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Modeling of nanometer scale dust grains with NDS-BOUT++¹ ZHUANG LIU, Soochow University, XUEQIAO XU, Lawrence Livermore National Laboratory, NAMI LI, Dalian University of Technology, XIAOTAO XIAO, Chinese Academy of Sciences, JIZHONG SUN, DEZHEN WANG, Dalian University of Technology — The NDS (Nanometer Dust Simulation) module, which evaluates the charging, ablation and transport of the dust grains, has been developed under BOUT++ framework. The guiding-center orbits of dust particles are tracked in tokamak plasmas, whose parameters are obtained from BOUT++, a highly desirable C++ code package for performing parallel plasma fluid simulations with an arbitrary number of equations in 3D curvilinear coordinates. Calculations with NDS-BOUT++ provides results such as trajectories, distributions and evolutions of dust particles with different components, sizes, and velocities for different tokamak geometries. Understanding the submicron and nanometer phases of dust is fundamentally interesting, which helps better understand how lithium dropping improves plasma confinement and how beryllium pellet contributes to ELM control. The distribution of tungsten impurity, resulted from ablated tungsten dust grains for several typical scenarios, is also assessed. Preliminary results show in some cases, tungsten dust grains can cross the seperatrix and survive for several milliseconds before ablated completely, which will significantly contribute to core contamination.

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