

# Giacomo Traini

## *Curriculum Vitae et Studiorum*

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### Personal information

First name Giacomo  
Last name Traini  
Place and date of birth  
Nationality  
Mail address

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### Education

- 2011 - 2014 **Master Degree in Physics**, *Università degli studi di Roma "La Sapienza"*, Title: *Ricostruzione del profilo di dose in trattamenti adroterapici tramite fotoni PET*, grade:110/110.
- 2008 - 2011 **Bachelor Degree in Physics**, *Università degli studi di Roma "La Sapienza"*, grade:110/110.

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### Current position

- 2014 - Present **Ph.D. student**, *Università degli studi di Roma "La Sapienza"*, Supervisor: Prof. Vincenzo Patera, Title: *Development of an innovative device for beam range monitoring in particle therapy*.

**Description of my research activity:** during my Ph.D. I focused my job on the development of an innovative detector for the on-line beam range verification in particle therapy, strongly needed for the quality assurance and improvement of treatments but still missing in clinical practice. The detector, named *Dose Profiler*, is designed to track the charged secondary particles produced due the interaction between the therapeutical beam and the patient nuclei, and is thought to assess the beam range from the reconstructed emission point pattern, achieved extrapolating the measured track towards the beam direction. The Dose Profiler is made by six planes of scintillating fibers read-out by arrays of Silicon PhotoMultipliers (SiPM), guaranteeing compactness and ease of placement in a treatment room. In 2014 a preliminary data-taking campaign has been performed at HIT (Heidelberg Io-Therapy center) to evaluate the feasibility of the technique and estimate the expected signal and background with a drift chamber and a LYSO calorimeter. During the first year of the Ph.D. I mainly contributed to perform the analysis of the collected data, developing a toy Monte Carlo simulation to give a proper evaluation of the detection efficiencies due to the dead time. In the second and third year of the Ph.D. I focused my activity on the development and test of the SiPM read-out electronics and DAQ system of the Dose Profiler. Firstly I setup a test-stand, based on VME data acquisition and a dedicated custom board, for the SiPM read-out ASIC test. Then I designed the firmware of FPGAs on which the Dose Profiler read-out system is based and I wrote the code for the PC interface. In February the whole detector has been assembled, and has been preliminarily characterized with cosmic rays. In May 2017 I participated in a test-beam at the trento ProtonTherapy center with the aim to characterize the detector with protons in the range of interest (50-220 MeV), finding the ideal working point in terms of gain, thresholds and temperature, and evaluating the detection efficiency. Finally in July 2017 a new data-taking campaign at CNAO has been performed to study the secondary charged particles produced by the irradiation of an antropomorphic phantom with a Carbon ion therapeutical beam. The thesis defence is expected in January 2018.

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## Languages

- Italian** Mother tongue.  
**English** Proficient in terms of reading, writing and speaking.

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## Skills

- Software skills**
- Operating systems: Linux, MacOS, Windows
  - Programming languages: C, C++, bash
  - Markup languages:  $\LaTeX$
  - Scientific software for data analysis: ROOT
- Hardware skills**
- Very good familiarity with NIM/VME laboratory instrumentations, capability to develop data acquisition systems based on VME standard.
  - Good familiarity with scintillator based detectors (assembling, maintenance, using).
  - Good experience to develop experimental setup with tracking detectors for time of flight and energy measurement of elementary particles.
  - Good knowledge of VHDL for FPGA firmware design.

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## Schools

- 2016 **Hadrontherapy School**, CNAO (Centro Nazionale Adritherapia Oncologica), Pavia, Italy
- 2015 **Excellence in Detectors and Instrumentation Technologies school**, Laboratori Nazionali di Frascati, Frascati, Italy

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## Conference contributions

- 2017 **Secondary charged fragments tracking for online beam range monitoring in Particle Therapy**, Talk, International Conference on Nuclear Tracks and Radiation Measurements, Strasbourg, France
- 2017 **Characterisation of a tracker for secondary fast and ultrafast neutrons**, Talk, International Workshop on Radiation Imaging Detectors 2017, Krakow, Poland
- 2016 **Dose Profiler: development of a device for online beam range monitoring in charged particle therapy treatments**, Talk, Mediterranean Thematic Workshop in Advanced Molecular Imaging, Ajaccio, France
- 2016 **A novel radio-guided surgery technique with  $\beta^-$  radiation**, Talk, Mediterranean Thematic Workshop in Advanced Molecular Imaging, Ajaccio, France
- 2016 **Realization of an innovative Dose Profiler for range monitoring in particle therapy treatments**, Poster, International Conference on Translational Research in Radio-Oncology - Physics for Health in Europe, Geneva, Sviss, 2016
- 2015 **Realization of an innovative Dose Profiler for range monitoring in particle therapy treatments**, Poster, Excellence in Detectors and Instrumentation Technologies school, Frascati, Italy

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## Publications on scientific journals

1. M. Vanstalle et al. “*Benchmarking Geant4 hadronic models for prompt- $\gamma$  monitoring in carbon ion therapy*”, *Physica Medica* 44(8) 2017, pp. 4276-4286, DOI: 10.1002/mp.12348
2. M. Marafini et al. “*MONDO: A neutron tracker for particle therapy secondary emission characterisation*”, *Phys. Med. Biol.* 62(8) 2017, pp.3299-3312, DOI: 10.1088/1361-6560/aa623a
3. E.S.Camilloci et al. “*Intraoperative probe detecting  $\beta^-$  decays in brain tumour radio-guided surgery*”, *NIM A* 2017, pp. 689-692, DOI: 10.1016/j.nima.2016.04.107
4. G.Battistoni et al., “*Design of a tracking device for on-line dose monitor in hadrontherapy*”, *NIM A*, Volume 845, pp. 679-683, DOI:10.1016/j.nima.2016.05.095
5. G.Traini et al. “*Design of a new tracking device for on-line beam range monitor in carbon therapy*”, *Physica Medica* 34 2017, pp. 18-27, DOI: 10.1016/j.ejmp.2017.01.004
6. M.Marafini et al. “*Secondary radiation measurements for particle therapy applications: nuclear fragmentation produced by  $^4\text{He}$  ion beams in a PMMA target*”, *Phys. Med. Biol.* 2017 , 62(4), pp. 1291-1309, DOI: 10.1088/1361-6560/aa5307
7. I.Mattei et al. “*Secondary radiation measurements for particle therapy applications: prompt photons produced by  $^4\text{He}$ ,  $^{12}\text{C}$  and  $^{16}\text{O}$  ion beams in a PMMA target*”, *Phys. Med. Biol.* 2017, 62(4), pp. 1438-1455, DOI: 10.1088/1361-6560/62/4/1438
8. E.S.Camilloci et al. “*First ex vivo validation of a radioguided surgery technique with  $\beta^-$  radiation*”, *Physica Medica*, 32(9), pp. 1139-1144, DOI:10.1016/j.ejmp.2016.08.018
9. S.Muraro et al. “*Monitoring of hadrontherapy treatments by means of charged particle detection*”, *Review Article Front. Oncol.* 6(AUG), 177 , DOI: 10.3389/fonc.2016.00177
10. I.Mattei et al. “*Prompt- $\gamma$  production of 220 MeV/u ( $^{12}\text{C}$ ) ions interacting with a PMMA target*”, *JINST* 10 (2015) no.10, P10034 DOI: 10.1088/1748-0221/10/10/P10034

Rome, September 8, 2017

Signature

