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3D-MHD Simulation of the Dynamics of the Plasma Flow through a Magnetic Nozzle ALFONSO TARDITI, University of Houston-Clear Lake — The present study focuses on the characterization of the plasma flow as it transitions through a diverging, axisymmetric, dipolar magnetic field that, performing the function of a 'magnetic nozzle'. For sufficiently large plasma densities, the nozzle magnetic field (externally imposed) is perturbed as the plasma transitions along the axial direction. This scenario was modeled with the 3D-MHD NIMROD code [1] for the purpose of analyzing the details of the resulting nonlinear interaction of the plasma with the magnetic field. The simulations show the formation of regions with reconnecting closed field lines: in the plasma parameter range that has been considered, these patterns occur on a faster time scale than the one characterizing the plasma convective motion, but on the same time scale as the thermal energy confinement time. The 3D results are analyzed to show quantitatively the role of the diamagnetic current that is generated in the plasma along the azimuthal direction. The relevance of this analysis for the establishment of flow conditions that lead to an effective detachment of the plasma from the magnetic field is discussed. Further developments are also considered in relation to the application of Rotating Magnetic Fields to FRC plasmas, as described in [2-3]. References: [1] C. R. Sovinec et al., J. Comput. Phys. 195, 355 (2004) [2] R. D. Milroy et al., Phys. Plasmas 17, 062502 (2010) [3] Y. Petrov et al., Phys. Plasmas 17, 012506 (2010)

Alfonso Tarditi
University of Houston-Clear Lake

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