Session:

Validation of the new (APS15) TGLF saturation model with L-mode electron stiffness experiments on DIII-D*

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In the DIII-D tokamak [1], we have performed experiments to probe the stiffness of the electron temperature gradient scale length as a function of electron energy flux. [2–5] One of the primary goals of those experiments was to compare the experimental fluxes [5,6] to the TGLF turbulent transport model. [7] While the equations for linear growth rates that TGLF solves are well-defined, the combination of growth rates across wavenumber space into a quasilinear flux is determined by providing a saturation model, which tries to obtain fluxes from the growth rate spectra similar to fluxes predicted by nonlinear GYRO [8] simulations. Being motivated to better match the GYRO predicted fluxes for upshifted critical gradients and multiscale (both ITG and ETG scale) coupling [9], there was a new saturation model formulated for TGLF. [10] In this paper, we will compare the TGLF predicted fluxes from the original saturation model and the new model to the experimental energy, particle, and momentum fluxes for the electron stiffness experiments. The experimental fluxes are calculated by the ONETWO transport code [11,12], which coordinates the calculation of the sources of particles, momentum, and energy in the DIII-D tokamak. The introduction of the calculation of the various sources in the code has accumulated over time, and the code has evolved over time. In this paper, the equations that ONETWO solves will also be reviewed. A definitive reconciliation of off-diagonal sources (e.g., particle sources leading to momentum sources) will be given. The appropriate forms of diffusivity given multiple ion species will be calculated. The ion particle sources, which are explicit in ONETWO, will be reconciled with the electron particle sources and quasineutrality.

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*Work supported in part by the US Department of Energy under DE-FC02-04ER54698[1].

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