ABSTRACT

Our understanding of the physics of internal transport barriers (ITBs) is being furthered by analysis and comparisons of experimental data from many different tokamaks worldwide. An international database consisting of scalar and 2-D profile data for ITB plasmas is being developed to determine the requirements for the formation and sustainment of ITBs and to perform tests of theory-based transport models in an effort to improve the predictive capability of the models. Analysis using the database indicates that: (a) the power required to form ITBs decreases with increased negative magnetic shear of the target plasma, and: (b) the E×B flow shear rate is close to the linear growth rate of the ITG modes at the time of barrier formation when compared for several fusion devices. Tests of several transport models (JETTO, Weiland model) using the 2-D profile data indicate that there is only limited agreement between the model predictions and the experimental results for the range of plasma conditions examined for the different devices (DIII–D, JET, JT-60U). Gyrokinetic stability analysis (using the GKS code) of the ITB discharges from these devices indicates that the ITG/TEM growth rates decrease with increased negative magnetic shear and that the E×B shear rate is comparable to the linear growth rates at the location of the ITB.