

# RICCARDO MIRABELLI

## Curriculum Vitae

Place **Rome**

Date **23/01/2023**

### Part I – General Information

Full Name	Riccardo Mirabelli
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### Part II – Education

Type	Year	Institution	Notes (Degree, Experience,...)
University graduation (Bachelor Degree)	2014	Department of Physics, “Sapienza” - Università di Roma	<i>Bachelor Degree</i> in Physics “ <i>Rivelatori per Scintigrafia (SPECT Detectors)</i> ” 110/110 Supervisor: Prof. R. Faccini and Dr. M.Marafini <b>“Sapienza” - Università di Roma, Rome, Italy</b>
University graduation (Master Degree)	2016	Department of Physics, “Sapienza” - Università di Roma	<i>Master Degree</i> in Physics “ <i>Caratterizzazione di un prototipo di tracciatore per l’esperimento MONDO</i> ” ( <i>Characterisation of a tracker prototype for the MONDO experiment</i> ) 110/110 <i>cum laude</i> Supervisor: Prof. R. Faccini and Dr. M.Marafini <b>“Sapienza” - Università di Roma, Rome, Italy</b>
PhD	2020	“Sapienza” - Università di Roma	<i>Ph.D.</i> in Accelerator Physics (XXXII cycle) “ <i>Development of a new tracking device for characterisation and monitoring of ultra fast neutron beams</i> ” Supervisor: Prof. V. Patera and Dr. M.Marafini <b>“Sapienza” - Dipartimento SBAI, Università di Roma. Rome, Italy</b>  Ph.D School Attended:  - 07/2018 <b>NDRA2018</b> - <i>Summer School in Neutron Detectors</i> , Riva del Garda (TN), Italia - 10/2017 <b>SQUAD2017</b> - <i>Advanced School on QUAntum Detectors</i> , Trento, Italia; - 01-02/2017 <b>JUAS 2017 - ESI</b> - <i>Joint Universities Accelerator School</i> , Archamps, Francia. Final examination: graduated (Top 8).

### Part III – Appointments

#### IIIA – Academic Appointments

Start	End	Institution	Position
N o v . 2019	A u g . 2021	<b>Dipartimento di Fisica, “Sapienza” - Università di Roma,</b> Rome, Italy <b>INFN - Sezione di Roma Scientific Association</b>	Assegnista di Ricerca (FIS/01-02/A1) <i>“Development of low energy radiation detectors for medical application”</i> Supervisor: Prof. R. Faccini
S e p . 2021	A u g . 2022	<b>Dipartimento di Chimica e Tecnologie del Farmaco, “Sapienza” - Università di Roma,</b> Rome, Italy <b>INFN - Sezione di Roma Scientific Association</b>	Assegnista di Ricerca (FIS/01-02/A1) <i>“Ottimizzazione e sviluppo di metodiche di rilevazione per studi di biodistribuzione di radiofarmaci marcati con emettitori beta-” (Optimization and development of detection methods for beta- radiopharmaceuticals biodistribution studies)</i> Supervisor: Prof. D. Rotili
O c t . 2022	Ongoing	<b>Dipartimento di Scienze di Base e Applicate per l’Ingegneria, “Sapienza” - Università di Roma,</b> Rome, Italy <b>INFN - Sezione di Roma Scientific Association</b>	Assegnista di Ricerca (FIS/01-02/A1) <i>“Sviluppo di un monitor per applicazioni alla FLASH therapy”</i> Supervisore: Prof. A.Sarti

### Part IV – Teaching experience

Year	Institution	Lecture/Course
2019- 2020	<b>Dipartimento di Fisica, “Sapienza” - Università di Roma, Roma, Italia</b>	Course of <i>Scientific Computation</i> for foreign students

2018-2019	<b>Dipartimento di Scienze di Base e Applicate all'Ingegneria (SBAI), "Sapienza" - Università di Roma.</b> Rome, Italy	<i>Assistant</i> for the course of <i>Physics I (Classical Mechanics and Thermodynamics)</i> held by Prof. A. Sarti for Mechanical Engineer students.
2017-2018	<b>Dipartimento di Scienze di Base e Applicate all'Ingegneria (SBAI), "Sapienza" - Università di Roma.</b> Rome, Italy	<i>Assistant</i> for the course of <i>Physics II (Electromagnetism and Optics)</i> held by Prof. M.Migliorati for Space and Astronautical Engineer students.
2017-2018	<b>Dipartimento di Fisica, "Sapienza" - Università di Roma,</b> Rome, Italy	<i>Assistant</i> for the course of <i>Math OFA (Obblighi Formativi Aggiunti)</i> for students with formative debts.
2014-2015	<b>Dipartimento di Fisica, "Sapienza" - Università di Roma,</b> Rome, Italy	<i>Assistant</i> for the course <i>Electronics Laboratory (Laboratorio di Segnali e Sistemi)</i> for Physics students.
2018-Ongoing	<b>Dipartimento di Fisica, "Sapienza" - Università di Roma,</b> Rome, Italy	<i>Supervisor of 4 Bachelor Students and 1 Master Student</i>

