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# P1.4002 Do we know how to simulate fusion plasma?

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See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.4002.pdf

Since more than three decades, numerical simulations of fusion plasmas have undergone significant development. Nowadays, access to the High-Performance Computing facilities allows one to model realistic plasma scenarios. The questions perhaps remain open about verification and validity of the results obtained from the numerical simulations.
It has been proved that the gyrokinetic models accurately predict violent, turbulent transport in the core region of a tokamak [1]. However, understanding of the processes in the edge of fusion devices, e.g. transition towards the high confinement mode with drastically increased plasma confinement, still be lacking. Several groups undertake the gyrokinetic simulations of the edge region across the world [2, 3, 4]. However, the codes models suitable for the core of the tokamak are unsuitable for simulations of the edge region. Indeed, the models for the edge should include electromagnetic effects and be fully non-linear. There exist no gyrokinetic code nowadays, possessing a self-consistent, energy conserving electromagnetic full-f model.
In this talk the two fold theoretical framework [5] for gyrokinetic models verification suitable for large spectrum of gyrokinetic codes will be presented for the edge modelling. It will be shown how the use of Hamiltonian and Lagrangian tools helps to prevent all the bottlenecks related to the models implemented in gyrokinetic simulations. Examples of test cases and simulations allowing to identify limits of currently implemented gyrokinetic models applications will be given for ORB5 code.

References
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## pppo

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