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Barrier Formation in Mixed Electron and Ion Channel Systems

K.K. D'BOYZ, D.E. NEWMAN, Univ. of Alaska Fairbanks, B.A. CARRERAS, Fusion Energy Division, ORNL, P.W. TERRY, Univ. Of Wisconsin - Madison — Simple dynamical models have captured much of the dynamics of the ion transport barriers found in a number of magnetically confined plasma experiments [1]. However, the mixed dynamics of ion and electron channel transport still has many open questions. It has been found that occasionally an electron channel barrier will form with a standard (“ion channel”) barrier, while at other times the electron channel barrier does not form even when a strong “ion channel” barrier forms. By adding to the simple barrier model an evolution equation for electron fluctuations we can investigate the interaction between the formation of the standard ion channel barrier and the somewhat less common electron channel barrier. Barrier formation in the electron channel is found to be even more sensitive to the alignment of the various gradients making up the sheared radial electric field than the ion barrier is. Electron channel heat transport is found to significantly increase after the formation of the ion channel barrier but before the electron channel barrier is formed. This increased transport is important in the barrier evolution and therefore the profile evolutions in the system. Various configurations will be explored and the implications for self heated plasmas explored.

[1] D. E. Newman, B. A. Carreras, D. Lopez-Bruna, P. H. Diamond, and V. B. Lebedev, Phys. Plasmas, 5 (4) 938-952 (1998)

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