Density Threshold for Edge Poloidal Flow Generation*

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A numerical transport model is used to examine a density threshold for the onset of an edge poloidal velocity shear layer in toroidal devices. This work is inspired by recent experimental results from the TJ-II stellarator which indicate a critical density threshold for the development of an edge poloidal velocity shear layer [1]. Edge shear-flow layers are commonly observed in toroidal confinement devices, even in L-mode discharges. The numerical transport model has been used to examine internal transport barriers and front propagation of internal transport barriers [2]. The transport model couples together density, ion temperature, electron temperature, poloidal flow, toroidal flow, radial electric field, and a fluctuation envelope equation which includes a shear-suppression factor. In this work, we present results from a series of cases using parameters that are typical of TJ-II discharges. We also present results for a ramp up of the density with a focus on the impact of the ramp on the generation of edge poloidal velocity.

[1] C. Hidalgo, M. A. Pedrosa, L. Garcia, and A. Ware, "Direct experimental evidence of coupling between sheared flows development and increasing in level of turbulence in the TJ-II stellarator", submitted to Phys. Rev. Letters.
[2] D. E. Newman, B. A. Carreras, D. Lopez-Bruna, P. H. Diamond, and V. B. Lebedev, Phys. Plasmas **5**, 938 (1998).