Riccardo Rossini

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Research Interests

Muon experiments
> My main research interest is the development of radiation detectors for muon experiments. My PhD work is focused on the activity of the **FAMU** experiment for the measurement of the Zemach radius of the proton in muonic hydrogen. I also work in **CHNet-MAXI**, a study of feasibility for muon-based isotopic analysis of lead samples.

Muon beam monitors
> I work on muon beam monitors for both experiments from all points of view: detector design, simulation, data acquisition, data analysis. I am carrying out FAMU and CHNet-MAXI beam monitor calibration with proton beams at CNAO (Pavia, Italy) and with muon beams at RIKEN-RAL (Didcot, UK).

FAMU data analysis
> My current analysis task in FAMU consists in conceiving a method for data normalisation based on the muon beam intensity and shape.

Employment History

2024 – now
> **Assegno di Ricerca** (post-doc), Department of Physics, University of Pavia, Italy.

Education

2021 – now
> **Ph.D. student in Physics, University of Pavia & INFN Pavia**
> Research topics: Nuclear Physics, Physics of fundamental interacton, Muonic atom X-ray Emission Spectroscopy. Activity within the FAMU (INFN, CSN III) and CHNet-MAXI (INFN, CSN V) experiments.
> Thesis title: *Exploring the proton structure with the FAMU experiment: detector performance and first physics results*
> Internal supervisor: Prof Alessandro Menegolli.
> External supervisor: Dr Massimiliano Clemenza (INFN Milano-Bicocca).
> Long-term Visitor at the **Rutherford Appleton Laboratory**, Didcot, UK.

2019 – 2021
> **Master's Degree in Physics, Univerity of Milano-Bicocca**
> Curriculum in Particle and Applied Physics. Mark: **110/110, cum Laude**.
> Thesis title: *Multidisciplinary protocol in the study of meteorites: γ-ray spectroscopy and neutron techniques combined with μ-Raman and SEM-EDS*.
> Supervisors: Prof Giuseppe Gorini, Dr Maya Musa (Gulf Institute of Gemology, Oman), Dr Daniela Di Martino, Dr Massimiliano Clemenza.

2016 – 2019
> **Bachelor Degree in Physics, Univerity of Milano-Bicocca**
> Mark: **107/110**
> Thesis title: *Neutron studies on $\beta \rightleftharpoons \alpha$ transition in tin-based commercial and historical samples*. Experimental campaign at the ISIS Neutron and Muon Source (Didcot, UK) on 7-11 Oct. 2019.
> Supervisors: Dr Daniela Di Martino, Dr Curzio Merlo.

Further training activities

National & International Schools

2023   ■ **X International Geant4 School** (Pavia, Italy, 16-20 January 2023).

2022   ■ **INFN School of Statistics 2022** (Paestum, Italy, 15-20 May 2022).

2021   ■ **AMARCH 2021**, theoetical and practical school on X-Ray Fluorescence (XRF) and X-Ray Diffraction (XRD) in archaeometry (online, 10-12 February 2021).

Teaching Experience

2023 – now   ■ **Laboratory of Ionising Radiations**, Master's Deg. in Physics, University of Pavia
Lecturer and tutor (8h) of Nuclear and Subnuclear Physics experiments for students of the Master's Degree in Physics. Focus: *characterisation of a HPGe detector*.

2022 – now   ■ **Laboratory of Physics III**, Bachelor Deg. in Physics, University of Pavia
Lecturer and tutor (26h) of Nuclear and Subnuclear Physics experiments for 3rd-year students of the Bachelor Degree in Physics. Focus: *detection of cosmic muons with scintillators read by SiPMs; study of neutron-activated targets with scintillators read by SiPMs and PMTs at the LENA reactor in Pavia.*

   ■ **Physics**, Bachelor Deg. in TeDCAT, University of Pavia
Tutor (30h) of General Physics (lectures and problem solving) for 1st-year students of the Bachelor Degree in Digital Technology for Construction and Environment (TeDCAT).

