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EX/P7-18: Parametric Dependencies of Low-k Turbulence in NSTX H-mode Pedestals

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Validating predictive models of pedestal turbulence is critical for ITER and next-step devices. Here, we characterize the poloidal correlation length and decorrelation time of low-k pedestal turbulence in NSTX ELM-free, MHD-quiescent H-mode plasmas, plus we identify parametric dependencies that influence pedestal turbulence quantities. Poloidal correlation lengths in the pedestal are typically 10–20 cm and about 10 rho_i. The parametric dependence with toroidal flow shear is consistent with enhanced confinement at higher flow shear, and parametric dependencies with density gradient and electron temperature inverse scale length are consistent with low-k drift-wave turbulence. Also, parametric dependencies with collisionality provide insight into turbulence mediation by zonal flows. The measurements and analysis presented here broadly characterize pedestal turbulence in high-performance spherical torus plasmas and establish validation benchmarks for pedestal and edge simulations in the challenging spherical torus parameter regime.

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