Tipo di tesi: Laurea Magistrale
Corso di Laurea: Fisica
Tipologia: Modellistica
Titolo della tesi: DTT NBI fast particle modelling with Monte Carlo ASCOT code
Proponente: Pietro Vincenzi
Relatore Accademico: Tommaso Bolzonella
Capogruppo: Paolo Innocente
Argomento della tesi:
The student will simulate and analyse the behaviour of neutral-beam (NB) injected energetic particles (EPs) in tokamak plasma scenarios by means of a numerical Monte Carlo model. The work will contribute to the study of the NB injector capabilities for DTT project (Divertor Test Tokamak), the new Italian large experimental facility now being designed. Fast particles injected by NB are one of the most promising tools to achieve the temperatures needed in fusion-relevant tokamak plasmas. The energetic particles are injected at energies much higher than the target plasma (at least 10 times higher, in our case a NB energy of 400 keV). The injected neutrals are ionized in the plasma (becoming fast ions) and Coulomb collisions allow energy exchange between EPs and plasma ions/electrons during the slowing down process. EPs not only heat the plasma but can drive non-inductive currents and provide torque to the plasma.
The student will acquire familiarity with the physics problem of the interaction between NB EPs and plasma, described by the Fokker-Planck equation, and typical methods to evaluate the EPs distribution function (particularly Monte Carlo solvers). ASCOT Monte Carlo code allows to solve EPs orbits (solving the full gyro-motion orbit), taking into account Coulomb collision for the Fokker-Planck equation. It is important to know EPs orbits because the size and shape of these orbits drive different EP losses. The student will prepare and manage the input/output for the Monte Carlo code ASCOT and will be guided in the interpretation and visualization of the simulation results such as orbits, particle losses, heating and current drive in the plasma. The student will use existing tools and may develop further numerical tools such as Matlab/Python scripts for the analysis.
Competenze richieste: basic notions on tokamak plasma physics; basic knowledge of computational programming tools (e.g. matlab and/or similar – e.g. python)
Data della proposta: 28/01/2020
Stato: non assegnata
Laureando/a: