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MHD dynamo in Reversed Field Pinch Plasmas: electrostatic drift nature of the dynamo velocity field

SUSANNA CAPPELLO, Consorzio RFX, Associazione Euratom-Enea sulla fusione, Padova, Italy

Within the framework of MHD numerical modelling, the Reversed Field Pinch (RFP) has been found to develop turbulent or laminar regimes switching from the former to the latter in a continuous way depending on the strength of dissipative forces. The laminar solution corresponds to a simple global helical deformation of the current channel and is associated to an electrostatic dynamo field. In this work we show that the associated drift yields the main component of the dynamo velocity. While quite natural in the stationary helical state, this analysis is shown to extend also to the dynamic turbulent regime for a sustained RFP. The continuity of the transition between the two regimes suggests that the simple helical symmetric solution can provide a fruitful intuitive description of the RFP dynamo in general. Many of the MHD predictions are in good agreement with experimental findings.

References:

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