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Development of Hybrid Scenario on DIII-D for Burning Plasma Devices[1] C.C. PETTY, J.C. DEBOO, T.E. EVANS, J.R. FERRON, J.E. KINSEY, R.J. LA HAYE, T.C. LUCE, T.H. OSBORNE, P.A. POLITZER, GA, H. REIMERDES, Columbia U., S.L. ALLEN, M.E. FENSTERMACHER, C.T. HOLCOMB, LLNL, M. MURAKAMI, ORNL, E.J. DOYLE, UCLA, R.A. MOYER, UCSD — Experiments on DIII-D have extended the hybrid scenario towards the burning plasma regime by increasing the noninductive current fraction to nearly 100%, and in separate experiments by incorporating edge localized mode (ELM) suppression. Strong core current drive by neutral beam injection and electron cyclotron heating reduced the loop voltage to 0.01 V in hybrids with normalized beta up to 3.5 and an H_{98} factor of 1.4. This demonstrates the potential for hybrids as a high-beta, steady-state scenario that is not sensitive to alignment of the noninductive current profiles. For the first time, large type-I ELMs have been completely suppressed in hybrids at $q_{95} = 3.6$ by applying edge resonant magnetic perturbations using $n = 3$ internal coils. The ELM suppression lasted for 0.5-1.0 times the current redistribution time for normalized beta up to 2.5 and a fusion performance factor equivalent to $Q = 10$ operation in ITER.

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Craig Petty
General Atomics

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