

How to keep up with fast ions in the increasingly complex fusion devices?

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This contribution aims at elucidating the field of modelling extremely energetic ions in hot fusion plasmas. We start by introducing the basic concepts, like identifying what are the energetic ions and what kind of configuration they are forced to move in. This is followed by a brief history of how we have moved from pen and paper to supercomputers. In this context, also the computational challenges that have arisen along the way are identified.

The second part of the presentation limits itself to addressing how these challenges have been tackled with the ASCOT suite-of-codes. Extreme examples regarding either numerical or computational challenges, together with how they were solved in this framework, are given. Many of these challenges are self-generated when we aim at ever more realistic and statistically reliable simulations of fusion plasmas, frequently requiring introducing new physics.

ASCOT suite-of-codes is a prime example of how the work carried out by a small group in a small country can grow to an international community of researchers. Consequently, today the development work is an effort joining fast-ion people from around the world. The basic principles of our development work are constant development, user friendliness via tutorial manuals and proper documentation, and training camps upon request.

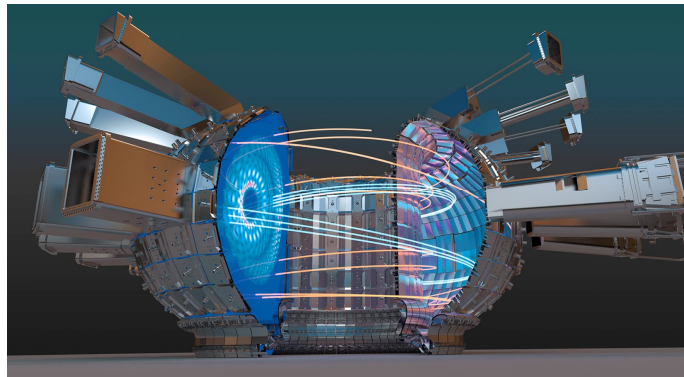


Figure 1: Artistic illustration of energetic ions in ITER © Jyrki Hokkanen, CSC