Particle sources and SOL dynamics in JET strike point sweeping experiments

A. Salmi[1], Tala[1], A. Järvinen[2], D. Dunai[3], R. Gomes[4], P. Lomas[5], L. Meneses[4,6], S. Mordijck[7], V. Naulin[8], J. Juul Rasmussen[8], M. Romanelli[4], A.C.C. Sips[9,10], and JET contributors*

Eurofusion Consortium JET, Culham Science Centre, Abingdon, OX14 3DB, UK
[1]VTT, Espoo, Finland; [2]LLNL, Livermore, USA; [3]Wigner Research Centre for Physics, Budapest, Hungary; [4]IPFN, IST, Universidade de Lisboa, Portugal; [5]CCFE, Abingdon, UK; [6]ITER Organization, France; [7]College of William & Mary, Virginia, USA; [8]DTU Physics, Lyngby, Denmark; [9]JET Exploitation Unit, Culham, UK; [11]European Commission, Brussels, Belgium;

JET experiments to study plasma fuelling, edge transport and scrape-off-layer (SOL) behaviour have been performed for the first time using a technique based on strike point sweeping. Sweeping itself is routinely used in JET high power discharges to, e.g., spread the heat flux or to measure high radial resolution SOL profiles with Langmuir probes. Here, however, we employ this technique at the highest feasible frequencies (limited by machine safety) to study its feasibility for edge plasma fuelling studies to complement gas puff modulations [1, 2].

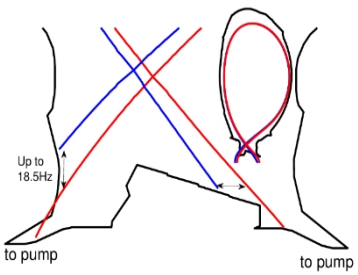

Figure 1 Strike point sweeping perturbs the recycled particle fluxes in the vicinity of the strike points as well as the divertor conditions in general thus affecting upstream SOL profiles and core fuelling. The main plasma shape as well as other heating and fuelling parameters are kept constant.

The sweep modulations are performed in various strike point configurations and in plasmas with Ohmic and L/H-mode confinement and in two isotopes H/D. By comparing the core and SOL electron density measurements, line radiation across the poloidal plane and divertor Langmuir probe data we can observe: (1) periodic LH transitions facilitated by the strike point movement from horizontal to vertical target and back in $P_{in} < 2P_{LH}$ conditions, (2) frequency independent (4/8/18.5Hz) midplane SOL electron density changes (3) radial SOL 'communication times' of the order of 10-20 ms (4) parallel SOL communication times within measurement accuracy (<5ms). Present observations seem to suggest that sweeping is not generating significant modulated neutral particle sources inside the separatrix but that the effect at the pedestal comes via SOL density modulation as a boundary condition.

EDGE2D/EIRENE [3,4] modelling is underway to identify the dominant physics mechanisms (pumping, recycling, flux expansion etc) responsible for these observations and to develop this experimental technique for plasma fuelling studies.

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* See the author list of "X. Litaudon et al 2017 Nucl. Fusion 57 102001"