

EMAFF: Equations MAgnétique avec FreeFem

MAGnetic Equations with FreeFem

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The FreeFem platform has been developed to facilitate teaching and basic research through prototyping. For the moment this platform is restricted to the numerical simulations of problems which admit a variational formulation. On the other hand, the development of new, simple but nevertheless efficient numerical methods is required to foster basic research for the numerical simulation of plasma in the context of the ITER project.

Our goal will be to evaluate the FreeFem tool on basic magnetic equations arising in Fusion Plasma. On the basis of the numerical results, we will evaluate other numerical strategies (for example Finite Volume Methods instead of Finite Elements) in order to compare the numerical accuracy.

Our starting point will be the Grad-Shafranov equation, and eventually the Soloviev system. The Grad-Shafranov equation is a diffusion equation on a poloidal geometry. An analytical solution is available. The goal is to capture the isoline of the potential with enough accuracy. This isoline is in fact the free boundary of the plasma inside the Tokamak. The meshing facilities provided by FreeFem will be used to improve the quality of the numerical results.

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References

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- [3] J. Blum web page, see a recent presentation at <http://www-sop.inria.fr/pumas/NMCF09/Talks/nmcf09>
- [4] F. Hecht web page, the FreeFem project, <http://www.freefem.org/ff++/>