A relativistic bounce-averaged Fokker-Planck code for stellarators and tokamaks

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In modern magnetic fusion devices plasma temperatures of several keV are obtained, so that relativistic effects may play an important role on the electron kinetics. We report here on the development of a new 2.5D fully relativistic, bounce-averaged Fokker-Planck code, suitable for the simulation of the radio frequency heating in both tokamaks and stellarators.

The present code represents a thoroughly revised and improved version of the Fokker-Planck for Toroidal Mirrors (FPTM) code [1,2], originally developed using a non-relativistic approach for the description of Electron Cyclotron Resonance Heating (ECRH) and Current Drive (ECCD) in the W7-AS stellarator. In addition to accounting for relativistic effects on the electron dynamics due to collisions [3] and interaction with radio frequencies, an interface for the coupling with the EC ray-tracing code TRAVIS [4] is foreseen.

In the code, the presence of trapped and passing particles is considered by using a bounce averaging procedure. A characteristic feature with respect to other codes is the possibility to treat the presence of different populations of trapped particles. This approach is suitable for describing radio frequency heating in stellarators, when the power deposition is located within a small flux tube around the magnetic axis with several magnetic traps along the toroidal coordinate.

References

[1] N. Marushchenko, U. Gasparino, H. Maaßberg and M. Romé, Comp. Phys. Comm. **103**, 145 (1997)
[2] M. Romé, V. Erckmann, U. Gasparino, H. J. Hartfuß, G. Kühner, H. Maaßberg and N. Marushchenko, Plasma Phys. Control. Fusion **39**, 117 (1997)
[3] B. J. Braams and C. F. F. Karney, Phys. Fluids B **1**, 1355 (1989)
[4] N. B. Marushchenko, Y. Turkin, and H. Maaßberg, Comp. Phys. Comm. **185**, 165 (2014)