

Antoine Cerfon -- Courant Institute-New York

Computing accurate MHD equilibria for plasma waves simulations

The propagation of electromagnetic waves in fusion plasmas depends sensitively on the background magnetic configuration, which is computed by solving the equations for MHD equilibrium in the confined plasma. The purpose of this lecture is to review the essentials of MHD equilibrium theory, highlighting the aspects which have a direct impact on radiofrequency wave calculations, and to present modern numerical methods for the computation of MHD equilibria.

In the first part of the lecture, I will focus on the theoretical aspects of MHD equilibrium: regime of validity of the equations, differential and variational formulations, axisymmetric vs non-axisymmetric equilibria, modifications due to the presence of flows.

In the second part of the lecture, I will present well-established and cutting-edge numerical methods for the computation of MHD equilibria, with an emphasis on fast and high order accurate solvers, for both axisymmetric and non-axisymmetric equilibria.