



# PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 39th cycle

**PNRR 118 INTERDISC Research Field: ADVANCED PLASMA THRUSTERS FOR SPACE PROPULSION**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1400.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	<p>Electric propulsion (EP) for space applications offers advantages compared to chemical propulsion, in terms of high specific impulse, reduced mass, and high flexibility regarding the propellants that can be used. EP can use nuclear and radiant power sources, which would allow its use for long-duration missions. Current EP technologies are characterized by low thrust and the presence of electrodes that limit the system's useful life and flexibility. A potential solution is to develop innovative EP systems in which the propellant is in a plasma state, such as microwave electrothermal thrusters and helicon plasma thrusters. The aim of this research is to study innovative plasma EP systems through a multi-physics and interdisciplinary approach, defining physical and technological limits to the increase in achievable propulsive power.</p>
<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>This research will be developed thanks to a joint collaboration between the Micro- and nanostructured laboratory (Nanolab), Department of Energy (DENG), and the Space Propulsion Laboratory (SPLab), Department of Aerospace Science and Technology (DAER). The project will exploit an integrated approach drawing upon expertise in physical disciplines such as plasma physics, atomic physics, and electromagnetism, as well as engineering</p>



	<p>disciplines such as aerospace and nuclear systems, orbital mechanics, thermofluidodynamics, and propulsion. This is reflected in the strong interdisciplinarity of the investigative methods, both numerical (kinetic, multi-fluid, magnetohydrodynamic simulations) and analytic-modeling (propulsion performance prediction, global energy balances, mission optimization). Additional competencies and skills will be developed during the period abroad, which will be carried out at a qualified research institution.</p>
<b>Educational objectives</b>	<p>Education of professionals able to work in the world of research and high technology industry, with a special focus on advanced topics in physics, nuclear science and technology, and aerospace engineering. The PhD graduate will be able to manage interdisciplinary issues, perform and interpret complex experiments and produce new equipment.</p>
<b>Job opportunities</b>	<p>Private and public R&amp;D. Highly qualified positions in a wide range of companies and research institutions working on high-tech topics such as space propulsion, advanced nuclear systems, plasmas for industrial applications.</p> <p>The present research will be performed in close collaboration with the company D-Orbit (<a href="https://www.dorbit.space/">https://www.dorbit.space/</a>), leader in space logistic and transportation. Other collaborations with national and international partners are foreseen.</p>
<b>Composition of the research group</b>	<p>3 Full Professors 5 Associated Professors 4 Assistant Professors 15 PhD Students</p>
<b>Name of the research directors</b>	<p>Matteo Passoni, Filippo Maggi</p>

<b>Contacts</b>	
<p>Matteo Passoni Phone: 02/23993267 Email <a href="mailto:matteo.passoni@polimi.it">matteo.passoni@polimi.it</a></p>	



Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	
By number of months at the company	0
Institution or company where the candidate will spend the period abroad (name and brief description)	to be defined
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Educational activities: Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentation and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.</p> <p>Teaching assistantship: Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p> <p>Computer availability: individual use. Desk availability: individual use.</p>