The **Space Propulsion and Plasmas Team** (EP2) at UC3M and the **National Fusion Laboratory** (LNF) at CIEMAT have been awarded the 3-year project '**PROMETEO: Plasma Propulsion and Nuclear Fusion: innovating space transport**'. The project addresses fundamental challenges of space plasma thrusters and fusion plasmas, exploiting the synergies between the two groups. The project is structured around **five large objectives**: Turbulence and anomalous transport; Plasma-material interaction; Wave-plasma interaction and energy deposition; Multi-thruster simulation platform; Design and test of a disruptive electrodeless plasma thruster (EPT). The reinforcement of the teams for this project requires the incorpporation of two post-doc postion, so we issue the following

Open call:
This is an open call to hire **two researchers at post-doctoral level** at LNF to address the different objectives of the project. Strong interaction and collaboration among these two positions with the two wholw teams is expected. More information on the positions and their specific requirements can be found by following the links below:

- Ref. PROMETEO-LNF-D1: *Interaction between plasmas and alkaline metals*
- Ref. PROMETEO-LNF-D2: *Wave-particle problem in plasmas for propulsion and fusion*

Strong interaction with all activities and researchers within PROMETEO at both institutions will be part of the duties of the candidates.

General conditions:
- Base gross salary of 38000 €/year. Salary supplements may be awarded depending on institutional rules.
- Health care under the Spanish National System.

How to apply:
Interested candidates must sent their applications to francisco.castejon@ciemat.es (for the 2 LNF positions) **before April 30, 2019**. Late submissions will be considered under the discretion of the hiring committee.

Applications must include:
- The reference of the preferred position (as e-mail subject)
- Curriculum Vitae (max. 6 pages)
- A motivation letter of experience, interests, and future goals (max. 1 page)
- E-mail of at least 2 professional or academic references (the hiring committee will contact them)

Ref. PROMETEO-LNF-D1: Interaction between plasmas and alkaline metals

The interaction of the plasma with the electrodes and surrounding elements in the thruster is eventually responsible of the working life of the engine and, to large extent, of the microscopic properties of the plasma and its propelling capacity. The conditions of the electron secondary emission by the exposed material affect the plasma potential, its energy consumption and stability, as well as the material sputtered from the wall by erosion and is integrated in gas phase (for instance Xe) can affect the composition of propellant species in a non-predictable way. The techniques developed for plasma-wall interaction in fusion plasmas are fully applicable to thrusters.

In the proposed work, we will explore the possibility of using alkaline coverings to protect the electrodes and the effect of alkaline ions that may enhance the gas ionization by charge exchange reactions (e. g. +K+Xe→ +Xe+K). The erosion of BN, presently used as cell material, by Xe+ will be also characterized and the possible ways for its mitigating will be explored. Electrostatic probes, spectroscopy, and laser and high vacuum techniques will be used to study the cold plasmas generated.

Requirements:

- Doctor in Physics, Chemist-Physics or Materials engineer.
- Experience in working with alkaline metals like Li, Na, K, Rb in liquid and solid phase.
- Computation skills
- Fluent English
- The knowledge of vacuum techniques, plasma diagnostics and properties of lasers and liquid metals will be appreciated.

Ref. PROMETEO-LNF-D2: Plasma-wave interactions in thrusters and fusion palsmas in the range of electron cyclotron frequency.

The study of the interaction between electromagnetic waves and plasmas in thrusters and fusion plasmas presents several challenges, especially considering the disparate plasma parameters and conditions to be considered. Waves are of key importance for fusion plasmas to achieve plasma heating and current drive, which can also modify transport and to tailor the rotational transform profile. Regarding thrusters, the use of waves to create and heat plasmas can improve the global efficiency of the device and get it rid of the use of electrodes that limit the life of the engine.
The study of the processes of wave propagation and absorption need the use of techniques of ray tracing and full wave, including a realistic dielectric tensor that takes into account the relevant physics.
The research on the effect of waves on plasma heating, transport and current drive is also mandatory, since the waves will modify the plasma confinement. Several tasks must be developed by the hired person:

- To study the properties of propagation and absorption of waves in the ECR range in thurster and fusion plasmas. This study will require different techniques, form WKB approximation to the full wave calculations.
- Research on the impact of heating on plasma confinement and current. Here, Fokker-Planck and Langevin-equation-based PIC codes must be used.

Requirements:

- Doctor in Physics or Engineering (Telecommunications).
- Knowledge of wave properties and plasma-wave interactions
- Computation skills, including the use of parallel codes
- Fluent English