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Implementation of non-axisymmetric mesh system in the gyrokinetic PIC code (XGC) for Stellarators TOSEO MORITAKA, National Institute for Fusion Science, ROBERT HAGER, MICHEAL COLE, CHOONG-SEOCK CHANG, SAMUEL LAZERSON, SEUNG-HOE KU, Princeton Plasma Physics Laboratory, SEIJI ISHIGURO, National Institute for Fusion Science — Gyrokinetic simulation is a powerful tool to investigate turbulent and neoclassical transports based on the first-principles of plasma kinetics. The gyrokinetic PIC code XGC has been developed for integrated simulations that cover the entire region of Tokamaks. Complicated field line and boundary structures should be taken into account to demonstrate edge plasma dynamics under the influence of X-point and vessel components. XGC employs gyrokinetic Poisson solver on unstructured triangle mesh to deal with this difficulty. We introduce numerical schemes newly developed for XGC simulation in non-axisymmetric Stellarator geometry. Triangle meshes in each poloidal plane are defined by PEST poloidal angle in the VMEC equilibrium so that they have the same regular structure in the straight field line coordinate. Electric charge of marker particle is distributed to the triangles specified by the field-following projection to the neighbor poloidal planes. 3D spline interpolation in a cylindrical mesh is also used to obtain equilibrium magnetic field at the particle position. These schemes capture the anisotropic plasma dynamics and resulting potential structure with high accuracy. The triangle meshes can smoothly connect to unstructured meshes in the edge region. We will present the validation test in the core region of Large Helical Device and discuss about future challenges toward edge simulations.

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