Ref. PROMETEO-LNF-T2: Wave-particle problem in plasmas for propulsion and fusion

Description and objectives:
The propagation of electromagnetic waves and their interaction with the electrons and ions of a fusion or propulsion magnetized plasma is a complex process that gives rise to transport phenomena that modify how the particles move across magnetic fields, energy exchanges, modification of the distribution function, and power deposition. These effects play an essential role on the physics of these plasmas, affecting the performance of space plasma thrusters and fusion reactors.

This activity interacts closely with PROMETEO-EP2-T2, and will be organized in the following tasks: (1) Estimate of the hot dispersion relation using the fully relativistic dielectric tensor for arbitrary wave vector, and perform studies with ray/beam tracing codes; (2) Implement a Particle-in-Cell code with Langevin formulation to study the effect of prescribed electromagnetic waves on the distribution function of electrons near the electron-cyclotron resonance; (3) Contribute to the advancement of the full-wave time-domain codes at LNF.

Specific Requirements:

- Excellent academic record. Strong background in the following fields will be appreciated:
  - Applied Mathematics
  - Scientific Programming (preferably in python, Fortran)
  - Plasma Physics (in particular, electromagnetic waves in plasmas)
  - Statistical mechanics
- Have completed 300 ECTS of university courses and meet the conditions to apply to an UC3M PhD program in 2019.
- Good skills in: team & independent working; critical & creative thinking; initiative & proactiveness; communication of scientific results
- Good proficiency in English (oral & written)
- Availability to travel abroad (e.g. conferences and research internships)

Expected output:
A minimum of two JCR research journals and two communications at relevant international conferences are expected as output of this PhD. International collaboration with other groups and a PhD internship of minimum three months abroad in a prestigious university/research center will be actively promoted.