Comparison of upstream T_e profiles with divertor heat flux and its implications on parallel and perpendicular transport in the SOL of DIII-D H-mode plasmas*

M.A. Makowski[1], C.J. Lasnier[1], A.W. Leonard[2], J.A. Boedo[3], J.G. Watkins[4], and D.N. Hill[1]

[1]*Lawrence Livermore National Laboratory, Livermore, California 94550, USA.*
[2]*General Atomics, P.O. Box 85608, San Diego, CA 92186-5608, USA.*
[3]*University of California-San Diego, La Jolla, California 92093, USA.*
[4]*Sandia National Laboratories, Albuquerque, New Mexico, USA*

A series of experiments designed to characterize the relation between the upstream and midplane measurements of T_e with the downstream divertor heat flux has been carried out in H-mode plasmas on DIII-D and the UEDGE code has been used to model a number of the discharges. We have found several trends in the heat flux data, such as a decrease in the heat flux width with increasing plasma current. We have also found that the divertor heat flux width is not well correlated with the upstream Thomson temperature profiles. This is in disagreement with simple two-point models that predict $\lambda_{Te} = (7/2)\lambda_q$. The disagreement is not unreasonable as radiation and divertor recycling are not taken into account in the two-point models.

The perpendicular transport coefficient in the scrape-off layer (SOL) can be varied in the UEDGE code and is used to match the various experimentally measured profiles. We seek to determine if corresponding trends in the divertor heat flux and upstream profiles can be reproduced and what this implies about the perpendicular transport.

Upstream T_e profiles are measured with Thomson scattering and mid-plane profiles with a reciprocating probe. Divertor temperature profiles are measured with a fast framing (multi-kHz) IRTV camera and the heat flux profiles are inferred from the THEODORE code. All the profiles are projected to the midplane for comparison. Effects of edge localized modes (ELMs) are eliminated by selecting only profile data that falls between ELMs.

*Work supported by the US Department of Energy under DE-AC52-07NA27344, DE-FC02-04ER54698, DE-FG02-07ER54917, and DE-AC04-94AL85000.