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3D field solver in toroidal geometry for the long wavelength E&M modes[1] SALOMON JANHUNEN, Princeton Plasma Physics Laboratory, BEI WANG, Princeton University, JAN HESTHAVEN, École polytechnique fédérale de Lausanne, MARK ADAMS, Lawrence Berkeley National Laboratory, SEUNG-HOE KU, CHOONG-SEOCK CHANG, Princeton Plasma Physics Laboratory — Gyrokinetic simulations – such as those performed by the XGC code – provide a self-consistent framework to investigate a wide range of physics in strongly magnetized high temperature laboratory plasmas, global modes usually considered to be in the realm of MHD simulations. However, the present simulation models generally concentrate on short wavelength electro-magnetic modes mostly to convenience the field solver performance. To incorporate more global fluid-like modes, also non-zonal long wavelength physics needs to be retained. In this work we present development of a fully 3D mixed FEM/FDM electro-magnetic field solver for the gyrokinetic code XGC1. We present optimization for use on massively parallel computational platforms, investigation of numerical accuracy characteristics using the method of manufactured solutions and evaluate the regime of validity for the current physics model.

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