Burning Plasma Projections Using Drift Wave Transport Models and Scalings for the H–mode Pedestal

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Abstract. The GLF23 [1] and Multi-Mode (MM95) [2] transport models are used along with a model for the H–mode pedestal to predict the fusion performance for the ITER, FIRE, and IGNITOR tokamak designs. The drift-wave predictive transport models reproduce the core profiles in a wide variety of tokamak discharges, yet they differ significantly in their response to temperature gradient (stiffness). Recent gyro-kinetic simulations of ITG/TEM [3] and ETG modes [4] motivate the renormalization of the GLF23 model. The normalizing coefficients for the ITG/TEM modes are reduced by a factor of 3.7 while the ETG mode coefficient is increased by a factor of 4.8 in comparison with the original model. A pedestal temperature model is developed for type I ELMy H–mode plasmas based on ballooning mode stability and a theory-motivated scaling for the pedestal width. In this pedestal model, the pedestal density is proportional to the line-averaged density and the pedestal temperature is inversely related to the pedestal density.