Transport study opportunities in WEST

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With WEST (Tungsten (W) Environment in Steady State Tokamak) [1], the Tore Supra facility and team expertise [2] is targeted at minimizing risks for ITER divertor procurement and operation. It consists in implementing a divertor configuration and installing ITER-like actively cooled tungsten monoblocks, while benefiting from Tore Supra long pulse capability. WEST has an aspect ratio between 5 and 6. It can operate in upper or lower single null as well as in double null. The heating systems are ICRH and LHCD, up to, respectively, 9 and 7 MW. All the PFC are in W: the upper and lower divertors, the baffle, the antennas side limiters, etc.

WEST first plasma is programmed by the end of 2016. WEST scientific programme is open to all ITER partners. A first call for proposals took place earlier this year, as well as a first WEST Experiment Planning meeting. A call for participation has been launched over the summer. 160 experiment and modelling proposals have been received worldwide. They are available on the participative WEST user pages: https://westusers.partenaires.cea.fr/. About 50 of these proposals are related to transport issues. Indeed WEST opens new experimental opportunities for exploring SOL transport, L-H transition, core and pedestal in a full W environment [3].

Concerning the SOL transport: the measured power decay length in this large A machine will be compared to existing scaling laws both in L and H mode as well as during ELMs. Langmuir probes, thermocouples and Infrared diagnostics will be cross-checked and SOL-edge modeling will be compared to the observations.

The transition into H mode will be explored. The Doppler reflectometer will provide a directed measurement of the radial electric field. The impact of the magnetic configuration will be assessed by varying the X point height, comparing USN and LSN (i.e. BxVB drift direction), etc. Flux driven nonlinear fluid simulations will be compared to the dynamics and the parametric dependences of the transition.

WEST being a RF heated tokamak, particle and momentum core transport can be studied in absence of core particle source and core torque. The large A impact on the role of trapped particles can be compared to gyrokinetic models. The transition into I mode can also be explored thanks to operation on the upper divertor.

The W penetration in the confined plasma and its impact on the operation will be crucial issue. W collisional, turbulent and MHD driven transport will be investigated. Integrated modelling will be carried out using NEO and QuaLiKiz. WEST operational window will depend on our understanding and control of W contamination.