#### Part V - Society memberships, Awards and Honors

Year Title

2016-Ongoing	<b>INFN - Sezione di Roma</b> <i>Scientific Association</i>
2017-2020	<b>Museo Storico della Fisica e Centro Studi e Ricerca 'Enrico Fermi' (CREF)</b> <i>Scientific Association</i>
2016	<b>102 Congresso Nazionale SIF</b> , Padova, Italia, " <i>MONDO: a neutron tracker for particle therapy secondary emission fluxes measurements.</i> ". <u>Special mention for the best presentation in "Medical Physics and Biophysics session"</u> . Contribution on <i>IL NUOVO CIMENTO</i> 40 C (2017) 99 DOI 10.1393/ncc/i2017-17099-0

#### Part VI - Funding Information [grants as PI-principal investigator or I-investigator]

Year Title Program Grant value

2021-2022	“Sviluppo di un rivelatore innovativo per la misurazione della biodistribuzione in piccoli animali di radiofarmaci marcati con Y90 (Development of an innovative detector for biodistribution measurements of Y90-labeled radiopharmaceuticals in small animals)”.	Avvio alla ricerca (Young Researcher financing) - “Sapienza” - Università di Roma	3k€ (P.I.)
2017-2018	“Misura della risoluzione temporale del sistema ToF dell’esperimento FOOT (FragmentatiOn On Target) basato su un calorimetro phoswich (Measurement of the ToF system resolution for the FOOT experiment based on a phoswich calorimeter)”	Avvio alla ricerca (Young Researcher financing) - “Sapienza” - Università di Roma	1k€ (P.I.)
2020-2023	“Nanomaterials for nanomedicine: from chemical synthesis to applications”	Progetti Medi Sapienza - “Sapienza” -Università di Roma	15 k€
2020-2023	“WIDMAPP:Wearable Individual Dose Monitoring Apparatus”	<b>INFN CSN V Experiment</b>	Ongoing -Responsible of the Working Package 3: Measurement on test phantoms.
2018-2021	“SOLE: Secondary photons OnLine monitor Experiment”	Progetti Medi Sapienza - “Sapienza” - Università di Roma	12 k€
2018-2020	“SPARE (Space Radiation Shielding)”	<b>Premiale MIUR 2016</b>	1.432 k€

