



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

THEMATIC Research Field: PROMPT-GAMMA IMAGING PER LA VERIFICA DEL RANGE NELL'ADROTERAPIA

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0
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	<p>The intrinsically-localized irradiation capability of hadron therapy would require a real-time monitoring of the Bragg Peak, to verify the correspondence with the treatment plan and to avoid the irradiation of organs at risk. The activity proposed for this PhD position is in the framework of a project which aims at developing a real-time range verification system based on the measurement of prompt gamma rays, emitted almost instantaneously after the beam interaction with the patient's tissues. An industrial-oriented approach will be adopted to realize a complete prototype, from one side including the most advanced technical solutions for gamma-detection, but at the same time engineered and scaled appropriately to successfully demonstrate in a real clinical irradiation scenario the application of an online range verification technique. The specific objective of this activity is the support of the fundamental research of the project with adequate analytical and numerical tools, in particular to study a detection system based on merging multiple prompt-gammas detection techniques (imaging and spectroscopy) and on an active reduction of neutron background on the detector.</p>
Methods and techniques that will be developed and used to carry out the research	<p>The activities will be carried out by exploiting the method and instruments typical of the radiation detection and measurement field. More specifically, numerical tools</p>



	based on Monte Carlo method will be required for the design of the overall detection system performance and for the study of its behavior in real scenarios. Moreover, instruments able to characterize gamma and neutron fields will be adopted, in particular low resolution and high resolution spectrometers.
Educational objectives	The research will allow to gain high-level knowledge and skills about numerical methods and tools used for the study of radiation transport, gamma and neutron spectrometers, low-noise electronics and medical applications of radiation fields.
Job opportunities	Radiation detector industry, hadron therapy facilities, particle accelerator industry and research centres.
Composition of the research group	2 Full Professors 1 Associated Professors 1 Assistant Professors 2 PhD Students
Name of the research directors	Davide Bortot, Stefano Agosteo

Contacts

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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	750.0 €
By number of months	6

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

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, instrumentations and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.



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