Abstract Submitted for the DPP05 Meeting of The American Physical Society

Mechanisms of current drive improvement in Rotamak plasmas.¹ YURI PETROV, TIAN-SEN HUANG, Prairie View A&M University — The current driven by the rotating magnetic field (RMF) is observed to be larger than expected from the simplified infinite-cylinder model. The mechanism appears to be different for the two regimes of rotamak operation: the Rotamak-ST (with the applied toroidal field), and Rotamak-FRC (no external toroidal field). In the former case, the larger current is associated with an improved penetration of RMF into the plasma. We inspect the experimental data with the model of the whistler wave mode excitation. The comparison of experimental radial profiles of the RMF components with theoretical profiles shows that the first radial mode is present in our plasmas. In the Rotamak-FRC case, we confirm that the poloidally swirling currents associated with the observed self-generated toroidal field in the Rotamak-FRC case can be responsible for driving the toroidal current in the inner areas of plasma where RMF field is nearly zero. The mechanism is due to the coupling of the radial component of the swirling currents with the axial magnetic field. To match the resulting toroidal current with the measured toroidal current density profile, we had to accept a large anomalous resistivity order of 1 mOhm-m.

¹Supported by DoE Contract DE-FG03-97ER54416

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Date submitted: 21 Jul 2005

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