

Studies of the neoclassical transport for CNT*

B. Seiwald¹, V.V. Nemov^{1,2}, T. Sunn Pedersen³, W. Kernbichler¹

¹ Association EURATOM-ÖAW, Institut für Theoretische Physik - Computational Physics, TU Graz, Petersgasse 16, A-8010 Graz, Austria

² Institute of Plasma Physics, National Science Center "Kharkov Institute of Physics and Technology", Akademicheskaya Str. 1, 61108 Kharkov, Ukraine

³ Columbia University, Department of Applied Physics and Applied Mathematics, New York, New York 10027, USA

The Columbia Nonneutral Torus (CNT) [1] was designed as a simple and compact stellarator with only two pairs of circular, planar coils. The CNT is a two-period torsatron and consists of one pair of interlocking coils inside the vacuum vessel and another pair of coils, the poloidal field coils, outside the vacuum vessel. The experiment started operation in November 2004.

CNT was not optimized with respect to $1/\nu$ neoclassical transport, therefore, such studies are of interest and desirable. For such a task the code SORSSA [2] was adapted to CNT. SORSSA computes a normalized stored energy based on a simple transport model depending on the neoclassical effective ripple ϵ_{eff} [3]. For this purpose ϵ_{eff} is calculated by following the magnetic field line. Because the magnetic field is computed in real space coordinates directly from coil parameters there is no restriction to the complexity of the magnetic field.

First results of computations of the total stored energy are presented.

References

- [1] T. Sunn Pedersen, A.H. Boozer, J. P. Kremer, R. G. Lefrancois, W. T. Reiersen, F. Dahlgren, and N. Pomphrey. *Fusion Science and Technology*, 46:200, 2004.
- [2] B. Seiwald, V. N. Kalyuzhnyj, S. V. Kasilov, W. Kernbichler, and V. V. Nemov. *Fusion Science and Technology*, 50(3):447–456, 2006.
- [3] V. V. Nemov, S. V. Kasilov, W. Kernbichler, and M. F. Heyn. *Phys. Plasmas*, 6(12):4622–4632, 1999.

*This work, supported by the European Communities under the contract of Association between EURATOM and the Austrian Academy of Sciences, was carried out within the framework of the European Fusion Development Agreement. The views and opinions expressed herein do not necessarily reflect those of the European Commission. Additional funding is provided by the Austrian Science Foundation, FWF, under contract number P16797-N08.