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P2.001 Modelling and experimental validation of RFX-mod tokamak shaped discharges

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Shaped Tokamak discharges with an insertable polarized electrode have been executed in RFX-mod to achieve H-mode regime. This was aimed at reproducing successful experiments of stable operation at q<2 by feedback stabilization of m=2, n=1 mode already performed with low and high-beta circular discharges. Equilibrium magnetic configurations with a wide range of plasma shapes have been experimentally produced and analysed by means of the linearized plasma response model CREATE-L. In order to provide a connection between computational tools and experiments, the purpose of this work was to develop a general procedure for computing linearized plasma response models through the CREATE-L code, in any kind of plasma regime with a high level of accuracy with respect to experimental data. This procedure involves the solution of a constrained nonlinear minimization problem to estimate the CREATE-L free parameters by using an iterative scheme trying to minimize the discrepancy between the magnetic field experimental and simulated measurements provided by pick-up coils. Eleven experimental shots have been identified and considered in this study: all of them are Upper Single Null tokamak configurations spanning the whole range of poloidal beta achieved in the RFX-mod tokamak (low-β, intermediate-β, biased induced H-mode regime). A preliminary sensitivity analysis showed a non-negligible dependence of static equilibria on variations of the total plasma current with respect to the measurement provided by Rogowski coils. Thus, the total plasma current has been set as an additional degree of freedom in the minimization problem allowing it to assume values between the Rogowski measurement and the value of the discrete line integral of the poloidal magnetic field measured by the pick-up coils. In all cases under analysis, the iterative procedure showed that the most accurate equilibrium is obtained with a plasma current higher than the Rogowski measurement but lower than the pick-up coils line integral.

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