1. Purpose of Experiments

The purpose of this experiment is to see whether the plasma wall separation influences the outside midplane neutral pressure and corresponding SOL profiles.

2. Background

Recent experimental results on C-Mod indicate that the midplane pressure is insensitive to gas escaping from the divertor. What then determines the midplane pressure? Our current thinking is that midplane neutrals are determined by main chamber recycling, independent of the divertor. If this is the case, then the plasma-wall separation might influence it. This experiment will test whether this is true.

3. Approach

Will vary the right gap from 0 cm (or close to 0 cm) to 6 cm. (Although right gap scans have been done before, nothing of this magnitude has been done.) We will use only Ohmic discharges (given the problems RF would have coping with a changing right gap).

We will do shot to shot comparisons, with gap fixed during the shot to ensure neutrals throughout the machine have come into equilibrium. Neutral gauges will be monitored along with SOL profiles of plasma conditions.

4. Resources
4.1 Machine and Plasma Parameters

Give values or range for:

**Toroidal Field**: 5.3 T

**Plasma Current**: 0.8 MA

**Working gas species**: \( D_2 \)

**Density**: Target density range, \( n_l04 = 1.0 \)

**Equilibrium configuration** (if possible, refer to database equilibria): SNL

**Pulse length, typical current & density waveforms, etc.** Refer to database or sketch desired waveforms: Long current flat-tops, until 1.4 s.

4.2 Auxiliary Systems

**RF Power, pulse length, phasing**: No

**Pellet Injection (species)**: No

**Impurity blow-off injection**: No

**Special gas puffing**: None.

**Other**: 

4.3 Diagnostics

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

Edge profiles from, ECE, Kaiser (helium beam), FSP, ASP, Edge Thomson, reflectometer, X-ray arrays, bolometers, Z meter array, tangential interferometer.

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.

This experiment requires roughly half a run day.

We would use 4 rights gaps, 0 cm, 2 cm, 4 cm, 6 cm. The left gap would be fixed at 2 cm. These would be maintained constant through the discharge. The corresponding elongations would range from approximately from 1.55 to 1.80, while maintaining a constant plasma height (somewhat smaller than normally used). The constant height would ensure than the conductance for gas from the inside limiter and secondary separatrix interaction around the periphery to the outside is maintained fixed.
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.

Target density, \( nl04 = 1.0 \). Two discharges per gap value is needed to establish a target plasma for the FSP and ASP.

(1) 2 discharges, right gap = 2 cm.

(2) 2 discharges, right gap = 4 cm.

(3) 2 discharges, right gap = 6 cm.

(4) 2 discharges, right gap = 0 cm.

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.

We may expect some influence of the right gap on the outside midplane pressure. Regardless of the outcome, the measurements with the SOL probes and helium beam should shed light on the results and tell us something about plasma transport far from the separatrix.

7. References

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