Stationary Discharges in the DIII-D Tokamak\textsuperscript{1} T.C. LUCE, J.R. FERRON, A.W. HYATT, P.A. POLITZER, J.T. SCOVILLE, A.G. KELLMAN, R.J. LA HAYE, General Atomics, M.R. WADE, M. MURAKAMI, ORNL, C.J. LASNIER, LLNL, J.G. WATKINS, SNL — Discharges with stationary pressure and current profiles and the wall particle source in equilibrium have been demonstrated on the DIII-D tokamak. The pressure profile is constant for $>30\, \tau_E$ and the current profile for $\sim2$ relaxation times. The particle inventory is maintained by gas puffing, neutral beam fueling, and pumping with no net particle exchange with the wall. These discharges have $q_{95} > 4$. In order to maintain the fusion gain at levels comparable with conventional ELMing H-mode scenarios at $q_{95} \sim 3$, enhanced in $\beta$ and $\tau_E$ are needed. The achieved values of $\beta_N H_{89} = 7$ for 6 s and $\beta_N H_{89} = 8.5$ for $\sim 4\tau_E$ indicate such enhancements are available. The key to the high performance appears to be reaching significant $\beta$ values before $q_{\text{min}}$ reaches 1. In this case, the current profile is stationary with $q_{\text{min}} > 1$ with a small 3/2 tearing mode. After stationary current profiles are found, $\beta$ has been raised to the no-wall $n = 1$ limit without exciting further tearing modes. Comparison to scenarios in future tokamaks will be presented.

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