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Improved Confinement in Highly Powered Advanced Tokamak Scenarios on DIII-D[1] T.W. PETRIE, A. LEONARD, T. LUCE, T. OSBORNE, W. SOLOMON, General Atomics, F. TURCO, Columbia University, M.E. FENSTERMACHER, C. HOLCOMB, C. LASNIER, M. MAKOWSKI, LLNL — DIII-D has recently demonstrated improved energy confinement by injecting neutral gas into high performance Advanced Tokamak (AT) plasmas during high power operation. Representative parameters are: $q_{95} = 6$, P_{IN} up to 15 MW, $H_{98} = 1.41.8$, and $\beta_N = 2.84.2$. Unlike in lower and moderate powered AT plasmas, τ_E and β_N increased (and ν_{ELM} decreased) as density was increased by deuterium gas puffing. We discuss how the interplay between pedestal density and temperature with fueling can lead to higher ballooning stability and a peeling/kink current limit that increasers as the pressure gradient increases. Comparison of neon, nitrogen, and argon as seed impurities in high P_{IN} ATs in terms of their effects on core dilution, τ_E, and heat flux ($q_\perp$) reduction favors argon. In general, the puff-and-pump radiating divertor was not as effective in reducing $q_\perp$ while maintaining density control at highest P_{IN} than it was at lower P_{IN}.

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