Christian Di Carlo, Ph.D.

Italian National Institute of Health
National Center for Radiation Protection and Computational Physics

Employment History

2023-ongoing — **Technical Inspector** at **ACCREDIA**, the Italian Accreditation Body.

2021-ongoing — **Researcher** at the National Center for Radiation Protection and Computational Physics of the **Italian National Institute of Health**.

Nominated Expert for the Scientific Committee on the Effects of Atomic Radiation of the **United Nations**.

2021 — **Research Assistant** at the National Center for Radiation Protection and Computational Physics of the **Italian National Institute of Health**.

Research Assistant at the Department of Basic and Applied Sciences for Engineering of **Sapienza - University of Rome**.

2021-ongoing — **Professor** at the Department of Astronautical, Electrical and Energy Engineering of **Sapienza - University of Rome**.
Subject: *Radiation Protection for the Environment and the Nuclear Medicine* for the *Master Degree in Nuclear Engineering*

2017–2021 — **Mentor** at the Department of Basic and Applied Sciences for Engineering of **Sapienza - University of Rome**.
Subject: *Radiation Protection* for the *Master Degree in Nuclear Engineering*

Mentor at the Department of Basic and Applied Sciences for Engineering of **Sapienza - University of Rome**.
Subject: *Measurement and Characterization of Nuclear Materials* for the *Master Degree in Nuclear Engineering*

2018–2020 — **Mentor** at the Department of Basic and Applied Sciences for Engineering of **Sapienza - University of Rome**.
Subject: *Physics* for the *Bachelor Degree in Clinical Engineering*

2017–2020 — **Mentor** at the Department of Basic and Applied Sciences for Engineering of **Sapienza - University of Rome**.
Subject: *Physics* for the *Bachelor Degree in Chemical Engineering*

2017 — **Intern** at the Laboratory of Radiation Protection of **Sapienza - University of Rome**.

2015 — **Intern** at **Nucleco S.p.a.**, ENEA Casaccia Research Center.

Education

2017 – 2020 — **Ph.D., Sapienza - University of Rome** in Energy and Ambient.
Thesis title: *Radon in indoor air and water: design and development of experimental apparatuses and measurement protocols*.

2023 — **Qualification to the Profession of Radiation Protection Expert - II Degree** (Italian legislation).

2020 — **Qualification to the Profession of Radiation Protection Expert - I Degree** (Italian legislation).

2018 — **Qualification to the Profession of Engineer** (Italian legislation).

2015 – 2017 — **Master Degree** at **Sapienza - University of Rome, Italy** in Nuclear Engineering.
Thesis title: *Design and commissioning of an affordable apparatus for computed axial micro-tomography*.

2012 – 2015 — **Bachelor Degree** at **Sapienza - University of Rome, Italy** in Energy Engineering
Thesis title: *Evaluation of radioactive gaseous effluents from treatment system for solid waste of Nucleco S.p.A. repository at the ENEA Casaccia Research Center*.

Research Publications

Journal Articles

1. Michalik, B., Dvorzhak, A., Pereira, R., Lourenco, J., Haanes, H., **Di Carlo, C.**, Nuccetelli, C., Venoso, G., Leonardi, F., Trevisi, R., Trotti, F., Ugolini, R., Pannecoucke, L., Blancharte, P., Perez-Sanchez, D., Real, A., Escribano, A. N., Fevrier, L., Kallio, A., … Popic, J. M. (2023). A methodology for the systematic identification of naturally occurring radioactive materials (NORM). *Sci Total Environ*, 163324. https://doi.org/10.1016/j.scitotenv.2023.163324

2. Mrdakovic Popic, J., Haanes, H., **Di Carlo, C.**, Nuccetelli, C., Venoso, G., Leonardi, F., Trevisi, R., Trotti, F., Ugolini, R., Dvorzhak, A., Escribano, A., Perez Sanchez, D., Real, A., Michalik, B., Pannecoucke, L., Blanchart, P., Kallio, A., Pereira, R., Lourenço, J., … Fevrier, L. (2023). Tools for harmonized data collection at exposure situations with naturally occurring radioactive materials (NORM). *Environment International*, *175*. https://doi.org/10.1016/j.envint.2023.107954

