THEORETICAL MODELLING OF ECR PLASMAS FOR APPLICATION TO PANDORA

Electron cyclotron resonance ion sources (ECRIS) are versatile devices for supplying accelerators with highly charged ion beams. They are based on the dual concepts of magnetic confinement using a minimum-B profile and resonance heating through coupling with microwaves. The resultant plasmas are composed of energetic electrons obeying multi-component distribution functions, and cold ions generated through collisional ionization and radiative processes. For many years ECR plasmas have been used as mere ion sources but now the PANDORA facility at INFN-LNS aims to use them as a laboratory test bench to study phenomena of interest in astrophysics – in particular, the modification of β-decay rates in stellar plasmas, and heavy element opacity in early stage kilonovae. Given the significant complexity of the system, it is necessary to develop robust theoretical models of ECR plasmas that can allow studying these processes in a systematic manner, help connect laboratory measurements to stellar models, act as a powerful predictive tool to support experimental design and help advance our overall understanding of these devices. We present here an overview of optimized 3D particle-in-cell (PIC) code suites aimed at modelling electron and ion dynamics in a self-consistent manner, capturing the most relevant physics for each and capable of furnishing space-resolved information on density, energy, charge state distribution (CSD) and atomic level populations.

ESPRESSO SEMINARS

05 APRILE 2023 | ORE 15:00

AULA AZZURRA - LNS

INFN LNS