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3D nonlinear MHD simulations for Ultra-Low q plasmas SUSANNA CAPPELLO, D. BONFIGLIO, R. PIOVAN, Consorzio RFX — Nonlinear 3D MHD simulations for Ultra-Low safety factor, ULq , plasmas have been performed with the SpeCyl code [1] in the simple frame of visco-resistive zero pressure model. This configuration is the intermediate state between the Tokamak and the Reversed Field Pinch. The experimental observation of the staircase-like behaviour in the evolution of the edge q-value, show that ULq plasmas have the natural tendency to select discrete q_{edge} which are about the major rational numbers, suggesting plasma self-organization. Similar behaviour is obtained in numerical modelling when driving the system from the RFP regime to the Tokamak one: the transition of the q-value somewhat inside the plasma edge from a plateau level (near the mode rational number) to the next one occurs in concomitance with the development of a kink deformation of the plasma column, whose stabilization yields a nearly axisymmetric state. This numerical study, and the preliminary experimental results obtained exploiting the flexibility of the experiment RFX-mod [2], indicate the possibility to explore the impact on transport of such different MHD behaviour within the same experiment [1]. S. Cappello & D. Biskamp Nuclear Fusion **36**, 571 (1996) [2] see on the web: R. Piovan, et al. *First results of Ultra-Low q experiments in RFX-mod* 12th IEA-RFP Workshop, Kyoto, Japan, 26-28 March 2007.

Susanna Cappello
Consorzio RFX

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