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Plasma rotation in a magnetic nozzle[1] BORIS BREIZMAN, ALEXEY AREFIEV, AHMET AYDEMIR, Institute for Fusion Studies, Univ. of Texas at Austin — This work generalizes the MHD description of an axisymmetric plasma flow in a magnetic nozzle [1] to the case of rotating flows. The generalization requires that the azimuthal magnetic field and radial electric field be taken into account. In the absence of a radial electric field, the MHD equations formally allow for a steady-state solution with the plasma velocity directed along the twisted magnetic field lines. However, such a solution is singular at the surface of sub- to super-Alfvnic transition. In the presence of a radial electric field, the azimuthal component of the plasma velocity must increase downstream along diverging magnetic flux tubes, because the electrostatic potential remains constant along the magnetic field lines. A regular physical solution is not possible in this case as well. In order to understand the role of plasma rotation and to understand whether perturbations can be accumulated at the surface of sub- to super-Alfvnic transition, we have examined the dynamics of small time-dependent rotating perturbations created by an external source in a steady-state plasma flow. [1] A.V. Arefiev and B.N. Breizman, Phys. Plasmas 12, 043504 (2005).

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