

## INTERNSHIP OPPORTUNITY - CALL FOR APPLICATION

### Study of Slow Beam Extraction

- 1. Internship Number:** 101008548-3
- 2. Contract Type:** Internship
- 3. Level:** In possession of a Master degree or higher.  
(Level of internship may vary according to the level of the candidate)
- 4. Location:** CNAO – Centro Nazionale di Adroterapia Oncologica, Pavia, Italy
- 5. Field:** Physics/Engineering – Accelerator Physics
- 6. Mode:** Full Time
- 7. Duration:** 12 to 16 weeks
- 8. Possible Date Window:** between February 2022 and February 2023
- 9. Grant:**

There are two types of internships available:  
**Type A:** Funded at €2000 per month plus €300 for travel  
**Type B:** Internship funded by the applicant or by third parties  
Candidates are to indicate whether they are applying for Type A, Type B or both.

#### 10. Description:

CNAO is one of the four unique cancer treatment facilities in Europe that use proton and carbon ion therapy for cancer treatment. Such therapy makes it possible to irradiate tumours in places that are difficult to reach with minimal effect to surrounding healthy tissue hence significantly reducing side effects. CNAO offers a unique international state-of-the-art working environment built around a particle accelerator which is used for therapy and research.

The project consists of the simulation of slow beam extraction driven in different ways ranging from betatron core, quadrupole driven, radio-frequency knock-out with noise or radio-frequency knock-out by frequency sweep or even crystals. The extracted beam and the spill quality are quantities and parameters that have a large influence on the cancer treatment quality. New beam extraction schemes and parameters can help in improving the speed and the quality of the treatments. As an example, the radio-frequency knock-out frequency and strength variation can be optimized to reduce spill ripples and homogenize intensity profiles before the feedback takes over. If possible with the existing hardware, without hindering the normal operation, tests of the simulated procedures could be made on the CNAO synchrotron

#### 11. Candidate Tasks, Duties, Responsibilities:

The successful candidate will be performing simulations with general purpose accelerator codes or with specifically written routines, macros, external programs that he/she will write. He/she will have to work within the CNAO R&D group, produce and document the simulations performed and write an "operation manual" of the codes that he/she will write such that his/her work can be continued after by other students and researchers. An internal note shall be written describing the work done and the results obtained before the candidate leaves (or after leaving if the stay is short).



## 12. Candidate Eligibility:

For grant funded internship Type A:

- Candidates with EU member state citizenship
- Candidates from organisations/universities located within EU member states
- Candidates with citizenship of at least one of the following countries: Iceland, Norway, Albania, Bosnia and Herzegovina, North Macedonia, Montenegro, Serbia, Turkey, Israel, Moldova, Switzerland, Faroe Islands, Ukraine, Tunisia, Georgia, Armenia.
- Candidates from Kosovo\*\*

For student funded internship Type B:

- All candidates eligible for Type A internships
- All other international applicants

## 13. Candidate Requirements:

The candidate shall have at least a master level degree or equivalent in physics or engineering

The candidate shall have experience in accelerator physics and optics/dynamics simulations.

Experience with the particle accelerator code MADX is required.

Knowledge on slow extraction will be highly valued.

Coding skills in Matlab, Mathematica or Python are appreciated.

Data visualization capabilities are appreciated.

The candidate shall be fluent in English

Knowledge of Italian language is appreciated but not required.

## 14: Submission Details:

Interested candidates are to submit the following:

- a. A motivation letter
- b. A Curriculum Vitae
- c. Degree transcripts and supporting documentation to date
- d. Copy of Degree certificates to date
- e. Three reference letters
- g. Valid Covid-19 vaccination certificate. If this is not available at the application stage, candidates may opt to submit it at the interview stage. This should be indicated in the motivation letter.

\*NB: A limited number of candidates will be awarded an internship which includes a grant and a limited number of candidates will be awarded a position that does not include a grant. Candidates are to indicate in their motivation letter whether they are applying for a grant internship or a non-grant internship or both. To note that also applying for a non-grant internship does not reduce a candidate's chance of obtaining a grant internship but simply opens the candidate to more possibilities of obtaining an internship position. Candidates who are selected for non-grant internships will be asked to sign a declaration that they can cover their own expenses during the internship.

\*NB: Health and disability death insurance will have to be taken care of directly by the candidate.

*\*\*This designation is without prejudice to positions on status, and is in line with UNSC 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.*



**15: Submission Deadline:** Wednesday 5<sup>th</sup> January 2022

**16: Submission Contact:** Submissions are to be sent by email to: [nicholas.sammut@um.edu.mt](mailto:nicholas.sammut@um.edu.mt)  
Submissions are to clearly state the internship number and internship name in the email subject line and in the motivation letter

**17: Remarks:**

Only shortlisted candidates will be contacted and advance to the next stage of the selection process. Individuals engaged under such internship contracts will not be considered “staff members” under the Staff Regulations and Rules of the organisation policies and procedures, and will not be entitled to benefits provided therein (such as leave entitlements and medical insurance coverage). Their conditions of service will be governed by their internship contract and the general conditions of contracts for the services of consultants and individual contractors. Interns are responsible for determining their tax liabilities and for the payment of any taxes and/or duties, in accordance with local or other applicable laws.

