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# Reconnection processes in 3D MHD modeling of Reversed Field Pinch magnetic self-organization

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Since the early 90ties, 3D nonlinear MHD studies have been developing a fundamental framework for the understanding of the Reversed Field Pinch (RFP) self-organization. The simple visco-resistive MHD approximation clearly shows that 3D reconnection processes strongly characterize the dynamics in an ample range of the dimensionless Lundquist/Hartmann numbers, as well as in experimental discharges [1-9]. In fact, this is particularly evident during the nearly periodic relaxation-reconnection events (so-called RFP sawtoothing activity) observed in both Multiple and Quasi Helical regimes where the natural kinking of the current carrying plasma column triggers relaxations with localized shrinking/collapse of the global helical magnetic field perturbation. In this presentation we will provide a survey of the typical magnetic reconnection manifestation in nonlinear visco-resistive MHD of the RFP and some comparison with the similar behavior in the circular tokamak case. The main features are: magnetic into kinetic energy conversion (possibly providing ion heating), 3D current sheets formation and related flow patterns, mode phase locking, (toroidal collapse of the helix), excitation of Alfvén waves. The possibility to "tune"the sawtooth cycle by adopting suitable Resonant or Non resonant Magnetic Perturbation will be also presented. How much extended-MHD physics would be necessary to better capture the RFP experimental phenomenology still remains to be clarified, and we expect to address this aspect with the help of the RFX-mod2 device under renovation.

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