7th Asia-Pacific Conference on Plasma Physics, 12-17 Nov, 2023 at Port Messe Nagoya

Energetic Particle Marginal Stability Profile for HL-2M Integrated Simulation based on Neural Network Module

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A critical gradient model (CGM) [1] is employed to develop a module of energetic particle (EP) marginal stability profile in OMFIT integrated simulation for studying EP transport. Currently, each iteration of transport evolution is approximately 10 minutes in the integrated simulation, whereas, the EP marginal stability profile, which serves as an input in the integrated simulation could take much longer; the reason being a combination of the TGLFEP and EPtran codes is employed in our previous investigation [2]. To reduce the simulation time, the critical gradient is predicted by a neural network instead of the TGLFEP code, and the EPtran code is revised with parallel computing, so that the running time of this module can be controlled to within 5 minutes. The prediction is in good agreement with previous approach. The integrated simulation of HL-2M [3] with Alfven Eigenmode (AE) transported neutral beam EP profile indicates that EP transport reduces the total pressure and current as expected, but could also under some condition raise the safety factor in the core, which is favorable for reversed magnetic shear and high-performance plasmas.

References
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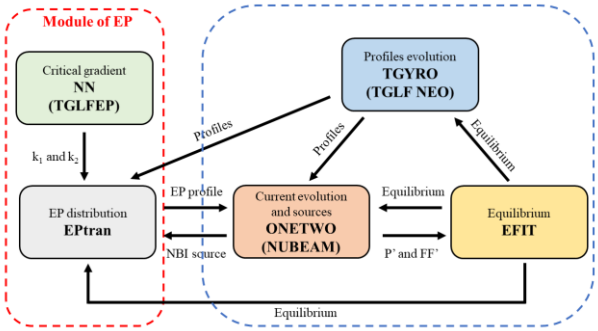

Figure 1 OMFIT workflow with module of energetic particles. The typical iteration is in the blue border, and MOE is in the red border.