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P4.1033 Towards the integrated analysis of tokamak plasma equilibria: PLEQUE

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The equilibrium solution of the GradShafranov equation in the form of the 2D function of psi and of the F() = R Btor function and the pressure p() profile offers fundamental information about the tokamak plasma state. The combination of these functions provides complex information about the plasma such as the topology, plasma currents, and the magnetic field. Plasma equilibrium is used for both data analysis and as one of the inputs of computer simulations. Known plasma equilibrium plays a key role in a design of new machines like COMPASS-U in Prague. As a consequence, equilibrium analysis tools are part of the most of simulation codes and they are included among the equipment of many tokamak plasma scientists. Nevertheless, a unified and universal package for simple and fast manipulation of equilibria is still missing. In this contribution, we present a new open-source python package PLEQUE (PLasma EQUilibrium Enjoyment) [1] which aims to solve this issue. We focus on four aspects of the package. Firstly, we introduce methods used for the input analysis which allow obtaining self-consistent information (e.g. x-point, magnetic axis, strike-points, or plasma boundary). Secondly, we demonstrate its possibility to be integrated with other codes via the IMAS (ITER Integrated Modelling & Analysis Suite) format or standard equilibrium g-eqdsk format. The ability to read some real tokamak machine equilibria is demonstrated as well. Thirdly, we show the simple high-level interface to obtain the requested data as simply and easily as possible. The interface allows an elegant ability to work with various tokamak coordinate system and to map profiles of various quantities of psi to the plasma equilibrium. Finally, applications such as field line tracing will be demonstrated and used for magnetic field reconstruction in the presence of resonant magnetic perturbations.
[1] https://github.com/kripnerl/pleque

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