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Development of test particle module for impurity generation and transport in BOUT++ framework[1] XIAOTAO XIAO, CASIPP, LLNL, XUEQIAO XU, LLNL — Developing the test particle module in BOUT++ framework is the first step to enhance its capability to simulate impurity generation and transport in edge plasmas, which potentially can be extended to efficiently simulate both turbulence and neoclassical physics in realistic geometry. The motion of impurity charged particles are governed by guiding-center (GC) equations in the presence of turbulent electromagnetic fields. The GC equations are the well-known Hamiltonian guiding center equation given by Littlejohn, Boozer, White and others. The Fourth-order Runge-Kutta algorithm is used to advance the GC equations in time. In order easily to couple with BOUT++ fluid module, the same field aligned coordinates are used except near the region close to X-point. The bilinear interpolation is used to interpolate 3D fluid turbulent electromagnetic fields from grid points to particle positions. The calculated orbits in equilibrium configuration are checked to conserve constants of motion. The various guiding-center orbits in divertor configuration under BOUT++ framework are demonstrated and benchmarked. Then spatial distribution of impurities in edge plasmas from given sources at the divertor plates and at the protection limiters near RF antennas is obtained in given background plasma.

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