2021 – 2022   ■ **Physics I**, Bachelor Deg. in Mthematics & Physics, University of Milano-Bicocca
Tutor (40h) for the problem solving in mechanics, thermodynamics and special relativity for 1st-year students of the Bachelor Degree in Physics.

2020 – 2021   ■ Bachelor Deg. in Physics, University of Milano-Bicocca
Support tutor (78h) for 1st year students of the Bachelor Degree in Physics.

2020   ■ LABEX project, University of Milano-Bicocca
Tutor (46h) for the LABEX outreach project (laboratory of Modern Physics) for High School students. Focus: *scintillation chamber for the detection of cosmic muons.*

Further Experience & Personal Interests

Science communication   ■ Volunteer (2018-2020) at the LABEX project, University of Milano-Bicocca.

Student representative   ■ Student rep. (2017 – 2021) in the Physics Department of the University of Milano-Bicocca. Vice-president (2017 – 2019) of the CPDS commission of the same department.

Organisation/Leading skills   ■ As a student rep. I gained experience in public relations and organisation skills. I organised and managed a trip to ITER (France) for 50 students. I was Staff Leader at the SpaceJump seminar with ESA astronaut Samantha Cristoforetti (Milano-Bicocca, May 2018), leading and helping the staff coping with about 800 attendees.

Skills

Languages   ■ Italian native.
English C1 (advanced level in CEFR), CAE C1 certificate achieved in 2013.
French B1 (intermediate level in CEFR).

Skills (continued)

Coding
- C, C++, Python, MATLAB, ROOT, LaTeX, GEANT4. Software for the analysis of Diffraction patterns (Mantid, GSAS)

Hardware
- Nuclear Physics instrumentation: scintillation and HPGe detectors, PMT, SiPM; NIM and VME electronics, DAQ systems; proton, muon and neutron beam setups.
  Material analysis instrumentation: ToF Neutron Diffraction, radioactivity measurements with gamma spectrometry, Raman, SEM, XRF.

National and International Conferences

International Conferences

ICHEP24 (2024)
- **42nd International Conference on High Energy Physics (ICHEP)** (Prague, Czech Republic, 18-24 July 2024). Talk:
  R. Rossini for the FAMU Collaboration; *The LaBr3-based detection setup for the FAMU experiment at RIKEN-RAL.*

PM24 (2024)
- **16th Pisa Meeting on Advanced Detectors** (La Biodola, Isola d'Elba, Italy, 26-31 May 2024). Poster presentations ($\times 2$):
  R. Rossini for the FAMU Collaboration; *The LaBr3-based detection setup for the FAMU experiment at RIKEN-RAL.*
  R. Rossini for the CHNet-MAXI Collaboration; *A muon beam monitor for the CHNet-MAXI experiment at RIKEN-RAL laboratory.*

IPRD23 (2023)
- **16th Topical Seminar on Innovative Particle and Radiation Detectors** (Siena, Italy, 25-29 May 2023). Talk and poster:
  Plenary talk: R. Rossini for the FAMU Collaboration; *Status of the FAMU experiment at RIKEN-RAL for a precision measurement of the Zemach radius of the proton in muonic hydrogen.*
  Poster presentation: R. Rossini, R. Benocci, et al.; *Characterisation of a low-momentum high-rate muon beam monitor for the FAMU experiment at RIKEN-RAL.*

3rd RANC (2023)
- **3rd International Conference on RadioAnalytical and Nuclear Chemistry** (Budapest, Hungary, 7-12 May 2022). Talk:
  R. Rossini, O. Cremonesi, et al.; *The role of gamma-ray spectrometry and Monte Carlo simulation in the characterisation of meteorites.*

