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

Make first in-situ measurements of plasma-facing surface erosion over the timescale of one to a few shots using the newly developed AGNOSTIC diagnostic.

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

AGNOSTIC has been developed to provide the capability to perform in-situ ion beam analysis of plasma-facing components. It uses a 900 keV deuteron ion beam produced by a RFQ accelerator which is injected into C-Mod at B-port. The beam intercepts the plasma-facing components and produces highly penetration nuclear reaction products which are measured with shielded scintillation detectors. The resulting pulse-height spectrum is used to determine the surface fluence (or depth) of low-Z isotopes such as boron, oxygen and carbon. A steady-state toroidal field is applied to steer the ion beam to different poloidal locations and thus provide a map of the surface properties. At this time the beam can be steered from the inner wall midplane (where the beam is pointed) to approximately the top of the lower inner divertor with an applied field \( \approx 0.18 \) T on axis using the PEI power supply.

We have successfully measured boron and oxygen photopeaks along the centerpost. The boron content is finite everywhere, but minimized near the midplane.

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.

AGNOSTIC is presently limited to making measurements along the centerpost due to the current limits in the PEI power supply. Our approach will be to maximize the effect of the tokamak plasma at and near the midplane centerpost by using inner-wall limited plasmas which should place the large majority of recycling and heating at the inner midplane.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

- Toroidal Field: 5-5.4 T
- Plasma Current: 0.7-1 MA
- Working Gas Species: D2
- Density: NL04 ~0.6 - 1
- Boronization Requested (if yes, specify whether overnight or between-shot, how recently needed, and any special conditions.): No
- Equilibrium configuration (if possible, refer to database equilibria): 1120802006

4.2 Auxiliary Systems

- ICRF Power, pulse length, phasing: 2 MW, 1 s
- LHCD Power, pulse length, phasing:
- Pellet Injection (species):
- Impurity blow-off injection:
- Diagnostic Neutral Beam:
- Special gas puffing:
- Cryopump:
- Non-axisymmetric Coils (Connections, Current):
- Other:

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

RFQ accelerator/AGNOSTIC
Cameras viewing inner wall.
Photodiode array viewing inner wall
Other inner wall diagnostics?

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.
2-4 hours
Will need cell access to set up AGNOSTIC equipment
Will need PEI to be operational between shots in manual control

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.

1. Setup the AGNOSTIC detectors and makes measurements at 3 vertical locations
   (I_PEI = 0, 2500 and 4500 A)

2. Run 3-4 innerwall limited discharges
   IWL, #1120802006 as target. 2 MW ICRF heating.

3. Setup the AGNOSTIC detectors and makes measurements at 3 vertical locations
   (I_PEI = 0, 2500 and 4500 A)

4. Inner wall limited disruption by decreasing minor radius while demanding constant current.

5. Setup the AGNOSTIC detectors and makes measurements at 3 vertical locations
   (I_PEI = 0, 2500 and 4500 A)

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.

First ever in-situ erosion measurements in a tokamak.

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