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.

Characterize the interaction of the DNB with the plasma so that it can be applied to diverse plasma conditions without surprises.

2. Background

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

The attenuation of a neutral beam by interaction with a plasma at high density has two important ramifications, heating of the plasma edge and limited measurement of the core plasma. Both are important for diagnostics. As a spin off, the former might be useful for plasma studies.

Minority heating is an important aspect of C-Mod operation. For diagnostic reasons that have often been discussed, the beam is best operated in H. Thus there is the capacity for affecting the global H fueling through leakage from the neutralizer into the edge plasma and from modification of the local minority content by beam fueling. Both must be controlled; the latter has potential for plasma heating control.

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

Determine heating of plasma edge at high density. Determine the effective fueling rate with beam. How does beam affect H content/minority content? Benchmark the attenuation of the beam using the BES system to measure the relative emission of H-alpha from the beam as a function of position.
4. Resources

4.1 Machine and Plasma Parameters

   Give values or range for:

   **Toroidal Field:** any
   **Plasma Current:** any
   **Working gas species:** D
   **Density:** various
   **Equilibrium configuration** (if possible, refer to database equilibria): any
   **Pulse length, typical current & density waveforms, etc.** Refer to database or sketch desired waveforms.

4.2 Auxiliary Systems

   **RF Power, pulse length, phasing:** need RF to look at minority concentration issues
   **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.

   Ti from Hirex Te from TeTS and GPC Z-effective Bolometer for Prad Ne pressure gauge H content Spectroscopy for neutral measurements BES

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.

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.

   Two run days after operation is successful in background.
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.

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