1. Purpose of Experiments

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

To find qualitative evidence of long scale length avalanche type behavior in the high resolutions ECE temperature profiles in C-MOD. This data can then be compared to results in DIII-D [1].

2. Background

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

The high-resolution ECE system has the best chance of observing avalanche behavior. The large number of closely spaced channels with excellent spatial and temporal resolution, are critical requirements to observe these effects. At first background experiments will be connected on standard 5.4T discharges. Fast ECE profile data (500kHz) will be taken during the flat top portions of the discharge. This data array of Te(r,t) will be processed to remove all slow space and time behavior. The data will be search for the characteristic patterns of avalanche behavior (as seen in numerical sand pile modeling [2],[3]). If any evidence of episodic behavior is found, we'll begin quantitative comparisons with theory of the frequency vs. size distribution of these events, and of the dependence on source strength and noise (input power characteristics). After the first exploration phase and successful data analysis then we would proceed to request quiescent L-mode discharges where these avalanches could be better resolved for comparison with theory.

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.

First phase, 5.4T and no other special requirements. If successful then request quiescent L-mode discharges, no MHD or sawteeth. Conditions to be determined by operators.
4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field:
Plasma Current:
Working gas species:
Density:
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:
Pellet Injection (species):
Impurity blow-off injection:
Special gas puffing:
Other:

4.3 Diagnostics

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

High resolution ECE, GPC

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.)

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.

Run in background for first phase. Experiments to be determined after initial results.

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.

To be determined after first results.
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 existence of a critical gradient is an important feature of many transport models [4]. However, fundamental differences exist in the dynamics near marginal stability, depending on whether the transport phenomena are controlled by strict linear marginal stability or by a self-organized criticality. Experimental identification of SOC like phenomena could add significantly to our understanding of transport and be very important to the understanding of the transient transport experiments.

7. References

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