NDIP20 (2022)
- **9th Conference on New Development in Photodetection** (Troyes, France, 4-8 July 2022). Poster presentations ($\times 6$):
  R. Rossini, R. Benocci, et al.; *Characterisation of muon and proton beam monitors based on scintillating fibers with a SiPM read-out.*
  R. Benocci, R. Bertoni, et al.; *Large area LaBr$_3$:Ce crystals read by SiPM arrays with improved timing and temperature gain drift control.*
  R. Benocci, M. Bonesini, et al.; *Characterisation of solid-state detectors for MIR radiation around 7 μm.*
  M. Bonesini, A. Menegolli, et al.; *Comparison of new SiPM models for applications in High-Energy Physics.*
  R. Rossini for the HERD Collaboration; *Beam test characterisation of SiPMs reading a a Plastic Scintillator Prototype for the space-based cosmic ray experiment HERD.*
  R. Rossini for the ICARUS Collaboration; *The scintillation light detection system of ICARUS T600: hardware implementation and early results.*

National and International Conferences (continued)

PM22 (2022) ◼ **15th Pisa Meeting on Advanced Detectors** (La Biodola, Isola d'Elba, Italy, 22-28 May 2022). Poster presentation:
R. Rossini, R. Benocci, et al.; *Characterisation of a scintillating fibre-based hodoscope exposed to the CNAO low-energy proton beam.*

ICRM-LLRMT 22 (2022) ◼ **8th Conference of the International Committee for Radionuclide Metrology on Low Level Radiation Measurements Techniques** (L'Aquila, Italy, 2-6 May 2022). **Plenary talk**:
R. Rossini, D. Di Martino, et al.; *Low-background gamma spectroscopy and neutron diffraction in the study of stony meteorites.*

Reviews for International Scientific Journals

Reviewer for publications on the Journal of Radioanalytical Nuclear Chemistry (JRNC).

References

Available on Request

Pavia, October 22, 2024
Riccardo Rossini

Research Publications by Riccardo Rossini

1 R. R. on behalf of the FAMU Collaboration, "First operations of the famu experiment at riken-ral," *submitted for publication on Proceedings of Science*, vol. -, pp. -, 2024, ISSN: -. DOI: -.

2 R. R. on behalf of the FAMU Collaboration, "The 2024 labr3(ce) detector setup for the famu experiment," *accepted for publication on NIM A*, vol. -, pp. -, 2024, ISSN: -. DOI: -.

3 A. Mazzinghi, L. Castelli, C. Ruberto, *et al.*, "X-ray and neutron imaging for cultural heritage: The infn-chnet experience," *Eur. Phys. J. Plus*, vol. 139, p. 635, 2024. DOI: 10.1140/epjp/s13360-024-05429-z.

4 A. Menegolli, G. Raselli, S. Copello, *et al.*, "A goniometric measurement system for reflection, diffusion, and transmission characterization in the vuv range," *NIM A*, vol. 1066, p. 169 666, 2024. DOI: 10.1016/j.nima.2024.169666.

5 G. Raselli, F. Boffelli, S. Copello, *et al.*, "A cryogenic system for measuring in the vuv range the absolute quantum efficiency of light detectors with large sensitive area," *NIM A*, vol. 1068, p. 169 807, 2024. DOI: 10.1016/j.nima.2024.169807.

6 R. Rossini, A. Adamczak, D. Bakalov, *et al.*, "Status of the detector setup for the famu experiment at riken-ral for a precision measurement of the zemach radius of the proton in muonic hydrogen," *Journal of Instrumentation*, vol. 19, no. 02, p. C02034, 2024. DOI: 10.1088/1748-0221/19/02/C02034.

7 R. Rossini, G. Baldazzi, S. Banfi, *et al.*, "The muon beam monitor for the famu experiment: Design, simulation, test, and operation," *Frontiers in Detector Science and Technology*, vol. 2, 2024, ISSN: 2813-8031. DOI: 10.3389/fdest.2024.1438902.

