Contribution ID: **1577**   Type: **Post Deadline Poster**

Benchmarking and validating SOLPS-ITER, SOLEDGE2D and UEDGE for power exhaust modelling in future tokamaks

Thursday 13 May 2021 18:25 (20 minutes)

The question of Power EXhaust (PEX) in future fusion reactors is an open issue. Current technology can exhaust only ~ 10 MW/m2, but reaching such low power deposition density would be impossible if only the ~ 1 m2 surface of the divertor targets is available to accommodate it. Suitable strategies are currently under investigation and, in the near future, the Divertor Tokamak Test (DTT) experiment will specifically address this issue. However, in the meanwhile, since no machine can effectively supply reactor-relevant data, modelling is the only way to reduce extrapolation in the design process of future tokamaks. In the present work, we aim at assessing the performance of SOLPS-ITER, SOLEDGE2D and UEDGE in modelling the SOL plasma, to eventually assist the reactor design. This contribution presents the progress so far in these studies. We first perform a benchmark of the three codes on a DTT scenario, showing that the codes, even when run with similar input parameters (e.g., user-selected anomalous transport coefficients), produce results which agree within 5-12% at the Outer MidPlane (OMP), but only within a factor ⊠ 2.5 at the targets. This outcome reflects the high sensitivity of divertor conditions to small perturbations of the upstream parameters, the major role played by atomic physics with low divertor temperatures and the different mesh extension allowed by the codes. Then, we model an Alcator C-Mod discharge and compare the results of the three codes with the experimental data. We obtain different levels of accuracy (within a factor ~ 1.1-3) compared to the data, with further fine-tuning of the user-selected transport coefficients required to achieve better agreement.

Keywords: DTT, Alcator C-Mod, scrape-off layer, power exhaust, modelling, benchmark, validation

Country or International Organization

Italy

Affiliation

NEMO Group, Dipartimento Energia

Author: Dr SUBBA, Fabio (Politecnico di Torino)

Co-authors: MOSCHENI, M. (NEMO Group, Politecnico di Torino); MEINERI, Carlo (ENEA, Fusion and Nuclear Safety Depatment, C. R. Frascati, via E. Fermi 45 00044, Frascati, Roma (Italy)); WIGRAM, Michael (University of York); CARATI, C. (Eni SpA); DE MARCHI, E. (NEMO Group, Politecnico di Torino); Dr INNOCENTE, Paolo (RFX); ZANINO, Roberto (dipartimento energia, politecnico di torino)

Presenter: Dr SUBBA, Fabio (Politecnico di Torino)

Session Classification: P6 Posters 6

Track Classification: Magnetic Fusion Theory and Modelling