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Wavenumber-resolved turbulence investigations using Doppler reflectometry in the ASDEX Upgrade tokamak and comparison to numerical simulations TIM HAPPEL, ALEJANDRO BANÓN NAVARRO, GARRARD CONWAY, CLEMENTE ANGIONI, TOBIAS GÖRLER, FRANK JENKO, FRANCOIS RYTER, ULRICH STROTH, Max-Planck-Institut fuer Plasmaphysik, Euratom Association, 85748 Garching, Germany, THE ASDEX UPGRADE TEAM
— Turbulence is known to cause substantial particle and heat losses from magnetically confined fusion plasmas. Different types of turbulence can (co-) exist, for example ion-temperature-gradient and trapped electron mode turbulence at large to intermediate scales along with electron-temperature-gradient turbulence at small scales. For the identification of the prevailing type of turbulence and its dependence on plasma parameters, scale-resolved measurements and comparison to numerical simulations are necessary. To this end, a newly installed optimized Doppler reflectometer is used to investigate core turbulence properties in the ASDEX Upgrade tokamak. In particular, the perpendicular electron density turbulence structure scale is scanned between $k_\perp = 5 - 25$ cm^{-1}, yielding radially resolved turbulence amplitude measurements. Dedicated discharges have been performed in which electron heat flux and temperature gradients have been varied to excite different types of turbulence. Related numerical modeling is performed by means of linear and nonlinear gyrokinetic GENE simulations. Beyond the primary goal of turbulence type identification, comparisons of fluctuation amplitudes and spectral indices for the different physical scenarios are presented.

Tim Happel
Max-Planck-Institut fuer Plasmaphysik,
Euratom Association, 85748 Garching, Germany

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