8 R. Rossini, R. Benocci, R. Bertoni, *et al.*, "Characterisation of a low-momentum high-rate muon beam monitor for the famu experiment at the cnao-xpr beam facility," *Journal of Instrumentation*, vol. 19, no. 01, p. C01024, 2024. DOI: 10.1088/1748-0221/19/01/C01024.

9 R. Rossini, M. Bonesini, M. Cataldo, *et al.*, "A muon beam monitor for the chnet-maxi experiment at the riken-ral laboratory," *NIM A*, vol. 1069, p. 169 824, 2024, ISSN: 0168-9002. DOI: 10.1016/j.nima.2024.169824.

10 R. Rossini, O. Cremonesi, M. Cataldo, D. Di Martino, M. Laubenstein, and M. Clemenza, "The role of gamma-ray spectrometry and monte carlo simulation in the characterisation of meteorites," *J Radioanal Nucl Chem*, 2024. DOI: 10.1007/s10967-023-09296-3.

11 M. Bonesini, R. Benocci, R. Bertoni, *et al.*, "Large area labr3:ce crystals read by sipm arrays with improved timing and temperature gain drift control," *NIM A*, vol. 1046, p. 167 677, 2023, ISSN: 0168-9002. DOI: 10.1016/j.nima.2022.167677.

12 M. Bonesini, R. Benocci, R. Bertoni, *et al.*, "One inch labr3:ce detectors, with temperature control and improved time resolution for low energy x-rays spectroscopy," *PoS*, vol. EPS-HEP2023, p. 547, 2023. DOI: 10.22323/1.449.0547.

13 M. Bonesini, C. De Vecchi, A. Menegolli, *et al.*, "Comparison of new sipm devices for applications in high-energy physics," *NIM A*, vol. 1047, p. 167 903, 2023, ISSN: 0168-9002. DOI: 10.1016/j.nima.2022.167903.

14 C. Petroselli, L. Bomben, S. Carsi, *et al.*, "A portable γ spectroscopy detector for didactic applications," *Il Nuovo Cimento C*, p. 191, 5 2023. DOI: 10.1393/ncc/i2023-23191-9.

15 R. Rossini, R. Benocci, R. Bertoni, *et al.*, "Characterisation of a scintillating fibre-based hodoscope exposed to the cnao low-energy proton beam," *NIM A*, vol. 1046, p. 167 746, 2023, ISSN: 0168-9002. DOI: 10.1016/j.nima.2022.167746.

[16] R. Rossini, R. Benocci, R. Bertoni, *et al.*, "Characterisation of muon and proton beam monitors based on scintillating fibres with a sipm read-out," *NIM A*, vol. 1046, p. 167 684, 2023, ISSN: 0168-9002. DOI: 10.1016/j.nima.2022.167684.

[17] R. Rossini, M. Clemenza, D. Di Martino, *et al.*, "Low-background gamma spectrometry and neutron diffraction in the study of stony meteorites," *Applied Radiation and Isotopes*, vol. 193, p. 110 653, 2023, ISSN: 0969-8043. DOI: 10.1016/j.apradiso.2023.110653.

[18] R. Rossini, D. Di Martino, T. Agoro, *et al.*, "A new multidisciplinary non-destructive protocol for the analysis of stony meteorites: Gamma spectroscopy, neutron and muon techniques supported by raman microscopy and sem-eds," *J. Anal. At. Spectrom.*, vol. 38, pp. 293–302, 2 2023. DOI: 10.1039/D2JA00263A.

[19] A. Vacchi, E. Mocchiutti, A. Adamczak, *et al.*, "Investigating the proton structure: The famu experiment," *Nuclear Physics News*, pp. 1–8, 2023. DOI: 10.1080/10619127.2023.2198913.

[20] M. Musa, R. Rossini, D. Di Martino, M. Riccardi, M. Clemenza, and G. Gorini, "Combining micro-raman spectroscopy and scanning electron microscopy mapping: A stony meteorite study," *Materials*, vol. 14, no. 24, 2021, ISSN: 1996-1944. DOI: 10.3390/ma14247585.