Abstract Submitted
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Multi-ion equilibrium with strong rotation L. GALEOTTI, D.C. BARNES, F. CECCHERINI, F. PEGORARO[1], Tri Alpha Energy — We describe a new formulation of the multiple ion species, quasi-neutral, axisymmetric equilibrium problem which includes the possibility of strong (sonic or supersonic) rotation about the geometric axis. This new work is more applicable to well confined, hot plasmas. In contrast to previous related work [1.2] which considered steady states with arbitrary isentropic mass flow, we impose the physically more realistic constraints of uniform temperature and negligible poloidal mass flow. It is shown that there exist three surface functions which are related by a single ordinary differential equation (per species), leaving two surface functions per species. These may be taken to be T and Ω for each species. Equilibria have been obtained by the LR_eqMI code which simultaneously solves a set of $2+3N_i$ (where N_i is the number of ion species) nonlinear equations at each point, along with Ampere's law and very flexible boundary conditions. Along with the derivation of the model and profiles, some examples of D-T low aspect, elongated tokamak equilibria with and without strong toroidal rotation are given.

[1] L. C. Steinhauer, *Phys. Plasmas* **6**, 2734 (1999).
[2] J. P. Goedbloed, *Phys. Plasmas* **11**, 81 (2004).

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