



## PhD in FISICA / PHYSICS - 39th cycle

### PNRR 117 Research Field: DIODE-PUMPED SOLID-STATE LASERS FOR SPACE APPLICATIONS

#### Monthly net income of PhDscholarship (max 36 months)

**€ 1200.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

#### Context of the research activity

##### Motivation and objectives of the research in this field

The main goal of this project is the development of diode-pumped near infrared solid-state lasers and amplifiers for the realization of innovative optical Radars and Telemeters operating in the near-infrared and its harmonics (visible as well as ultraviolet) for remote sensing by satellite. Spaceflight exposes the mission's instruments and components to extraordinary environmental conditions, from extreme g-forces at launch to severe temperature gradients and intense radiation fields. In this context, although in Italy there are many companies involved in the development of opto-electronic instrumentation to be installed on aerospace satellites, there are still few specific skills in the development of laser sources and laser technology for space applications. From this point of view, the activation of an industrial doctorate in the field of laser for space applications with the direct involvement of a leading company in the development of solid-state laser sources (Bright Solution S.r.l.) is of extreme interest. This industrial PhD will allow to cover a technological gap that limits the actual involvement of the Italian industry in the field of lasers for satellite applications. This activity well fit the mission of the PNRR DM-117 PhD program with the specific area of "Aerospazio" Aerospace. Indeed, the proposed PhD target is the development of laser instrumentations for remote sensing by satellite.

##### Methods and techniques that will be developed and used to carry out the research

In collaboration with the laser leading company Bright Solutions, a spin-off of University of Pavia, the scholar will



	develop diode-pumped novel solid-state laser architectures (design, construction and characterization of near infrared single frequency Q-switched lasers and amplifiers) as well as nonlinear frequency conversion in the visible and UV spectral regions for the implementation of optical instruments for the atmospheric remote sensing and telemetry from satellite. During the PhD there will also be a six-month internship at a foreign University/Research institution operating in the fields solid-state lasers for space applications (such as European Space Research and Technology Centre, Noordwijk, The Netherlands).
<b>Educational objectives</b>	The scholar will receive a multidisciplinary training in topics including laser physics, nonlinear optics, and material science with particular attention to space applications. He/she will be exposed to steps required for the industrial development of a deep-tech instrument such as optical radars and telemeters by the company Bright Solutions s.r.l..
<b>Job opportunities</b>	Due to the multidisciplinary training in cutting edge techniques of laser physics, optical radars and instrumentations, and optical, thermal, and mechanical properties of materials, the scholar will have excellent job opportunities in high-tech laser industries and space agencies. In addition, he/she will be also well positioned for an academic career.
<b>Composition of the research group</b>	2 Full Professors 2 Associated Professors 2 Assistant Professors 2 PhD Students
<b>Name of the research directors</b>	Paolo Laporta - Gianluca Galzerano

<b>Contacts</b>
Prof. Paolo Laporta: <a href="mailto:paolo.laporta@polimi.it">paolo.laporta@polimi.it</a>
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Contacts Bright Solutions S.r.l., Cura Carpignano (PV) :
Dr. Giuliano Piccinno: <a href="mailto:g.piccinno@brightsolutions.it">g.piccinno@brightsolutions.it</a>



Dr. Stefano Dell'Acqua:s.dellacqua@brightsolutions.it

#### 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	600.0 €
By number of months	6

#### National Operational Program for Research and Innovation

Company where the candidate will attend the stage (name and brief description)	Bright Solutions S.r.l., Cura Carpignano (PV)
By number of months at the company	18
Institution or company where the candidate will spend the period abroad (name and brief description)	European Space Research and Technology Centre, Noordwijk, The Netherlands (non ancora definito)
By number of months abroad	6

#### Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

**Educational activities:** Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences). Financial aid per PhD student per 3 years: max **4.892,40** euros per student.

**Teaching assistantship:** 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.

**Computer and Desk availability:** individual use.