1. Purpose of Experiments

1. Exploration of enhanced confinement regime - Ohmic - Conditions required to access mode - relation to observed ohmic "L" mode - comparison of diverted shaped plasma to circular limited plasma

2. Studies of pellet ablation and fast profile relaxation phenomena - Compare standard ablation model to experiment - confirm previous measurements of fast profile relaxation with improved diagnostics (ECE polychromator, Xray tomography, etc)

3. Studies of divertor physics at high densities and low neutral pressure.

4. Enhanced confinement studies - RF - PEP mode studies - Effects on RF coupling, heating efficiency

2. Background

1. P-mode confinement was first seen on Alcator C. It resulted in improved ion energy and particle transport and was attributed to the suppression of ITG modes by the peaked profiles created by pellet injection.

2. The standard neutral gas shielding code does a credible job matching experimental observations, but only with its simplest and least physically relevant model. More "realistic" models predict far too much pellet penetration. Our hypothesis is that all versions of the neutral shielding model neglect anomalous cross field transport which allows thermal energy from the core to reach the pellet and increase ablation.

3. Pellet injection allows us to decouple control of the density and the edge neutral density. This should be an important tool in understanding and optimizing divertor physics.

4. JET sees the pellet enhanced mode even with strong ICRF heating. The result is some of the highest performance discharges ever observed.
3. Approach

Pellet Injection

4. Resources

4.1 Machine and Plasma Parameters

Toroidal Field: 5.2
Plasma Current: .4 - 1. MA
Working gas species: D2
Density: various
Equilibrium configuration (if possible, refer to database equilibria): various
Pulse length, typical current & density waveforms, etc. Refer to database or sketch desired waveforms:

4.2 Auxiliary Systems

RF Power, pulse length, phasing: maximum (for #4 Above)
Pellet Injection (species): D2
Impurity blow-off injection: at times
Special gas puffing:
Other:

4.3 Diagnostics

all standard core diagnostics for #s 1,2, and 4 any available fluctuation diagnostics edge diagnostics for #3

4.4 Neutron Budget

Could be in $10^{13} - 10^{14}$ range for #1 possibly higher for #4
5. Experimental Plan

5.1 Run sequence plan

#2 and #3 could be done in piggy back mode (including pellet runs for other purposes) For #2 the widest range in operating condition is desireable - probably more than could be accomplished in a single dedicated run. #3 relies on the active participation of the edge group.

#1 will require dedicated time, I estimate 2 runs. The plan would be to make comparisons at several values of Ip; pushing the density with pellets and (hopefully) accessing P-Mode

5.2 Shot sequence plan

6. Anticipated Results

Papers on P-mode, ablation and profile relaxation phenomena, etc

7. References

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


