

**The maintenance of good wall conditions and high performance operation on DIII-D over extended periods without boronization**

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**Abstract.** High performance plasmas and daily reference shots with both L-mode and H-mode phases were used to demonstrate the maintenance of good wall conditions over ~7000 seconds of plasma operation in DIII-D with no intervening boronizations or high temperature bakes during each of the 2006 and 2007 campaigns. High performance discharges with high normalized beta and confinement factor and good density control over the duration of the high-power beam injection period were very repeatable over the course of these campaigns. High performance operation was also demonstrated after a six week entry vent followed by the standard high temperature bake at 350°C and plasma conditioning, but prior to a boronization. Over the 2006 and 2007 campaigns, the daily reference shot database indicated little to no secular increase in impurity content. Oxygen content and nickel line emission were higher after the entry vent, but were still minor contributors to plasma contamination compared to carbon. Because DIII-D has a plasma facing surface that is >95% graphite, we take this as a demonstration that erosion of

boronization films used for wall conditioning will not be a limitation to establishing long-pulse high-performance discharges in the new generation of superconducting tokamaks if graphite is used as the primary plasma facing material. In contrast, recent work in devices using high-Z metal plasma facing materials has indicated that there are some limitations on the parameter space over which high performance can be obtained without frequent boronization. [B. Lipschultz, *et al.*, *Phys. Plasmas* **13**, 056117 (2006), and A.C.C Sips and O. Gruber, *Plasma Phys. Control. Fusion* **50**, 124028 (2008)].

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