13^{th} INTERNATIONAL STELLARATOR WORKSHOP

MAPPING TECHNIQUE FOR STELLARATORS WITH REALISTIC MAGNETIC FIELD*

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A Monte-Carlo (MC) method to solve the drift kinetic equation using the stochastic mapping technique has been proposed in Ref. [1]. A numerical implementation of this approach has been presented in Ref. [2]. However, two major simplifications were made, namely the use of a simplified stellarator magnetic field configuration and the neglect of the quasi-static radial electric field.

Within the stochastic mapping approach, test particle orbits are traced only on those surfaces where the magnetic field module reaches a minimum along the magnetic field line, the minimum-B cuts. The full test particle orbit integration needed for the MC procedure is replaced by mapping of particle positions and velocities between minimum-B cuts. In this way the integration procedure is speeded up because the information about the respective particle dynamics is precomputed and stored. However, the complex topology of minimum-B cuts in realistic magnetic field structures poses a significant difficulty.

Therefore, for the implementation of the mapping technique, the topology of those cuts had been kept simple, i.e., only one minimum value of the magnetic field module within one toroidal field period was allowed. On the other hand, this assumption is not valid for almost all realistic stellarator magnetic fields. In the present report, more realistic topologies for stellarator configurations are considered and, in addition, also the effects of radial electric fields. The results for the transport coefficients obtained from the stochastic mapping technique are compared to the results obtained from a conventional MC procedure.

[1] S.V. Kasilov, V.E. Moiseenko, and M.F. Heyn, Phys. Plasmas, **4**(7), 2422-2435 (1997).
[2] S.V. Kasilov, W. Kernbichler, V.V. Nemov, and M.F. Heyn, 26^{th} EPS Conf. on Contr. Fusion and Plasma Physics, 14 - 18 June, 1999, Maastricht, ECA Vol.23J, 1629 (1999).

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