Scientific and Academic Curriculum

Luca Ghislotti

Università degli Studi di Bergamo

Department of Engineering and Applied Sciences

Microelectronics Laboratory

Bio

I am a Computer Engineer and a Ph.D. student in microelectronics for high-energy physics at the Microelectronics Laboratory in the Department of Engineering and Applied Sciences at the University of Bergamo. I work as a technologist at the Pavia branch of the Italian National Institute of Nuclear Physics (INFN) within the CSN2 particle physics division, and I previously served as an associate research fellow at the Astrophysics Laboratory of Columbia University. My research focuses on the design and characterization of analog integrated circuits for the readout of silicon-strip detectors employed in high-energy physics and astrophysics experiments.

I am currently contributing to the development of the General AntiParticle Spectrometer (GAPS) Antarctic balloon experiment as part of the GAPS collaboration. GAPS is a NASA, JAXA, INFN and ASI experiment that is designed to precisely measure the flux of low-energy cosmic-ray antideuterons, antiprotons, and antihelium as an indirect signature of dark matter.

Personal Details

Place and Date of Birth:	Treviglio (BG), 03/02/1998
Personal Email Address:	ghislottiluca@gmail.com
Academic Email Address:	luca-ghislotti@unibg.it
GitHub:	https://github.com/lucaghislo
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Personal Web Page:	https://lucaghislotti.com
Laboratory Web Page:	https://microlab-unibg.it/

Academic Education and Training

Doctor of Philosophy (Ph.D.) - Engineering and Applied Sciences (XXXVIII cycle)

SSD: IINF-01/A - Electronics (Microelectronics for High Energy Physics)
Università degli Studi di Bergamo, Bergamo (2022 - 2025)

Thesis:	"Design, Testing, and Calibration of the GAPS Experiment Si(Li) Tracker Readout ASIC: From the First Flight Campaign Toward the Second Mission Upgrade"
Supervisor:	Prof. Massimo Manghisoni
Co-Supervisor:	Dr. Elisa Riceputi
Ph.D. Coordinator:	Prof. Alessandra Marini
Keywords:	ASIC, Silicon Detectors, Readout Electronics, CMOS Technology, Dark Matter

Research Associate II at Columbia University

Astrophysics Laboratory - Columbia University, New York (August 1, 2023 - July 31, 2024)

Master of Science (M.Sc.) - Computer Engineering (LM-32)

Università degli Studi di Bergamo, Bergamo (2020 - 2022)

Thesis:	"Characterization of the readout electronics of the Si(Li) tracker for the first flight of the GAPS experiment" [PDF]
Supervisor:	Prof. Massimo Manghisoni
Keywords:	GAPS, Dark Matter, Spectrometer, Si(Li), ASIC
Final Grade:	110/110 cum laude

Bachelor of Science (B.Sc.) - Computer Engineering (LM-8)

Università degli Studi di Bergamo, Bergamo (2017 - 2020)

Thesis:	"Data Anonymization Techniques: Implementation in the Apache Spark Environment"
Supervisor:	Prof. Stefano Paraboschi
Keywords:	Data Anonymization, Apache Spark, Apache Hadoop, Privacy, Computer Security
Final Grade:	107/110

Secondary School Diploma - IT and Telecommunications Engineering

Centro Studi Leonardo da Vinci, Bergamo (2012 - 2017).

Final Project:	"Where's my car? Sistema di localizzazione GPS"
Final Grade:	100/100

Scholarships and Certificates

Ph.D. Scholarship:	Doctoral Fellowship in Engineering and Applied Sciences (Cycle XXXVIII), Università degli Studi di Bergamo *Years: 2022–2025*
TOP 10 Student Program:	Università degli Studi di Bergamo Fee exemption award issued to the best students. *Years: 2017–2018, 2020–2021, 2021–2022*
Excellence Award (Io e Lode):	Confindustria Bergamo Award for outstanding upper secondary school students. *Years: 2013–2017*
FCE (B2 First Certificate):	Cambridge Assessment English, Cambridge *Certified in 2017*

