

Abstract Submitted
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3D magnetic fields and plasma flow in helical RFX-mod equilibria PAOLO PIOVESAN, DANIELE BONFIGLIO, FEDERICA BONOMO, MARCO GOBBIN, LIONELLO MARRELLI, PIERO MARTIN, EMILIO MARTINES, BARBARA MOMO, LIDIA PIRON, ANTON SOPPELSA, BARBARA ZANIOL, Consorzio RFX, RFX-MOD TEAM — A spontaneous transition to a helical equilibrium with electron internal transport barriers (ITB) is observed in RFX-mod as the plasma current is raised [R. Lorenzini et al. *Nature Phys.* 5, 570 (2009)]. The transition can be stimulated and controlled by means of 3D magnetic fields from a system of 192 active coils, providing at the same time proper helical boundary conditions and dynamic error field correction. A global helical flow develops in these states and is expected to play an important role in their formation: it generates a large portion of the dynamo electric field in a laminar way and it may contribute, through its shear, to the ITB sustainment. The origin of this flow, from resistive MHD and/or ambipolar electric fields, will be discussed, along with the possibility to control it by 3D magnetic fields. Its role in error field screening and in the suppression of MHD modes that perturb the helical equilibrium will be investigated. The commonality of the above 3D physics issues with tokamaks and stellarators will be also discussed.

Paolo Piovesan
Consorzio RFX

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