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TH/P6-02: Finite Orbit Width Features in the CQL3D Code

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The CQL3D Fokker-Planck equation solver is being upgraded to allow for the Finite-Orbit-Width (FOW) capabilities, which will provide an accurate description for a neoclassical transport, losses to the walls, and transfer of particles, momentum, and heat to the scrape-off layer. Two different options are discussed for implementing the FOW capabilities. In one option, the Fokker-Planck equation is solved for the distribution function of orbits centered around given flux surface; in the other, the equation is solved for the local distribution function at the outer-most point of flux surface at the midplane. Both options use a fast lookup table that allows characterization of orbits without actually tracing them. The lookup table, in effect, performs mapping from the Constants-Of-Motion space onto the (R_0, u_0, θ_0) computational space on the midplane. The FOW modifications have been implemented for the formations of neutral beam source, rf quasilinear diffusion operator, particle diagnostics and collisional operator, and internal boundary conditions are being refined. Initial test runs show that in general, the FOW modifications result in a broader profiles of power absorption and RF-driven current, and accurate description of the loss cone.

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