Memberships

INFN Member:	Istituto Nazionale di Fisica Nucleare, CSN2 group (Technological Ph.D., Pavia section) *Years: 2022–2025*
IEEE Student Member:	IEEE - Nuclear and Plasma Sciences Society Membership number 97046986 *Years: 2023–2026*
SIE Member:	Società Italiana di Elettronica *Years: 2023–2025*

Research Profiles

ORCID:	0000-0002-7084-5979
Scopus:	57939698700
Web of Science:	JUU-2100-2023
ADS:	ADS Author Profile
Semantic Scholar:	L. Ghislotti
Google Scholar:	Google Scholar

Scientific Activity

The research activity of Luca Ghislotti focuses mainly on the design of low-noise, low-power analog front-end integrated circuits for semiconductor detector readout in high-energy physics, and their experimental characterization. Since 2022 he has been a member of the GAPS collaboration with affiliations to the University of Bergamo and INFN Pavia (https://gaps1.astro.ucla.edu/gaps/people.php).

The main research topics to date include:

1. **65 nm CMOS readout ASIC for the second GAPS Si(Li) tracker flight**
   Design of a new Application-Specific Integrated Circuit (ASIC) for the second long-duration balloon flight of the GAPS experiment. The chip is an evolution of the current SLIDER32 ASIC (180 nm CMOS), migrating to a 65 nm CMOS technology to achieve improved noise, dynamic range, and integration density. The flight is scheduled to launch from McMurdo Station, Antarctica, in late 2025.

2. **Characterization and calibration of the Si(Li) tracker electronics**
   Validation of the flight-ready readout electronics of the GAPS Si(Li) tracker, with calibration campaigns focused on ultra-low noise performance and accurate detection of high-energy particles. These activities supported the integration of the instrument for the Antarctic long-duration balloon campaign scheduled for late 2024.

3. **Radiation-hard bandgap references**
   Characterization of bandgap voltage references for high-radiation environments, including devices developed for the ARCADIA project and a 28 nm CMOS bandgap for high-energy physics applications. *Related work:* G. Traversi, D. Falchieri, L. Gaioni, M. Manghisoni, M. Pezzoli, L. Ratti, V. Re, L. Ghislotti, *"A radiation hard bandgap voltage reference for the ARCADIA project"*, TWEPP 2022, Bergen, Norway.

4. **DSSC bare module testing for the European XFEL**
   Characterization of bare detector modules consisting of pixelated sensors bump-bonded to readout ASICs, within the DSSC (DEPFET Sensors with Signal Compression) project for the European XFEL in Hamburg. The aim is the development of a MiniSDD-based 1-Megapixel camera for photon science in the 0.25–6 keV energy range.

5. **Wearable device for medical applications**
   Development of a microcontroller-based wearable system for monitoring arteriovenous fistulas in dialysis patients, in collaboration with Istituto di Ricerche Farmacologiche Mario Negri IRCCS.

6. **Gas sensors for air quality monitoring**
   Analysis and characterization of gas sensors for the development of artificial intelligence algorithms able to recognize complex odor signatures and monitor air quality, in collaboration with the University of Brescia.

Publications

[1]   A. Tiberio for the GAPS Collaboration, "Indirect search for dark matter with cosmic-ray antinu-clei: The GAPS experiment," *J. Phys.: Conf. Ser.*, vol. 3053, no. 1, p. 012 002, Jul. 2025, ISSN: 1742-6596. DOI: 10.1088/1742-6596/3053/1/012002.

[2]   S. Botticini, E. Comini, S. Dello Iacono, *et al.*, "Index Air Quality Monitoring for Light and Active Mobility," *Sensors*, vol. 24, no. 10, p. 3170, Jan. 2024, ISSN: 1424-8220. DOI: 10.3390/s24103170.

[3]   S. N. Feldman, T. Aramaki, M. Boezio, *et al.*, "The GAPS time-of-flight detector," in *Proceedings of 38th International Cosmic Ray Conference — PoS(ICRC2023)*, vol. 444, SISSA Medialab, Sep. 2024, p. 120. DOI: 10.22323/1.444.0120.

