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Helical self-organization in the reversed-field pinch: detection of barriers to transport. MARCO VERANDA, DANIELE BONFIGLIO, SUSANNA CAPPELLO, Consorzio RFX, DOMINIQUE ESCANDE, Aix-Marseille Université, CNRS, FULVIO AURIEMMA, Consorzio RFX, DARIO BORGOGNO, Université Côte d'Azur, LUIS CHACÓN, Los Alamos National Laboratory, DANIELA GRASSO, Istituto dei Sistemi Complessi-CNR, GIULIO RUBINO, ENEA, ALESSANDRO FASSINA, PAOLO FRANZ, MARCO GOBBIN, MARIA ESTER PUIATTI, Consorzio RFX — Self-organized helical states are an ubiquitous feature in astrophysical and magnetic fusion plasmas. In the reversed-field pinch plasmas quasi-helical states are observed both in high current experiments [1] and in nonlinear magnetofluid numerical simulations [2]. We show the 3D nonlinear MHD prediction that small edge helical magnetic perturbations can shape the whole plasma column with their helical twist [3], a result confirmed by dedicated experiments in RFX-mod. When a non-resonant twist is imposed chaos healing results in a higher area of conserved magnetic surfaces and in reduced diffusion of magnetic field lines. Barriers to the transport of magnetic field lines are detected: they can be identified as cantori of the magnetic field [4], and can explain the observation of electron temperature transport barriers in experiments [5]. 1 - R.Lorenzini, E.Martines, et al, Nature Physics **5**, 570 (2009) 2 - D.Bonfiglio, M.Veranda, et al, PRL **111**, 085002 (2013) 3 - M.Veranda, D.Bonfiglio, et al, PPCF **55**, 074015 (2013) 4 - G.Rubino, D.Borgogno, et al, NF **57**, 085004 (2015) 5 - M.Gobbin, D.Bonfiglio, et al, PRL **106**, 025001 (2011)

Marco Veranda
Consorzio RFX

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