Abstract Submitted
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Optimization of the Internal Magnetic Configuration for High Bootstrap Current Fraction and High Beta for Steady-state[1] J.E. 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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