WEST scenarios data consistency investigated by the fast integrated transport solver, METIS

C. Bourdelle, J.F. Artaud, Y. Peysson,
J. Bucalossi, H. Bufferand, F. Clairet, L. Colas, L. Delpech, C. Desgranges, P. Devynck, D. Douai, R. Dumont, A. Ekedahl, N. Fedorczak, J. Garcia, C. Gil, M. Goniche, R. Guirlet, F. Imbeaux, T. Loarer, P. Manas[1], D. Mazon, J. Morales, O. Meyer, Ph. Moreau, F. Saint-Laurent, E. Tsitrone, D. Vézinet
and the WEST team

CEA, IRFM, F-13108 Saint-Paul-lez-Durance, France.
1 Max-Planck-Institut für Plasmaphysik, D-85748 Garching, Germany

WEST [1] is a full W environment tokamak embedding ITER-like divertor plasma facing units. Its aspect ratio is between 5 and 6. Electrons are predominantly heated by ICRH and LHCD [2].

WEST has started diverted plasma operation in December 2017. In February 2018, up to 2.5 MW of LHCD have been coupled to plasmas at 0.7 MA over a few seconds. The C3 campaign will take place in June and July. 2 LHCD launchers and 2 ICRH antennas will be operated in order to access H mode. Long pulse operation will take place on the upper divertor.

WEST data consistency, in a context of diagnostic restart, is investigated using METIS. Synthetic diagnostics of some of the measured quantities are implemented: magnetic flux consumption constraining the plasma resistivity; neutron flux constraining the D content and central T_i; interferometry chords constraining the density profile; bolometer and SXR chords reconstruction constraining the W content, etc.

METIS combines 0-D scaling-law, normalised heat and particle transport with 1-D current diffusion modelling and 2-D equilibria. For LHCD, the source is iterated with C3PO/LUKE [3].

WEST density peaking at high aspect ratio will be compared to quasilinear gyrokinetic predictions. The W behavior will be compared to neoclassical and turbulent transport modelling using NEO and QuaLiKiz.

The strengths and weaknesses of such fast integrated modelling will be stressed in view of optimization of future experiments on WEST, in particular in view of W control in long pulses.

[1] J. Bucalossi et al., Fus. Eng. and Design, 89 (2014) 907-912
[2] C. Bourdelle et al., Nucl. Fusion 55 (2015) 063017
[3] Y. Peysson & J. Decker, Fusion Science and Technology, 65:1, (2014) 22-42