

Plasma equilibrium reconstruction of JET discharges using the IMAS modelling infrastructure

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The reconstruction of Tokamak plasma equilibrium is a fundamental step in the understanding of fusion plasma physics since it sets the starting point for all subsequent plasma modelling applications and experimental data interpretation. The verification and validation of the numerical codes used to reconstruct plasma equilibrium, using as many available input experimental data e.g. magnetic field or flux measurements, density and temperature diagnostics and polarimetry diagnostics, is essential both for physics model interpretation and when qualifying and extrapolating for ITER. In the framework of the EUROfusion Work Package on Code Development for Integrated Modelling, a scientific Kepler [1] workflow for the reconstruction of Tokamak plasma equilibrium was prototyped, using the ITER Integrated Modelling and Analysis Suite (IMAS) [2,3]. The workflow can seamlessly use any sort of data from Tokamak experiments and call reconstruction codes such as EQUAL [4], CLISTE [5], EQUINOX [6] and SDSS [7], all using the same physics and engineering data ontology and methods for accessing the data. In this work, we address plasma equilibrium reconstructions on dedicated JET plasma discharges, performing a code benchmark using, at first, magnetic data only and subsequently considering also other constraints such as polarimetry (Stokes vector based or Motional Stark Effect). First results with magnetic only give good qualitative and quantitative agreement between the codes.

References

- [1] <https://kepler-project.org/>
- [2] S.D. Pinches et al., Proc. 26th IAEA FEC, Kyoto, Japan, 2016, paper TH/P2-14.
- [3] F. Imbeaux, et al, Nuclear Fusion 55 (12), 123006, (2015)
- [4] W. Zwingmann, Nucl. Fusion 43 (2003) 842
- [5] P. J. McCarthy, Phys. Plasmas 6, 3554 (1999)
- [6] B. Faugeras et al., Plasma Phys. Control Fusion 56 (2014)
- [7] R. Coelho et al, Fusion Sci. Technol. 69, 611 (2016)

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