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 the proposed C-Mod/JET pedestal dimensionless experiment is to obtain reliable measurements of pedestal profiles on both tokamaks in similar discharges to see if pedestal parameters in H-mode scale with plasma physics variables and, ultimately, to assess a relative role of neutral and plasma transport in formation of the H-mode pedestal.

2. **Background**

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

The first C-Mod/JET pedestal dimensionless identity experiment was carried out in October 2002 and continued in March 2003. Results of these experiments are reported in [1]. Reasonably similar (in dimensionless sense) plasmas were achieved on JET and C-Mod. The pedestal profile measurements on JET seem to suggest that pedestal width in dimensionlessly identical plasmas may scale with the plasma’s minor radius. In JET discharges similar to EDA H-mode on C-Mod a new ELM-free H-mode regime was observed, characterized by constant pedestal density similar to the steady-state EDA regime. However, in order to achieve dimensionlessly similar discharges on JET the plasma parameters had to be pushed to the edge of the tokamak operational domain. Running JET plasmas with low magnetic field and current presented difficulties for both RF and NB heating schemes. At the same time, higher L-mode target density was used, actually leading to higher L-H transition threshold than on C-Mod. This led to higher pedestal temperature on JET just after the L-H transition and prevented a good match in electron pedestal temperature between C-Mod and JET. Besides, using unusual plasma shape on JET led to difficulties in interpreting the results of edge LIDAR measurements,
thus preventing a definitive conclusion about scaling of H-mode pedestal width between tokamaks.

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 propose the second stage of dimensionless identity experiments on both JET and C-Mod aimed at achieving a better match of dimensionless parameters in the pedestal region of both tokamaks. In order to do this we will run higher field and current plasmas on C-Mod thus enabling JET to operate closer to its “standard” regime and obtain dimensionlessly identical plasmas. The plasma shape optimized for best possible edge LIDAR performance should be run on JET (existing DOC-U configuration). C-Mod shape should be optimized to approach as close as possible the DOC-U shape.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field: 8 T
Plasma Current: 1.2 MA
Working Gas Species: D2
Density: target n\_l 1. – 2.e20
Equilibrium configuration (if possible, refer to database equilibria): adjusted to match JET shape – as in 1031219011

4.2 Auxiliary Systems

RF Power, pulse length, phasing: 3 – 6 MW, He3 minority
Pellet Injection (species):
Impurity blow-off injection:
Diagnostic Neutral Beam:
Special gas puffing:
Other:

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

All pedestal diagnostics and fluctuation diagnostics are necessary. Spectroscopy to monitor helium (McPherson and Chromex)
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.

2 run days

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.

Establish an EDA discharge at 8 T, 1.2 MA – modify target density and RF power (He3 puffing) as necessary. – 8 shots?
Adjust the shape to match JET DOC-U configuration – 4 shots
Scan RF power and target density shot to shot to obtain pedestal measurements in a range of electron temperatures and densities – 4 values of RF power and 4 values of target density – 16 shots

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.

Enough pedestal data should be obtained to carry out a detailed comparison with JET data from dimensionlessly identical discharges.

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