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High Internal Inductance as a Steady-State Scenario[1] J.R. FERRON, T.C. LUCE, General Atomics, C.T. HOLCOMB, LLNL, J.M. PARK, ORNL — An optimized high ℓ_i discharge is being investigated as a candidate steady-state operating scenario. Increased plasma internal inductance, ℓ_i, is motivated by better confinement and higher ideal-stability-limited normalized beta (β_N). Stable operation at high β_N, even with relatively low H-mode pedestal pressure, could be possible with sufficient confinement and without a requirement for a conducting wall or $n \geq 1$ feedback coils. Increased β_N, and thus bootstrap current fraction (f_{BS}), results in lower ℓ_i, so an optimized steady-state scenario is expected to have moderate $\beta_N \approx 4$, $f_{BS} \approx 0.5$ and $\ell_i \approx 1$. The externally-driven current is required near the axis where it can be produced efficiently. In experiments, non-stationary discharges with parameters exceeding these values ($f_B \approx 0.8$, $\beta_N > 4$ but below the calculated no-wall ideal stability limit) have been produced. Noninductive overdrive of the plasma current was verified through freezing of the ohmic coil current. Based on these discharges, an ideal MHD stable, stationary solution for DIII-D has been modeled using FASTRAN and TGLF.

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