

Abstract Submitted  
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**Recent upgrades on BOUT++ framework**<sup>1</sup> BEN ZHU, XUEQIAO XU, Lawrence Livermore Natl Lab — We report a few recent upgrades on BOUT++’s drift-reduced six-field turbulence model, in particular the flux-driven source option and the new Laplacian inversion solver which is able to capture  $n = 0$  mode evolution. With flux driven particle and energy sources from the core side, BOUT++ global simulations self-consistently evolve plasma backgrounds in transport time-scale runs. Moreover, in the previous simulations, due to numerical inaccuracy  $n = 0$  zonal mode is usually omitted when evaluating the electrostatic potential  $\phi$  by inverting vorticity. Now a new Laplacian inversion solver that captures  $n = 0$  mode, first developed in Hermes-1 [1] – a BOUT++ based five field model; and more recently in a four field shift circular model [2] has been extended and implemented in the six-field turbulence model, in both limited and diverted configurations. These improvements on BOUT++ is essential towards a fully self-consistent edge turbulence model capable of both transient (e.g., ELM, disruption) and transport time-scale simulations. [1] B. Dudson and J. Leddy, Plasma Phys. Control. Fusion **59** 054010 (2017) [2] H. Seto et.al, Phys. Plasma **26** 052507 (2019)

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