1. Purpose of Experiments

Determine how much and how rapidly we can modulate the plasma density as we change the gas source at A-port. Adjust gas modulation amplitude and see if we can push the stability envelope as the plasma current changes. Data should provide initial information needed for estimating particle transport coefficients. We would also like to have the pellet injector firing late in the shot with small pellets if possible, since it should provide another window into transport and confinement issues.

2. Background

TFTR, JET, Alcator C, and Asdex have all tried modulated gas experiments. There are about as many analysis procedures as there are machines. A major objective of this mini-proposal is to get the initial data needed to begin sorting out what analysis procedure is best for our machine.

3. Approach

See section 5.

4. Resources

4.1 Machine and Plasma Parameters

Toroidal Field: 5 Tesla
Plasma Current: 300–400 kA
Working gas species: H
Density: Standard
Pulse length, typical current & density waveforms, etc.: Shot 930630010

4.2 Auxiliary Systems

RF Power, pulse length, phasing: No
Pellet Injection (species): Late in shot
Impurity blow-off injection: Very Late if available
Special gas puffing: Yes
Other:

4.3 Diagnostics

$H_\alpha$, TCI, ECE, and Tomography are absolutely essential, everything else is just essential.

4.4 Neutron Budget

approx $10^{11}$ for .1 secs.

5. Experimental Plan

5.1 Run sequence plan

One run day

5.2 Shot sequence plan

We would expect approximately 5-10 shots will be needed to set up reliable conditions, probably using a combination of A and B-port Hor gas feeds. Depending on how well the A-port feed works, we will probably shift over to it entirely as the run progresses. The remainder of the run would be used to make adjustments to the modulated gas valve on A-port Hor. We would start with 3–5 large pulses during the shot, after 100 mS or so. The large pulses may be able to push us above the density limit. We would then reduce the modulation level until we were perturbing the plasma parameters at only a few percent level.
6. Anticipated Results

A zeroth order outcome will be a determination of how much gas we need to approach some fraction of the source from the inner wall. We will also learn to run the machine on the A-port valve. Whether or not we actually make a good measurement of the transport coefficient is difficult to say at this point.

7. References