GMOXIT: Geometric Multigrid for Box-Splines. Application to $\rho^\star$ scaling for ITER

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It is well known that the key dimensionless variable, when projecting the confinement of present tokamaks to reactors, is the relative gyroradius $\rho^\star$. Therefor, both the size and magnetic field scaling confinement can be fixed through the $\rho^\star$ scaling. A major concern when dealing with kinetic turbulences is the resolution of the Poisson equation. Unfortunatly, no study has been done on the scaling and behavior of Poisson solvers with respect to the relative gyroradius $\rho^\star$.

In this work, we discuss and study the solution of the Poisson equation with source terms that mimic the behavior of the $\rho^\star$ dependency. Different kind of Finite Elements will be tested among Cubic Hermite-Bézier, B-Splines and Box-Splines. Moreover, a new class of Geometric Multigrid solvers will be implemented for these Finite Elements spaces using Bézier techniques.

All developments will be done in Jorek-Django, a new Finite Element framework for Computational Plasma Physics, beeing implemented in collaboration with IPP and INRIA Sophia-Antipolis and Nancy Grand-Est.

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