI. Fast magnetics (10MHz), reflectometry for edge fluctuations. Fast D-alpha for ELM timing. Passive edge CXRS. PCI (10MHz), Beam-based CXRS for pedestal $T_i$. HIREX-Sr for core rotation.
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 run day. Ideally it would be schedules after, and be informed by the results of, Whyte’s MP on I-mode in LSN, reversed field.

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.

Begin in JFT-2M shape at 5.4T, 900kA, and ramp power to find threshold for ELMy H-mode. Several shots may be required to recover from boronization and get the density down.

Having established a good base case, begin incrementing delta_L shot-to shot until ELMy H-mode is lost at the same density/power levels.

Choosing a suitable value of delta_L from the above scan, begin increasing kappa ahot-to-shot until the ELMs are lost.

If suitable ELMs are obtained in the above scans with a more modest value of delta_L than is usual, try increasing I_p in steps of 0.1MA as high as one can go and not disrupt the plasma.

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.

Successful completion of this experiment will provide an extended data set for tests of EPED (and perhaps other models for predicting pedestal structure). The work will contribute to the FY11 FES Joint Research Target, and its associated papers. It could also produce a lot of incidental I-modes which we all love.

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