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EX/P4-04: The Evolution of the Edge Pedestal Structure and Turbulence Spatial Scale during the ELM Cycle on NSTX

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Characterizations of the pedestal parameter dynamics and microturbulence in the pedestal region throughout the edge localized modes (ELM) cycles are performed on the National Spherical Torus Experiment (NSTX). First, a clear buildup of the pedestal height is observed between ELMs for three different plasma currents, and this buildup tends to saturate prior to the onset of ELM at low and medium plasma current. The pedestal parameter evolutions during the ELM cycle are found to be qualitatively consistent with the peeling ballooning description of the ELM cycle. Second, using the beam emission spectroscopy systems probing the pedestal top, we report first measurements of the spatial structure of turbulence fluctuations during an ELM cycle in the pedestal region. Measurements show spatial structure kθρiped ranging from 0.1 to 0.2 propagating in the ion diamagnetic drift direction. These propagating spatial scales are found to have a large poloidal extent (˜ 18ρiped) and are consistent with ion-scale microturbulence of the type ion temperature gradient (ITG), ITG-trapped electron mode, and/or kinetic ballooning modes (KBM). Preliminary simulations during the last part of the ELM cycle, using XGC1 code in a fully nonlinear regime, show poloidal correlation around 9ρiped smaller than experimental observations. Characterization of the microturbulence in the pedestal region represents a first step in unraveling the role of microturbulence in limiting the pedestal gradient, which is critical for ITER and next-step devices.

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