3. **Di Carlo, C.**, Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C., Caccia, B. & Bochicchio, F. (2023). Extreme reverse seasonal variations of indoor radon concentration and possible implications on some measurement protocols and remedial strategies. *Environmental Pollution*, *327*. https://doi.org/10.1016/j.envpol.2023.121480

4. **Di Carlo, C.**, Maiorana, A., Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C. & Bochicchio, F. (2023). Models of radon exhalation from building structures: General and case-specific solutions. *Sci Total Environ*, 163800. https://doi.org/10.1016/j.scitotenv.2023.163800

5. **Di Carlo, C.**, Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C. & Bochicchio, F. (2022). Thoron interference on performance of continuous radon monitors: An experimental study on four devices and a proposal of an indirect method to estimate thoron concentration. *International Journal of Environmental Research and Public Health*, *19*, 2423. https://doi.org/10.3390/ijerph19042423

6. Venoso, G., Iacoponi, A., Pratesi, G., Guazzini, M., Boccini, L., Corbani, E., Bucci, S., Leonardi, F., Trevisi, R., Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C., **Di Carlo, C.** & Bochicchio, F. (2021). Impact of temporal variability of radon concentration in workplaces on the actual radon exposure during working hours. *Scientific Report*, 1–9. https://doi.org/10.1038/s41598-021-96207-9

7. Antignani, S., Venoso, G., Ampollini, M., Caprio, M., Carpentieri, C., **Di Carlo, C.**, Caccia, B., Hunter, N. & Bochicchio, F. (2020). A 10-year follow-up of yearly indoor radon measurements in homes, review of other studies and implications on lung cancer risk estimates. *Science of The Total Environment*, *762*, 144150. https://doi.org/10.1016/j.scitotenv.2020.144150

8. Venoso, G., Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C., **Di Carlo, C.** & Bochicchio, F. (2020). Short-Term Annual Variations of Radon Concentration in Workplaces: Some Results in a Research Institute. *Radiation Protection Dosimetry*, 1–6. https://doi.org/10.1093/rpd/ncaa138

9. Caprio, M., Venoso, G., Ampollini, M., Antignani, S., Carpentieri, C., **Di Carlo, C.**, Pozzi, S., Carelli, V., Cordedda, C., Bottacchiari, F. & Bochicchio, F. (2020). Evaluation of Representativeness of Samples used for Indoor Radon Surveys. *Radiation Protection Dosimetry*, 1–4. https://doi.org/10.1093/rpd/ncaa135

10. Curguz, Z., Venoso, G., Zunic, Z. S., Mirjanic, D., Ampollini, M., Carpentieri, C., **Di Carlo, C.**, Caprio, M., Alavantic, D., Kolarz, P., Stojanovska, Z., Antignani, S. & Bochicchio, F. (2020). Spatial Variability of Indoor Radon Concentration in Schools: Implications on Radon Measurement Protocols. *Radiation Protection Dosimetry*, *25*, 1–5. https://doi.org/10.1093/rpd/ncaa137

11. **Di Carlo, C.**, Venoso, G., Lepore, L., Ampollini, M., Carpentieri, C., Antignani, S., Caprio, M., Remetti, R. & Bochicchio, F. (2020). Reproducibility of Radon-in-Water Measurements by Emanometry Technique. *Radiation Protection Dosimetry*, 1–5. https://doi.org/10.1093/rpd/ncaa142

12. Bochicchio, F., Ampollini, M., Antignani, S., Caccia, B., Caprio, M., Carpentieri, C., **Di Carlo, C.**, Nuccetelli, C., Pozzi, S., Valentini, S. & Venoso, G. (2020). A short summary of past and recent activities on protection from radon exposure carried out by the Italian National Institute of Health. *Contemporary Materials*, *11*(1), 1–8. https://doi.org/10.7251/COMEN2001001B

