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EX/P3-11: The Value of Flexibility: the Contribution of RFX to the International TOKAMAK and STELLARATOR Programme

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RFX-mod embodies the characteristics of flexibility of an experiment where cross-configuration studies can be carried out. Such condition has aroused lively interest and has led to important collaborations with laboratories worldwide (JT60-SA, DIII-D, AUG, PPFL, PPPL, Auburn University, ORNL). As a Reversed Field Pinch (RFP), RFX-mod addresses many basic physics issues that are common to both Tokamak and Stellarators, just in a different region of the parameters space of a hot plasma, characterized by low magnetic fields. In addition RFX-mod can be run directly as a low current, ohmic, circular Tokamak and apply to it its state-of-the-art system for active MHD feedback control and investigate, for instance, Resistive Wall Modes and Resonant Field Amplification processes. The control of the (2,1) mode has allowed exploring equilibria down to q(a)=1.6, showing the importance of correctly treating the aliasing of the sidebands generated by the correction coils. A high triangularity plasma with double x-point has also been produced. Entering an ohmic H mode would open the way to further important studies such as ELM's control.
The bridge with the Stellarator community has been established because the RFP helical states can provide a good test-bed for numerical codes conceived to deal with 3D effects. The equilibrium codes VMEC and V3FIT developed for the Stellarator have been successfully adapted to reconstruct RFX-mod equilibria with diagnostics. Such equilibria show a good agreement with the results of the RFP equilibrium reconstruction code SHEq, providing the additional information on the role of pressure. The resulting q profiles show a non monotonic radial shape and the presence of a maximum where usually a strong thermal barrier develops.
The contribution of coherent structures to the transport of particles and energy at the plasma edge has been studied on RFX-mod with direct observations of current density filaments in the edge region both in the RFP configuration - where drift kinetic Alfvén structures have been identified - and in the Tokamak configuration, where small scales current filaments have been found. These results are compared with the findings in the TORPEX experiment, those obtained in the AUG experiments during type one ELM's, and with those in the TJ-II Stellarator device where similar investigations are in progress.

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