**Part VII – Research Activities**

Keywords

Brief Description

<p>Particle Therapy Nuclear Fragmentation</p>	<p>Scientific Collaorations: <b>TIFPA</b> - Trento Institute for Fundamental Physics and Application; <b>FBK</b> - Fondazione Bruno Kessler; <b>CNAO</b> - Centro Nazionale di Adroterapia Oncologica, Pavia</p> <p>I joined the ARPG (Applied Radiation Physics Group) during my Master Thesis in Particle Physics and I decide to continue my work in the collaboration also for my Ph.D thesis.</p> <p>My main activity concerns <b>the development of a tracking device for fast and ultra-fast secondary neutrons detection for applications in Particle Therapy and in radio-protection in space</b>: I collaborate on the construction of the MONDO prototype at “Sapienza” Università di Roma - SBAI department in close collaboration with the mechanical service. I partecipate to the data taking campaigns with electrons at Beam Test Facility of INFN-LNF and with protons at the Trento Proton Therapy Centre experimental room. In parallel, in collaboration with Fondazione Bruno Kessler (FBK), I work at <b>the development of the electronic readout of the MONDO experiment</b>, a new SPAD array sensor. I am collaborating with the FBK engineers in the design phase, in the development of the acquisition software and in the electronic test of the device. Since 2017 I am also responsible of <b>the implementation of the readout system in the FLUKA Monte Carlo simulation</b> of the MONDO detector. Moreover, using the knowledge acquired with MONDO, I participated to the development of the Dose Profiler detector (INSIDE collaboration).</p> <p>From 2016 to 2019 I was a member of the <b>FOOT (INFN-CSN III)</b> collaboration, devoted to the Relative Biological Effectiveness (RBE) proton measurements for PT applications and radio-protection measurements for space applications. My work in the collaboration has been focused on the test of the “Start Counter” time detector performances. I also gave an important contribution to the R&amp;D work aimed to <b>develop a phoswich detector</b> made by the combination of fast plastic scintillator and BGO crystal.</p> <p>Oral presentation:</p> <p>09/2019 <b>105 Congresso Nazionale SIF</b>, L’Aquila, Italia, “<i>MONDO tracker for secondary ultra-fast neutron characterization in Particle Therapy</i>”</p> <p>11/2018 <b>IEEE Nuclear Science Symposium and Medical Imaging Conference</b>, Sydney, Australia, “<i>In-room performance evaluation of a novel charged particles monitor of light ions PT treatments</i>”.</p> <p>06/2018 <b>World Congress on Medical Physics and Biomedical Engineering</b>, Praga, Repubblica Ceca, “<i>Particle Therapy secondary neutrons characterisation with the MONDO project</i>”.</p> <p>09/2017 <b>103 Congresso Nazionale SIF</b>, Trento, Italia, “<i>Study and design of a Drift Chamber for the FOOT experiment</i>” &amp; “<i>MONDO neutron tracker characterisation by means of proton therapeutical beams and Monte Carlo simulation studies</i>”</p> <p>05/2017 <b>8th Young Researchers Meeting</b>, Cagliari, Italia, “<i>MONDO: A tracker for the characterization of secondary fast and ultrafast neutrons emitted in Particle Therapy</i>”. Contribution on IOP Conf. Series: Journal of Physics: Conf. Series 956 (2018) 012013 doi:10.1088/1742-6596/956/1/012013</p> <p>09/2016 <b>102 Congresso Nazionale SIF</b>, Padova, Italia, “<i>MONDO: a neutron tracker for particle therapy secondary emission fluxes measurements.</i>”. <u>Special mention for the best presentation in “Medical Physics and Biophysics session”</u>. Contribution on IL NUOVO CIMENTO 40 C (2017) 99 DOI 10.1393/ncc/i2017-17099-0</p>
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Fast Scintillators development	<p>Since 2018 I am involved in the TOPS (Time Of flight Plastic Scintillators) project, a collaboration with scientists of different backgrounds (chemists, solid state physicists, particle physicist, ecc.) for the realisation of <b>new fast plastic scintillators</b>. I am in charge of new scintillators time resolution measurements with different readout systems. I participate to the calibration data taking of the new plastic scintillator sample with m.i.p. particles, radioactive sources and with light ions (protons and carbon ion) beam at CNAO.</p> <p>Oral presentation: 09/2019 <b>FATA2019: FAsT Timing Applications for nuclear physics and medical imaging workshop</b>, Catania, Italia, "<i>TOPS Project: Development of New Fast Timing Plastic Scintillators</i>".</p>
Nuclear Medicine Application Probes and Live Bioimaging	<p>Scientific Collaboration: <b>IEO - Istituto Europeo di Oncologia; Policlinico Universitario Agostino Gemelli - Università Cattolica del Sacro Cuore; IFO - Istituti Fisioterapici Ospedalieri - Istituto Nazionale Tumori Regina Elena; VUB - Vrije Universiteit Brussel</b></p> <p>I contributed on a project in which <b>radio-guided surgery can be performed by means of a novel probe exploiting the detection of <math>\beta</math> radiation</b>. In particular I collaborate to the feasibility study for expanding the application cases of the <math>\beta</math> probe to gynecological tumor with F18 based radiofarmaceuticals uptake. I am also the person in charge for the development a <b>multi-channel</b> version of the existing probe. I am collaborating at the design phase and I am conducting the campaigns of measurements for its characterization.</p> <p>I am also collaborating at the In-vivo tests of <math>\beta^+</math> Radioguided Surgery on Intestine Neuroendocrine Tumors with <math>^{68}\text{Ga}</math>-DOTATOC and on Prostate Cancer with <math>^{68}\text{Ga}</math>-PSMA: I am one of the person in charge at the development of the final design of the <math>\beta</math> laparoscopic probe and I am also one of the responsible of the analysis of the data obtained in the experimentation.</p> <p>I am also the responsible for the realization of a <b>new detector for small-animal bio-distribution measurements with <math>\beta^-</math> radiofarmaceuticals</b>. The device, after its realisation, will be used for the validation of a new class of <math>^{90}\text{Y}</math>-based radiofarmaceuticals.</p> <p>Within the <b>WIDMApp project (INFN - CSN V)</b>, devoted to the precise determination of absorbed dose in Molecular Radio Therapy through an innovative system of wearable photon counters, <b>I am the responsible of the measurements campaigns of the detector on different phantoms</b> of the in order to test the feasibility of the whole system.</p> <p>Oral presentation: 06/2022 <b>World Congress on Medical Physics and Biomedical Engineering</b>, Singapore (Partecipazione Online), "<i>Feasibility study of a Wearable Individual Dose Monitoring Apparatus for Internal Dosimetry in Targeted Radionuclide Therapy</i>". 11/2020 <b>XIX Congresso Nazionale SIRR (Società Italiana Ricerca sulle Radiazioni)</b>, Online, "<i>Feasibility study of a Wearable Individual Dose Monitoring Apparatus for Molecular radionuclide therapy</i>"</p>

## Part VIII – Summary of Scientific Achievements

Product type	Number	Data Base	Start	End
Papers [international]	46	Scopus	01/01/2017	18/01/2023
Papers [national]	0			
Books [scientific]	0			
Books [teaching]	0			

Total Impact factor	89,40
Total Citations	214
Average Citations per Product	4,65
Hirsch (H) index	9
Normalized H index*	1,5

\*H index divided by the academic seniority.