13. Colenghi, V., Lepore, L., **Di Carlo, C.**, Bochicchio, F. & Remetti, R. (2020). Development of an electrostatic precipitator prototype to reduce exposure to radon progeny in poorly ventilated workplaces. *Journal of Radiation Research and Applied Sciences*. https://doi.org/10.1080/16878507.2020.1838039

14. **Di Carlo, C.**, Lepore, L., Venoso, G., Ampollini, M., Carpentieri, C., Tannino, A., Ragno, E., Magliano, A., D'Amario, C., Remetti, R. & Bochicchio, F. (2019). Radon concentration in self-bottled mineral spring waters as a possible public health issue. *Scientific Reports*, *9*(1), 14252. https://doi.org/10.1038/s41598-019-50472-x

15. Bochicchio, F., Ampollini, M., Antignani, S., Carpentieri, M., C. Caprio, Caccia, B., **Di Carlo, C.**, Pozzi, S., Valentini, S. & Venoso, G. (2019). Protection from radon in Italy: past, present and perspectives. *Romanian Journal of Physics*, *64*(9-10).

16. Centomani, G., **Di Carlo, C.**, Lepore, L. & Remetti, R. (2019). Design and commissioning of an innovative radon chamber with a single 226Ra source and continuous variation and control of concentration vs. time. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, *940*(June), 109–115. https://doi.org/10.1016/j.nima.2019.05.084

17. Venoso, G., Ampollini, M., **Di Carlo, C.**, Carpentieri, C. & Bochicchio, F. (2019). Some practical improvements of radon concentration measurement protocols to reduce costs and environmental impact. *Romanian Journal of Physics*, *64*(7-8), 8–13.

Conference Proceedings

18. Nuccetelli, C., Venoso, G., **Di Carlo, C.**, Trotti, F., Ugolini, R., Trevisi, R., Leonardi, F. & Urso, L. Sviluppo di una metodologia a livello europeo per la valutazione della dose dei lavoratori agricoli a seguito dell'utilizzo di fanghi NORM in agricoltura. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2022"*. Milano (Italy), 2022, September.

19. Venoso, G., Ampollini, M., **Di Carlo, C.** & Nuccetelli, C. Il trasferimento di efficienza per le misure di spettrometria gamma ad alta risoluzione: Validazione di software (ANGLE ed EFFTRAN) con sorgenti di taratura di varie geometrie. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2022"*. Milano (Italy), 2022, September.

20. Carpentieri, C., Kunte, A. & **Di Carlo, C.** Large scale building radon remediation: Survey results. In: *Radon Outcomes on Mitigation Solutions (ROOMS), 2022*. Bergen (Norway), 2022.

21. Nuccetelli, C., **Di Carlo, C.**, Venoso, G., Trotti, F., Ugolini, R., Trevisi, L. & Urso, L. Development of a methodology at European level for dose-assessment of agricultural workers following use of NORM sludge in agriculture. In: *Proceedings of NORM X Conference*. Utrecht (Netherlands), 2022.

22. **Di Carlo, C.**, Ampollini, M., Carpentieri, C., Caprio, M., Antignani, S. & Bochicchio, F. Remediation of a large-scale building in rome. In: *Radon Outcomes on Mitigation Solutions (ROOMS), 2022*. Bergen (Norway), 2022.

23. **Di Carlo, C.**, Leonardi, F., Trevisi, R. & Remetti, R. Spatial variability of radon concentration in large buildings: A case study in a university campus. In: *Proceedings of 10th International Conference on High Level Environmental Radiation Areas*. Strasbourg (France), 2022.

24. **Di Carlo, C.**, Venoso, G., Ampollini, M., Carpentieri, C., Caprio, M., Antignani, S. & Bochicchio, F. Proposal of an affordable method to estimate indoor thoron concentration close to the walls using active radon monitors. In: *Proceedings of 10th International Conference on High Level Environmental Radiation Areas*. Strasbourg (France), 2022.

