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Achieving Steady-State Conditions in the High-Beta Hybrid Scenarios in DIII-D,[*] C.C. Petty, T.C. Luce, J.R. Ferron, A.M. Garofalo, A.W. Hyatt, G.L. Jackson, *GA*; F. Turco, *Columbia U.*; C.T. Holcomb, *LLNL*; E.J. Doyle, *UCLA*: The natural attributes of the hybrid scenario, especially the anomalously broad current profile, with $q_{min} \gtrsim 1$, allows steady-state conditions with zero surface loop voltage to be achieved at 1 MA plasma current in DIII-D. Using efficient central current drive, the surface loop voltage is driven down to zero for >1 τ_R, with ≈ 50% bootstrap current fraction when β_P is increased above 1.9. Interestingly, good alignment between the current drive and plasma current profiles is not necessary as the hybrid regime self-organizes the current density profile. Steady-state hybrid plasmas can achieve β_N=3.6 for the full duration of the NB pulse (>1 τ_R) without exciting the *m*/*n*=2/1 tearing mode, corresponding to β_T up to 3.4%. The thermal energy confinement time is excellent, with confinement factors up to H_{98y2}=1.6 even during strong EC heating. A 0-D physics model demonstrates that attractive scenarios with Q_{fus}=3.5–3.8 exist for steady-state operation in ITER and FNSF.

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