## Part IX– Selected Publications

List of the publications selected for the evaluation. For each publication report title, authors, reference data, journal IF (if applicable), citations, press/media release (if any).

- (1) Morganti, S. et al, *Technical note: A wearable radiation measurement system for collection of patient-specific time-activity data in radiopharmaceutical therapy: system design and Monte Carlo simulation results* (2021) *Medical Physics*, 48 (12), pp. 8117-8126. DOI: 10.1002/mp.15311. Impact Factor: 4,506; Citations: 0.
- (2) Collamati, F. et al, *Radioguided surgery with  $\beta$  – radiation in pancreatic Neuroendocrine Tumors: a feasibility study* (2020) *Scientific Reports*, 10 (1), art. no. 4015. DOI: 10.1038/s41598-020-61075-2. Impact Factor: 4,38; Citations: 5.
- (3) Fischetti, M. e al., *Inter-fractional monitoring of  $^{12}C$  ions treatments: results from a clinical trial at the CNAO facility* (2020) *Scientific Reports*, 10 (1), art. no. 20735. DOI: 10.1038/s41598-020-77843-z. Impact Factor: 4,38; Citations: 11.
- (4) Toppi, M. et al (Mirabelli, R. Corresponding author), *The MONDO Tracker: Characterisation and Study of Secondary Ultrafast Neutrons Production in Carbon Ion Radiotherapy* (2020) *Frontiers in Physics*, 8, art. no. 567990, . DOI: 10.3389/fphy.2020.567990. Impact Factor: 3,560; Citations:0.
- (5) Morganti, S. et al, *Tumor-non-tumor discrimination by a  $\beta$ - detector for Radio Guided Surgery on ex-vivo neuroendocrine tumors samples* (2020) *Physica Medica*, 72, pp. 96-102.DOI: 10.1016/j.ejmp.2020.03.021. Impact Factor: 2,685; Citations: 5.
- (6) Collamati, F. et al, *A DROP-IN beta probe for robot-assisted  $^{68}Ga$ -PSMA radioguided surgery: first ex vivo technology evaluation using prostate cancer specimens* (2020) *EJNMMI Research*, 10 (1), art. no. 92. DOI: 10.1186/s13550-020-00682-6. Impact Factor: 3,138; Citations: 11.
- (7) Collamati, F. et al, *Characterisation of a  $\beta$  detector on positron emitters for medical applications* (2019) *Physica Medica*, 67, pp. 85-90. DOI: 10.1016/j.ejmp.2019.10.025. Impact Factor: 2,485; Citations: 6.
- (8) Russomando A. et al, *The  $\beta$  - radio-guided surgery: Method to estimate the minimum injectable activity from ex-vivo test* (2019) *Physica Medica*, 58, pp. 114-120. DOI: 10.1016/j.ejmp.2019.02.004. Impact Factor: 2,485. Citations: 9.
- (9) Collamati F. et al, *Radioguided surgery with  $\beta$  radiation: a novel application with  $Ga^{68}$*  (2018)



Scientific Reports, 8 (1), art. no. 16171 . DOI: 10.1038/s41598-018-34626-x. Impact Factor: 4,011. Citations: 16.

- (10) Mirabelli R. et al, *The MONDO Detector Prototype Development and Test: Steps Toward an SPAD-CMOS-Based Integrated Readout (SBAM Sensor)* (2018) IEEE Transactions on Nuclear Science, 65 (2), pp. 744-751. DOI: 10.1109/TNS.2017.2785768. Impact Factor: 1,575; Citations: 8
- (1) Mancini-Terracciano C., *Feasibility of beta-particle radioguided surgery for a variety of “nuclear medicine” radionuclides* (2017) Physica Medica, 43, pp. 127-133. DOI: 10.1016/j.ejmp.2017.10.012. Impact Factor: 2,24. Citations: 19.
- (2) Marafini M., *MONDO: A neutron tracker for particle therapy secondary emission characterisation* (2017) Physics in Medicine and Biology, 62 (8), pp. 3299-3312. DOI: 10.1088/1361-6560/aa623a. Impact Factor: 2,665; Citations: 21