25. Urso, L., Fohlmeister, J., Dilling, J., Achatz, M., Trotti, F., Ugolini, R., Perez-Sanchez, D., Popic, J. M., Nuccetelli, C., Venoso, G., **Di Carlo, C.**, Trevisi, R., Leonardi, F., Fevrier, L. & Caplin, H. Development of a methodology for dose assessment and estimate of amount of NORM residues disposable at landfills for conventional waste. In: *Proceedings of NORM X Conference*. Utrecht (Netherlands), 2022.

26. Nuccetelli, C., Venoso, G., **Di Carlo, C.**, Ampollini, M., Trotti, F., Ugolini, R., Caldognetto, E., Trevisi, R. & Leonardi, F. Esposizioni ai NORM: Attività dell'Italia nell'ambito del progetto europeo RadoNORM. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2021"*. Roma (Italy), 2021, September, 245.

27. Venoso, G., Ampollini, M., **Di Carlo, C.** & Nuccetelli, C. La correzione per effetto somma in coincidenza nelle misure di spettrometria gamma ad alta risoluzione: Proposta di un metodo semi-empirico. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2021"*. Roma (Italy), 2021, September.

28. Pugliese, M., Nuccetelli, C., Trotti, F., Bucci, S., Pinto, I., La Verde, G., Venoso, G., **Di Carlo, C.**, Caldognetto, E., Ugolini, R., Leonardi, F., Luzzi, L. & Trevisi, R. Protocols and computational methods to support stakeholders of NORM-related industrial sectors in Italy: a research project. In: *Book of abstracts 2nd ENA Workshop*. 2020.

29 Caprio, M., Venoso, G., Antignani, S., Ampollini, M., Carpentieri, C., **Di Carlo, C.**, Carelli, V., Cordedda, C., Bottacchiari, F. & Bochicchio, F. Evaluation of representativeness of samples used for indoor radon surveys. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 19.

30 Carpentieri, C., **Di Carlo, C.**, Venoso, G., Ampollini, M., Bonifazi, S., Dante, V., Petetti, E., Pozzi, S., Valentini, S., Caccia, B. & Bochicchio, F. Radon mitigation actions in large public buildings: some review and a case study. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 78.

31 **Di Carlo, C.**, Venoso, G., Ampollini, M., Caccia, B., Carpentieri, C., Pozzi, S. & Bochicchio, F. Variazioni stagionali inverse della concentrazione di radon indoor e relativo impatto sui protocolli di misura. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2019"*. Perugia (Italy), 2019, September, 442–452. ISBN: 9788888648484.

32 **Di Carlo, C.**, Venoso, G., Ampollini, M., Carpentieri, C., Caprio, M. & Bochicchio, F. Thoron interference in radon measurements for different radon monitors: results and proposal for an estimation method. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 35.

33 **Di Carlo, C.**, Venoso, G., Lepore, L., Ampollini, M., Carpentieri, C., Pozzi, S., Caprio, M., Remetti, R. & Bochicchio, F. Reproducibility of radon-in-water measurements by emanometry technique. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 56.

34 Venoso, G., Ampollini, M., Antignani, S., Caprio, M., Carpentieri, C., **Di Carlo, C.** & Bochicchio, F. Annual variations of indoor radon concentration in workplaces: some results and implications on protocols. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 26.

35 Venoso, G., Curguz, Z., Zunic, Z., Mirjanic, D., Ampollini, M., Carpentieri, C., **Di Carlo, C.**, Caprio, M., Alavantic, D., Kolarz, P., Stojanovska, Z., Antignani, S. & Bochicchio, F. Spatial variability of indoor radon concentration in schools: implications on radon measurement protocols. In: *Book of abstracts 9th International Conference on Protection against Radon at Home and at Work*. Prague (Czech Republic), 2019, September, 32.

36 Venoso, G., **Di Carlo, C.**, Ampollini, M., Antignani, S., Carpentieri, C., Caprio, M. & Bochicchio, F. Impatto della presenza di thoron sulle prestazioni dei monitor attivi per la misura della concentrazione di radon in continuo. In: *Atti "Convegno Nazionale AIRP di Radioprotezione 2019"*. Perugia (Italy), 2019, September, 159–168. ISBN: 9788888648484.

