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Optimization of the Internal Magnetic Configuration for High Bootstrap Current Fraction and High Beta for Steady-state,* J.R. Ferron, T.C. Luce, P.A. Politzer, J.C. DeBoo, T.W. Petrie, C.C. Petty, R.J. La Haye, *GA;* C.T. Holcomb, *LLNL;* A.E. White, F. Turco, *ORISE;* E.J. Doyle, T.L. Rhodes, L. Zeng, *UCLA* – A systematic scan of the safety factor (q) profile has been used to study the optimum for steady-state operation, which requires the maximum possible beta and bootstrap current fraction (f_{BS}) and good alignment between the total current density and the bootstrap current density (J_{BS}). The n_e, T_e, and T_i profiles at constant $\beta_N = 2.7$ were measured in a scan of the minimum q ($1.1<q_{min}<2$) and q at the edge ($4.5<q_{95}<6.5$). ∇n_e is largest at the highest q_{min} and the pedestal n and T are highest at $q_{95}=4.5$. Thus, with the q scaling of J_{BS}, the calculated f_{BS} is maximum at $q_{min}=2$, but with J_{BS} that locally exceeds the total current density. The maximum achieved β_N was 3.1 at $q_{min} >2$, and 3.8 at $q_{min} = 1.1$. These opposite trends in β_N and f_{BS}, and the improved current profile alignment for $q_{min}<2$, point to intermediate q_{min} and q_{95} as optimal for steady-state operation.

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