Alcator C-MOD
Mini-Proposal

Subject: PCX Beast commissioning  
From: R. Boivin, C. Rost, J. Miller  
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Approved by:  
Date Approved: 13-JUN-1995

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.

   The TFTR type NPA recently installed in F port (PCX) is now complete. However, we need to recheck the calibration done in Princeton in 1992. Many components have been changed or modified, including electronic, analyzer/magnet and detector components. Although preliminary debugging can be done efficiently by passive piggy-backing on any shot, special conditions are needed for the final commissioning.

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

   None specific to this task.

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

   The analyzer consists of parallel electric and magnetic fields, which deflect stripped neutrals on micro-channels which has 78 channels, 39 on each "mass column".

   The first task consists to confirm/optimize fields as to maximize and calibrate flux on given channels. Starting with previous calibration and some geometrical calculations, the analyzer can be scanned in either field (E and/or B) in order to establish proper "scaling" and calibration of channels. In such cases, a series of identical/reproducible discharges is needed in order to optimize the measured flux. A period of 300-400 msec, during flattop is needed preferably with lowish density (i.e avoiding runaways but maximizing ion temperature and flux). After that period other experiments could be performed, but preferably none that could lead to disruptions. Highish current, in the 800 kA region would be good, maximizing ion temperature. Hydrogen should be also puffed with Deuterium in order to "calibrate" both column. However, we will start with deuterium only in order to
confirm the deuterium signature first. We are looking in a series of approx. 10 shots, less if our first guess is good!

The second phase corresponds to a density scan which would help us to understand/establish a base for neutral “cut-offs” for this analyzer. It will serve also to examine, especially at higher density, the region (i.e. edge) which is being viewed. We would need approximately 5-7 shots to do this part.

4. Resources

4.1 Machine and Plasma Parameters

Give values or range for:

Toroidal Field: 5.3 T.

Plasma Current: As high as possible but still reproducible (approx. 800 kA).

Working gas species: D, with some H later

Density: $10^{20} \text{ m}^{-3}$ and lower.

Equilibrium configuration a stable, reproducible discharge, diverted not necessary

Pulse length, typical current & density waveforms, etc. Refer to database or sketch desired waveforms: 1 sec or greater

4.2 Auxiliary Systems

RF Power, pulse length, phasing: none

Pellet Injection (species): none

Impurity blow-off injection: none

Special gas puffing: D/H

Other:

4.3 Diagnostics

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

All available diagnostics preferred, but not required. Particularly, plasma density, and ion temperature.

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.)

minimal
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.

Lots of piggybacking plus 1 dedicated, mainly for reproducible stuff.

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.

Constant shots as established during discharge development.

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.

This procedure is an absolute prerequisite before we can interpret the data from the NPA.

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