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q-solver equilibrium model with fast ion orbit width, velocity anisotropy and toroidal flow effects NIKOLAI GORELENKOV, STEVEN JARDIN, PPPL, Princeton University — We present a novel formulation for the plasma equilibrium problem using the q-solver framework together with the pressure coupling scheme for energetic particle (EP) contribution. The employed formulation accounts for the EP pressure anisotropy which is based on the moments of the velocity distribution function representation incorporating the finite orbit width (FOW) effects. The system of equations includes the toroidal plasma flow. These effects are important in applications for recently upgraded plasmas of NSTX-U and DIII-D where additional NBIs are installed. Strongly anisotropic beam ions accompanied by plasma rotation have to be addressed in various applications involving for example the stability of Alfvenic and internal kink modes. The anisotropy and rotational effects could be treated separately or together depending on applications. Fast ion anisotropic pressure tensor is computed using the set of basis functions. In particular we show that in the limit of zero orbit width any distribution function can satisfy the solvability requirements for Grad-Shafranov equation, which follows from the force balance along the magnetic field lines.

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