37 Bochicchio, F., **Di Carlo, C.**, Ampollini, M., Caccia, B., Carpentieri, C., Pozzi, S. & Venoso, G. Extreme reverse seasonal variations of indoor radon concentration: a case study. In: *Book of Abstracts 3rd International Conference "Radon in the Environment 2019"*. Kraków (Poland), 2019, May, 17.

38 **Di Carlo, C.**, Lepore, L., Venoso, G., Ampollini, M., Carpentieri, C., Tannino, A., Ragno, E., Magliano, A., Remetti, R. & Bochicchio, F. First survey on radon concentration in mineral spring waters in Lazio region, Italy. In: *Book of Abstracts 3rd International Conference "Radon in the Environment 2019"*. Kraków (Poland), 2019, May, 72.

39 Venoso, G., Ampollini, M., Carpentieri, C., **Di Carlo, C.** & Bochicchio, F. Experimental evaluation of ageing and fading effects over 3, 6, and 12 months for three radon concentration measurement techniques based on nuclear track detectors. In: *Book of Abstracts 3rd International Conference "Radon in the Environment 2019"*. Kraków (Poland), 2019, May, 20.

40 **Di Carlo, C.**, Lepore, L., Gugliermetti, L. & Remetti, R. An inexpensive and continuous radon progeny detector for indoor air-quality monitoring. In: *WIT Transactions on Ecology and the Environment*. *236*. Aveiro (Portugal), 2019, 325–334. https://doi.org/10.2495/air190321.

41 **Di Carlo, C.**, Remetti, R., Leonardi, F., Trevisi, R., Lepore, L. & Ippolito, R. Indoor radon survey in university buildings: A case study of Sapienza – University of Rome. In: *WIT Transactions on Ecology and the Environment*. *236*. Aveiro (Portugal), 2019, 317–324. https://doi.org/10.2495/air190311.

Books and Chapters

42 World Health Organization. (2022). *Guidelines for drinking-water quality: Fourth edition incorporating the first and second addenda* (4th ed + 1st add + 2nd add). World Health Organization.

43 Cinelli, G., De Cort, M., Tollefsen, T., Achatz, M., Ajtić, J., Ballabio, C., Barnet, I., Bochicchio, F., Borelli, P., Bossew, P., Braga, R., Brattich, E., Briganti, A., Carpentieri, C., Castellani, C. M., Castelluccio, M., Chiaberto, E., Ciotoli, G., Coletti, C., … Zhukovsky, M. (2019). *European Atlas of Natural Radiation*. Publication Office of the European Union.

Skills

Languages	Strong reading, writing and speaking competencies for English and Italian. Intermediate writing and speaking, and strong reading competencies for Spanish.
Coding	Python, MATLAB, Visual Basic, C++, LaTeX .
Simulation	RESRAD ONSITE, OFFSITE, BUILD & BIOTA, Monte Carlo N-Particle Transport Code, Angle, MicroShield Pro.
3D Modelling	Autodesk™-AutoCAD, SOLIDWORKS.
Image & Video	Adobe Photoshop, Adobe Premiere, MAGIX, Sony Vegas Pro.
Misc.	Academic research, teaching, training, consultation, LaTeX typesetting and publishing.

Il sottoscritto **Di Carlo Christian**, consapevole che (ai sensi dell'art. 76 del D.P.R. 445/2000) le dichiarazioni mendaci, la falsità negli atti e l'uso di atti falsi sono puniti ai sensi del codice penale e delle leggi speciali, dichiara che le informazioni contenute nel curriculum vitae rispondono a verità.

Il sottoscritto **Di Carlo Christian** autorizza il trattamento dei dati personali contenuti nel presente curriculum vitae ai sensi dell'art. 13 del D. Lgs. 196/2003 e all'art. 13 del Regolamento UE 2016/679 per la protezione delle persone fisiche e giuridiche riguardo al trattamento dei dati personali.

Roma, 30 agosto 2023