DPP07-2007-001371

Abstract for an Invited Paper
for the DPP07 Meeting of
the American Physical Society

Progress in ITER-relevant exhaust physics at JET[1]

RICHARD PITTS, Centre de Recherches en Physique des Plasmas, EPFL, Association Euratom-Confédération Suisse, 1015 Lausanne, Switzerland

Plasma boundary research during the 2006-2007 campaigns at JET has made advances in several ITER-relevant exhaust physics issues. On the critical question of fuel retention, dedicated gas balance experiments provide unequivocal evidence for long term retention of 10-20% in both L-mode and ELMing H-mode, in fair agreement with that obtained from campaign averaged post-mortem analysis. In-situ quartz microbalance (QMB) techniques coupled with visible spectroscopy and modelling show that long range migration of carbon to remote areas and is a major contributor to this retention. The QMB data also register an ELM induced erosion rate increasing exponentially with ELM energy. Large Type I ELMs (up to $\sim$1MJ), comparable to the smallest expected in ITER, provoke divertor and X-point radiation in the range 50-100% of the ELM energy with an in-out asymmetry favouring the inner divertor. This is consistent with the observed trend for the ELM to deposit more energy on the inboard target for normal field direction and the presence of redeposited layers, which have lower threshold for ablation under high power fluxes. The magnitude and time variation of these power fluxes can be reproduced quantitatively by new PIC simulations of kinetic transport parallel to the field in the SOL. The spatial patterns and magnitudes of energy deposition during ELMs have been measured for the first time on JET main chamber wall surfaces using IR thermography, confirming the presence of field aligned filaments carrying a small fraction of the ELM energy. Meanwhile, the small, convective ELMs previously found in JET at ITER relevant pedestal collisionalities, have been recovered in the new MarkIIHD divertor configuration and a clear threshold in q_{95} identified for their occurrence.

[1]This work was funded in part by the Swiss National Science Foundation.