1. Purpose of Experiments

The purpose of this experiment is to reproduce the off-axis ITB studies from 2001 described in MP269, MP289a, and MP291a with the expanded diagnostic set which is now available. The goal is to obtain detailed density profiles from visible bremsstrahlung and Thomson scattering, detailed temperature measurements from Thomson scattering, ECE, HIREX, and CX (if available) diagnostics, and improved plasma rotation data for input into TRANSP and GS2 or other gyrokinetic codes. This proposal calls for obtaining EDA H-mode plasmas at a series of magnetic fields, suitable for obtaining both high and low field ITBs.

2. Background

We have observed internal transport barrier formation with both low and high field side ICRF with 70 and 80 Mhz rf injection. However, much of the data obtained to date lacks good profile data that would enable detailed transport and stability simulations. Revisiting these earlier runs (1010727, 1010730, 1010801) with expanded profile diagnostics would greatly enhance our understanding of the nature and physics of these ITBs.

3. Approach

Begin by setting up a good off axis double barrier ITB plasma, such as 1001220016 (4.5 T, 80 Mhz), taking particular care that all of the relevant diagnostics are collecting good data. Vary the field from shot to shot to move the resonance near the ITB location until the ITB disappears, then repeat on the high field side.
4. Resources

4.1 Machine and Plasma Parameters
Give values or range for:

**Toroidal Field:** As in shot 1001220016, 4.5 T, scan down to 4.2 T up to 5 T as needed, then repeat at higher field around 6 T

**Plasma Current:** 0.8 MA

**Working gas species:** D, H minority

**Density:** target for obtaining EDA H-mode: 6e19 on nl04.

**Equilibrium configuration** (if possible, refer to database equilibria): Shot 1001220016

**Pulse length, typical current & density waveforms, etc.** Refer to database or sketch desired waveforms:
Setup as shot 1000915009 Note: In the 9/15/00 run various exotic gases were being used for plume studies. These will not be necessary.

4.2 Auxiliary Systems

**RF Power, pulse length, phasing:** 80 Mhz, 70 Mhz, \( \approx 2\)MW as available, heating phasing.

**Pellet Injection (species):** none

**Impurity blow-off injection:** none

**Special gas puffing:** none

**Other:**

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

Note: the success of this run is critically dependent on availability of good profile data!

Hirex for Ti profiles and rotation
Thomson Scattering
Visible Bremmstrahlung array
GPC 1 and 2, FRC-ECE
Neutron diagnostics
Beam diagnostics (CHERS, MSE, BES) desirable
All standard core diagnostics

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.)

less than \( 5 \times 10^{15} \)
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 experiments should take only one run.

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 contin-
gency plans, if appropriate.

Part 1. (1-4 shots) Reproduce 1001220016 Set up good off axis ICRF ITB and verify
the diagnostics

Take shots at 4.3, 4.6, 4.8, 5. T with 80 Mhz, add 70 Mhz late in shot (8-10 shots as
needed)

Part 2. (8-10 shots) Scan field with rf on the high field side, 5.7-6.3 T

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 expect to gain profile information in support of further computer analysis and
simulation work. This will improve our knowledge of how to control the formation and
lifetime of internal transport barriers.

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

Wukitch, et al., PoP 9 2049 (2002); Fiore, et al., Pop 8 2023 (2001); Rice et
al., NF 42 510.