

Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Sustained High Beta Operation With Internal Transport Barriers on DIII-D¹ E.J. DOYLE, UCLA, DIII-D ADVANCED SCENARIO THRUST TEAM — Sustained high beta, high confinement operation with $\beta_N \sim 4$, $\beta_T \sim 3\text{-}8\%$ and $H_{89} \sim 2.5$ for ~ 2 s has been achieved in discharges with internal transport barriers (ITBs) and negative central magnetic shear (NCS) on DIII-D. The minimum safety factor was maintained at ~ 2 , transiently leading to high bootstrap current fraction operation, $f_{BS} \sim 60\%$. This combination of high beta and high confinement operation with moderate safety factor, $q_{95} \sim 5.5\text{-}3.5$, also leads to high normalized fusion performance, with fusion gain factor spanning the anticipated ITER performance range. Transport barriers are observed in the ion temperature and rotation profiles, but not in the electron temperature profile, which is broad. These results address a critical issue for ITB operation in AT plasmas, obtaining sustained ITB profiles compatible with high beta limits. Previously, typical ITB operation has been limited to $\beta_N < 3$ by pressure peaking. Pressure peaking in these discharges remains low due to a broad electron temperature profile.

¹Work supported by US DOE under DE-FG03-01ER54615 and DE-FC02-04ER54698.

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Date submitted: 21 Jul 2005

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