# Angelica De Gregorio

## Personal Information

• **Current position**: Ph.D. Student at "La Sapienza" University of Rome

#### EDUCATION

•	Ph.D. in Accelerator Physics, Sapienza University of Rome	November 2021-
-	Supervisor: Prof. Alessio Sarti.	
•	Researcher Fellow, CREF (Centro Studi e Ricerche E. Fermi) July 202	21- November 2021
	RSI FLASHDC – Contatore di dose in tempo reale per acceleratori di elettroni FLASH terapeutici.	
•	Master's degree in Physics, Sapienza University of Rome, 110/110	2018-2020
	"Nuclear fragmentation studies with the FOOT experiment: trigger optimization and cross section measurement.", advisor Prof. Giacomo Traini.	
•	Bachelor degree in Physics, Sapienza University of Rome	2014-2018
	"Chirurgia radioguidata con decadimento $\beta$ ", advisor Prof. Riccardo Faccini.	

## Ph.D. Schools

- JUAS: Joint Universities Accelerator School 2022; https://indico.cern.ch/event/1088622/.
- INFN School of Statistics; https://agenda.infn.it/event/28039.
- XIX Seminar on Software for Nuclear, Subnuclear and Applied Physics; https://agenda.infn.it/event/28830/.

## TRACK RECORDS

My research activity is mainly focused on the study of radiation interactions and in particular on the developments of tools for the medical application field. During my first year of studies, I developed an interest towards particle physics and in particular on its applications. I had the chance to follow different courses where I foster my interest on medical physics and in particular on Particle Therapy (PT). For my Master degree thesis I joined the Applied Radiation Physics Group (ARPG) which involves members University of Rome "La Sapienza" (Physics and SBAI Departments), INFN and CREF (Centro Ricerche Enrico Fermi). In particular, my activity has been focused on the FOOT (Fragmentation Of Target) experiment, which has been conceived to perform a set of measurements of nuclear cross-sections which will be used to develop a new generation of biologically oriented Treatment Planning Systems (TPS) for proton and heavy ion therapy. I gave my main contribution on the analysis of the data acquired at GSI (Darmstadt, Germany) in 2019 with an 16O beam at 400 MeV/u impinging on a C target, from which I performed the first preliminary cross section measurement using the FOOT apparatus. During my thesis I also worked on the validation of the fragments reconstruction algorithms developed for one of the FOOT detectors, an hodoscope of two layers of plastic scintillator bars, called Tof-Wall. In addition I have studied possible trigger implementation to be used in future data acquisitions in order to maximize the acquired fragmentation events. I had a researcher Fellow and contributed to the FLASH-DC project, whose aim is to develop a monitor for FLASH radiotherapy (RT), based on air fluorescent, capable at the same time to monitor online the dose of the single FLASH-RT pulses and their position with a resolution of the order of mm. In addition to the laboratory activity, I participated in a data taking, at the SIT - Sordina IORT Technologies S.p.A., of an electron beam produced by an accelerator machine for FlashRT. Currently, my research activity, as a Ph.D. student, is focused on the development of a tool for the optimization of the TPS using VHEE (very high energy electrons). In particular we have implemented a VHEE Treatment Planning System combining an accurate Monte Carlo (MC) simulation with a simple modelling of the FLASH effect. The dose maps obtained for a given set of conditions can been used as input for an optimisation algorithm capable of defining the beam fluence starting from the treatment dose prescription and the constraints on the organs at risk. In addition, I decided to continue the activity in the FOOT experiment, helping on the analysis of the data taken at GSI in 2019 and CNAO 2021.

# Conferences and Seminars

- iWoRiD: 22nd International Workshop on Radiation Imaging Detectors "The timing detectors of the FOOT experiment: the charge changing cross sections measured using 16O beams of 400 MeV/u energy", 27 June-1 July 2021; Oral Presentation.
- SIF: 107th Congresso Nazionale Società Italiana di Fisica "Measurements of 16O fragmentation cross sections on C target with the FOOT apparatus", 13-17 September 2021; **Oral Presentation**.
- ECMP: 4th European Congress of Medical Physics "A feasibility study of deep stated tumor treatments combining FLASH effect and Very High Energy Electron beams", 17-20 August 2022; Accepted Oral Presentation.

## Award and Scholarships

## Best Oral Communication, SIF 2021

<sup>•</sup> "Measurements of <sup>16</sup>O fragmentation cross sections on C target with the FOOT apparatus".

## Funded Projects as a member

- "FRIDA" Call CSNG5 INFN. Flash radiotherapy with hight dose-rate. I participate in WP4. Funding 2022: 225 keuro. PI: Alessio Sarti (Dipartimento SBAI, Sapienza)
- **"FOOT"** CSNG3 INFN Experiment. Cross section measurement for particle therapy and radioprotection in Space.
- "FLASH DC" Domanda n. PROT. A0375-2020- 36748. Avviso Pubblico "Gruppi di ricerca 2020" POR FESR Lazio 2014-2020.

### EXPLOITATION, COMMUNICATIONS AND DISSEMINATION

- Exhibition guide, "Quantum weeks" at Museo Storico della Fisica e Centro Studi e Ricerche E. Fermi Organization and partecipation, 8 Aprile 2022
- Exhibition guide, "Notte dei ricercatori" at Museo Storico della Fisica e Centro Studi e Ricerche E. Fermi Organization and partecipation, 24 September 2021

#### Publications

• M. De Simoni et al., A Data-Driven Fragmentation Model for Carbon Therapy GPU-Accelerated Monte-Carlo Dose Recalculation. Frontiers in Oncology,2022,12,2234-943X.DOI:10.3389/fonc.2022.780784