Evolution of the pedestal structure in ELMy H-mode in NSTX

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The pedestal structure has been shown to have a strong influence in the overall performance of tokamaks. Characterizations of the pedestal structure evolution throughout the Edge Localized Mode (ELM) cycles are performed on NSTX. More specifically, we report analysis of the pedestal height, width, and maximum pressure gradient during the ELM cycle and compare their scaling with I_p and B_t with other tokamaks. A clear buildup of the pedestal height is observed for three different plasma currents, which tends to saturate prior to the onset of ELM at low and medium plasma current. Similarly, the pedestal width increases with no clear evidence of saturation during an ELM cycle. The maximum pedestal gradient increases as a function of plasma current, reaches a nominal value after the ELM crash, and remains constant until the end of the ELM cycle. The pedestal height during the last part of the ELM cycle is shown to increase quadratically with plasma current, but is found to be independent of toroidal magnetic field. The pedestal width Δ scales as $\Delta = 0.6\ (\beta_{\theta}^{ped})^{1/2}$ with the poloidal β at the top of the pedestal. Finally, investigations of correlations between edge fluctuations and the pedestal structure during an ELM cycle are performed. A coherent density fluctuation at the top of the pedestal is observed to peak prior to the onset of ELM and to decay during the rest of the ELM cycle. Implications of the pedestal structure scaling with engineering parameters for NSTX U will be discussed.

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