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EX/P3-02: Measurements of Core Lithium Concentration in Diverted H-Mode Plasmas of NSTX

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The National Spherical Torus Experiment (NSTX) is investigating the use of lithium as a candidate plasma-facing material to handle the large power flux to the wall of fusion devices. To investigate the possible contamination of the core plasma caused by lithium influx from the plasma boundary, measurements of core lithium concentration, $n_{\text{Li}}(R)$, have been performed in diverted H-mode plasmas of NSTX. Various experimental scenarios, representative of the NSTX operating space, are explored from the 2010 NSTX experimental campaign, during which a total of ~1.3 kg of lithium was evaporated into the vessel. It is found that, in spite of the large amount of lithium (hundreds of milligrams) introduced in the vessel either before or during a discharge, n_{Li} remains insignificant, typically $\ll 0.1\%$ of the electron density. The measured n_{Li} is rather insensitive to variations of plasma current, toroidal field, divertor conditions and of the specific technique utilized for lithium conditioning of the vessel wall. These results enable projections to the higher field and current and longer pulse length of the NSTX Upgrade (NSTX-U), suggesting that lithium contamination will remain negligible compared to other impurities such as carbon.

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