

Abstract Submitted  
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**ESC-EEC-EPC code system for plasma core and edge equilibrium and particle orbits**<sup>1</sup> XUJING LI, Academy of Mathematics and Systems Science, Chinese Academy of Sciences — A new Edge Equilibrium Code (EEC), which is a new solver of the Grad-Shafranov equation complementing the existing ESC code (based on Fourier representation) is presented. EEC, being developed specifically for the near edge region with an arbitrary shape of the plasma boundary, uses adaptive flux coordinates with Hermite finite element representation. A special routine for fast solving the sparse matrix equations was created for EEC. The edge solution of EEC is matched with the core solution from ESC through a virtual boundary and the two codes communicate as two parallel processes. This approach addresses the future needs in enhancing functionality of EEC without conflicting with the interface of both codes. The code was complemented by Edge Particle Code (EPC) for massive calculation of collisional particle orbits using GPU. The resulting ESC-EEC-EPC code system acquired unmatched ability (a) in fast free and fixed boundary equilibrium calculations for arbitrary plasma shapes, (b) in using both  $r - z$  and different flux coordinates, (c) in choosing different combinations of input profiles, (d) in performing equilibrium reconstruction together with variances analysis, and (e) in assessing the diagnostics used for equilibrium reconstruction.

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