Fluid Simulation of Particle and Heat Fluxes during Burst of ELMs on EAST and DIIID

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TH/P2-45

6-field 2-fluid module in BOUT++ are developed to study turbulence and flux transport in plasma edge region.

- In shifted circular geometry, the typical values for transport coefficients in the saturation phase after ELM crashes are D_r~200m^2/s, χ_{ir}~χ_{er} ~40m^2/s[1]
- For DIIID ELMy H-mode discharge #144382, the measured profiles are used as the initial condition of the simulation[2].
- The simulated energy loss during the ELM is around 18kJ, very close to the measured value 18kJ.
- The collapse of the electron density profile after the burst of ELM in simulation is similar to the experiments. The collapse width for both simulation and measurement are Δr_N~0.02.
- The the peak amplitude of heat flux distributions on divertor targets shows the similar width and increase process to the measurement.

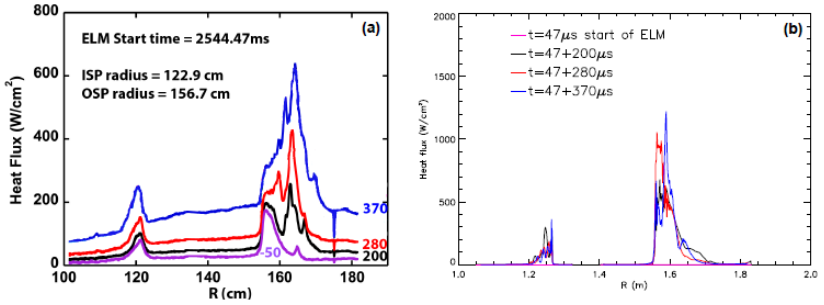

Fig. 1 Heat flux distributions on divertor targets during the ELM of DIIID H-mode discharge #144382. Left: the measured heat flux profiles on tagets [2]. Right: the simulated heat flux on targets.

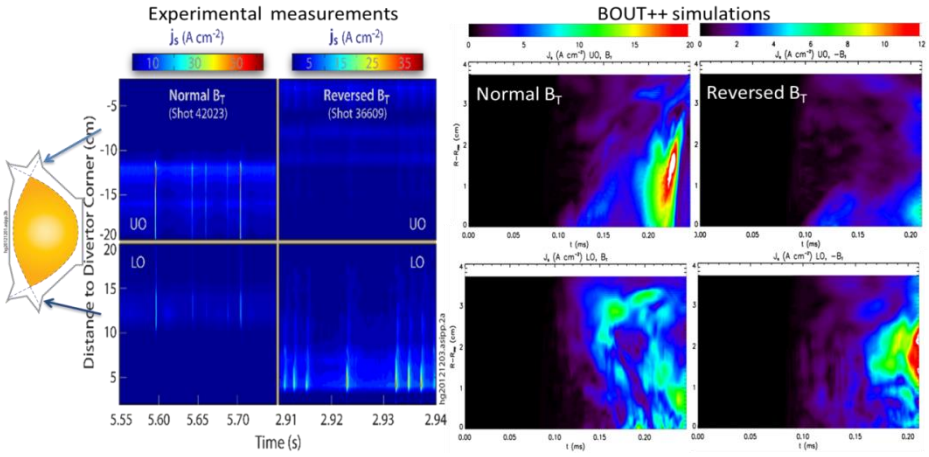

Fig2: The asymmetric particle flux distribution on upper and lower outer divertor targets are measured in left panels. The right panels are derived from BOUT++ simulations. The consistent distributions are obtained with the measurement.

- For EAST ELMy H-mode discharge #38300 with double-null geometry[3], simulations start with the measured profiles.
- The simulated power loss of the simulation is around 0.7MW, which is consistent with the typical value of EAST discharges with LHCD.
- The distributions of the particle fluxes on divertor targets are found to be dependent on the direction of toroidal field B_t[4]. Our simulations shows the same asymmetric distributions as the measurements.

[1] T.Y. Xia, X.Q. Xu and P.W. Xi, Nucl. Fusion **53**, 073009 (2013).
[2] M.E.Fenstermacher, et al. 40th EPS Conference on Plasma Physics, P4.104.
[3] G.Q. Li et al. Plasma Phys. Control. Fusion 55 (2013) 125008.
[4] H.Y. Guo et al. Phys. of Plasmas 21, 056107 (2014);