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Dependence of Bootstrap Current, Stability, and Transport on the Safety Factor Profile in DIII-D Steady-state Scenario Discharges,* C.T. Holcomb, *LLNL,* J.R. Ferron, T.C. Luce, P.A. Politzer, J.C. DeBoo, T.W. Petrie, C.C. Petty, R.J. La Haye, *GA,* A.E. White, F. Turco, *ORISE,* E.J. Doyle, T.L. Rhodes, L. Zeng, *UCLA* – A high beta, high gain steady state tokamak scenario with large bootstrap current fraction will have strong coupling between the current density and the pressure gradient through turbulent transport and the bootstrap current. To address this coupling experimentally, a scan of the safety factor minimum (q_{min}, from 1.1 to over 2) and edge value (q_{95}, from 4.5 to 6.5) was performed. The bootstrap current fraction increases with q_{min} and q_{95} by virtue of increasing density gradients. Compared to lower q_{min}, q_{min}>2 has lower n=1 stability limits, enhanced drift wave growth rates, higher low-k density fluctuations, and lower confinement. At q_{min}>2 and q_{95}=4.5 the unsustainable condition $J_{BS} > J_{Total}$ occurs near the axis. These considerations suggest intermediate q is the optimal operating point.

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