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Developments in plasma shaping experiments on NSTX[1] D.A. GATES, J.E. MENARD, D. MUELLER, T. STEVENSON, Princeton Plasma Phyics Laboratory — The spherical torus concept relies heavily on the bootstrap current in order to maintain plasma current in the absence of a large transformer. In addition, the cost of fusion power is strongly affected by the recirculating power fraction due to the normally conducting toroidal field coil. This additional constraint necessitates operating with high plasma toroidal β_t, where $\beta_t = 2\mu_0 < p > /B_t^2$ with $< p >$ the volume averaged plasma pressure, and B_t the toroidal field at the plasma geometric center. A useful figure of merit that combines these 2 parameters is $f_{bs}\beta_t$ where $f_{bs} = I_{bs}/I_p$ is the bootstrap current fraction. $f_{bs}\beta_t$ has been referred to as the sustained β. Progress in this parameter requires either improved plasma shaping or increases in C_T, the Troyon coefficient ($C_T = \beta_{max} \mathrm{aB_t/I_p}$). To this end, NSTX is investigating pathways to stronger plasma shaping. Progress to date is reported, including achievement of world record sustained plasma shape factor and world record controlled plasma elongation of ∼3.1. An interesting result of this campaign was the achievement of extremely low sustained normalized internal inductance $l_i \sim 0.3$. The effect of improved plasma shaping on plasma performance as determined by the sustained β will also be presented.

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