Operation of DIII-D and Monitoring of Wall Conditions Over Extended Periods Between Boronizations*

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During the 2006 and early 2007 DIII-D campaigns the rate of boronization (BZN) events was reduced significantly from past campaigns with no apparent effects on operation, including high performance hybrid and advanced tokamak (AT) discharges. The 2006 campaign was initiated with the usual wall conditioning including a boronization. Subsequently, a daily reference discharge was used to monitor long-term changes in impurity and particle sources on DIII-D. Over a three-month period (~6000 plasma-seconds), no secular trends were observed in impurity line emission during the H-mode phase of the reference discharges. A small secular increase in intrinsic impurities during an L-mode phase was observed in the early part of the campaign, but these appeared to saturate after a month of operation. After 3 months, a second BZN was performed as a check on any improvements to operations.Following this BZN, decreases were observed in most of the impurity line emissions, but these increased to near their pre-BZN levels after only 3 weeks of plasma operation. After an entry vent of 6 weeks, reference shots taken during the cleanup period for the 2007 campaign indicated impurity line emission had returned quickly to levels near the long-term averages. Only oxygen remained elevated, however it was still low in an absolute sense, and the 2007 campaign was initiated without a BZN.

At several times throughout the 2006 through early 2007 campaigns, high performance hybrid and AT discharges were carried out using very similar operational parameters. Hybrids, operating in a stationary state with a normalized beta of 2.7 and an ITER89P H-factor of 2.4 were very repeatable. AT discharges, with a peak normalized β_N of 3.8 and an H-factor of 3.0 were also very repeatable. Line emission from C, O, and Ni were also reasonably repeatable. Details of these observations, along with the implications for the robustness of high performance operation in an all carbon wall device will be discussed.

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