Equilibrium reconstruction analysis of TCV tokamak plasmas in the EU-IM platform

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Tokamak plasma equilibrium reconstruction is a fundamental step in the understanding of fusion plasma physics. Accurate reconstructions of the plasma shape and position are essential from the point of view of plasma control, ensuring that the target scenario requested is met and that no machine operational limits are reached with the consequent termination of the discharge. The range of different plasma equilibria, depending on shape, current density and pressure profiles, is also large and poses significant challenges on numerical tools to provide reliable equilibrium reconstructions that perform well in the vast majority of cases using the available experimental measurements.

In the framework of the EUROfusion Code Development for Integrated Modelling Work Package, a scientific Kepler [1] workflow focused on the reconstruction of Tokamak plasma equilibrium was developed and already used for the modelling of selected JET and AUG plasma equilibrium. Magnetic data and Motional Stark Effect (on JET) and kinetic thermal pressure profile constraints (on AUG) were used [2]. The workflow interfaces to consolidated reconstruction codes such as EQUAL [3], CLISTE [4], EQUINOX [5] and SDSS [6], all using the same physics and machine data ontology and methods for accessing the data used in the European Integrated Modelling framework [7]. In this work, the validation of the codes on TCV data is described, taking advantage of the variety of different plasma shapes and divertor configurations possible in TCV plasma discharges. The results are compared to plasma equilibrium reconstructions carried out using the LIUQE code [8].


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\(^*\) See http://www.euro-fusionscipub.org/eu-im
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