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Plasma equilibrium with fast ion anisotropy and toroidal flow[1]
NIKOLAI GORELENKOV, S. JARDIN, PPPL, Princeton University — Strong induced toroidal flow is typical for present day plasmas with significant anisotropic pressure of energetic ions population. We present a model for the equilibrium solver to account for the fast ion phase space anisotropy and toroidal plasma flow. Anisotropic pressure tensor is computed based on the set of the basis functions used to evaluate the contribution of the fast ions to the pressure tensor. A procedure to include fast ion distribution via the pressure coupling scheme into the Grad-Shafranov equation is discussed. Proposed model allows to include finite orbit width effects self-consistently. We show that in the particular case of zero orbit width any distribution function can satisfy the solubility requirements for Grad-Shafranov equation, which follows from the force balance along the magnetic field lines. For efficient solution technique we developed a conforming grid in the phase space which allows for accurate treatment of the topological boundaries (often characterized by the singularities in particle drift frequencies) in the particle confinement domain.

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