[4]   L. Ghislotti, M. Boezio, L. Fabris, P. Lazzaroni, M. Manghisoni, L. Ratti, V. Re, E. Riceputi, and G. Zampa, "Energy threshold calibration of the GAPS experiment Si(Li) tracker readout electron-ics," *Il Nuovo Cimento C*, vol. 47, no. 3, pp. 1–5, Apr. 2024, ISSN: 03905551, 03905551. DOI: 10.1393/ncc/i2024-24121-1.

[5]   L. Ghislotti, P. Lazzaroni, M. Manghisoni, and E. Riceputi, "Low-noise wide dynamic range charge sensitive amplifier in 65 nm CMOS technology for the second flight of the GAPS ex-periment," in *2024 19th Conf. PhD Res. Microelectron. Electron. PRIME*, Jun. 2024, pp. 1–4. DOI: 10.1109/PRIME61930.2024.10559720.

[6]   R. Munini, A. Lenni, and on behalf of the GAPS Collaboration, "The identification of the cosmic-ray light nuclei with the GAPS experiment," in *Proceedings of 38th International Cosmic Ray Conference — PoS(ICRC2023)*, vol. 444, SISSA Medialab, Sep. 2024, p. 179. DOI: 10.22323/1.444.0179.

[7]   R. Munini and on behalf of the GAPS Collaboration, "Integration and Calibration of the GAPS Antarctic Balloon Payload," in *Proceedings of 38th International Cosmic Ray Conference — PoS(ICRC2023)*, vol. 444, SISSA Medialab, Sep. 2024, p. 180. DOI: 10.22323/1.444.0180.

[8]   A. Stoessl and on behalf of the GAPS Collaboration, "The GAPS experiment - a search for light cosmic ray antinuclei," in *Proceedings of 38th International Cosmic Ray Conference — PoS(ICRC2023)*, vol. 444, SISSA Medialab, Sep. 2024, p. 1440. DOI: 10.22323/1.444.1440.

[9]   M. Verzeroli, L. Gaioni, A. Galliani, L. Ghislotti, P. Lazzaroni, and V. Re, "Advancing Sustainable Mobility: A Data Acquisition System for Light Vehicles and Active Mobility," *Electronics*, vol. 13, no. 21, p. 4249, Jan. 2024, ISSN: 2079-9292. DOI: 10.3390/electronics13214249.

[10]   M. Verzeroli, A. Galliani, L. Ghislotti, L. Gaioni, P. Lazzaroni, and V. Re, "Empowering Smart Mobility with a Component-based Data Acquisition System for Multi-sensor Readout," in *2024 19th Conf. PhD Res. Microelectron. Electron. PRIME*, Jun. 2024, pp. 1–4. DOI: 10.1109/PRIME61930.2024.10559671.

[11]   T. Aramaki, M. Boezio, S. E. Boggs, *et al.*, "GAPS contributions to the 38th International Cosmic Ray Conference (Nagoya 2023)," 2023. DOI: 10.48550/ARXIV.2310.10181.

[12]   T. Aramaki, M. Boezio, S. E. Boggs, *et al.*, *GAPS contributions to the 38th international cosmic ray conference (nagoya 2023)*, Oct. 2023. DOI: 10.48550/arXiv.2310.10181. arXiv: 2310.10181 [astro-ph].

[13]   M. Manghisoni, L. Ghislotti, P. Lazzaroni, V. Re, E. Riceputi, L. Ratti, L. Fabris, M. Boezio, and G. Zampa, "A 32-channels readout ASIC for x-ray spectrometry and tracking in the GAPS experiment," *IEEE Trans. Nucl. Sci.*, 2023.

[14]   V. Re, L. Ghislotti, P. Lazzaroni, M. Manghisoni, E. Riceputi, L. Ratti, M. Boezio, G. Zampa, and L. Fabris, "A mixed-signal processor for x-ray spectrometry and tracking in the GAPS experiment," *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 1045, p. 167 617, Jan. 2023, ISSN: 0168-9002. DOI: 10.1016/j.nima.2022.167617.

[15]   E. Riceputi, M. Boezio, L. Fabris, L. Ghislotti, P. Lazzaroni, M. Manghisoni, L. Ratti, V. Re, and G. Zampa, "The 32 Analog Channels Readout for the Long-Flight GAPS Balloon Experiment Tracking System," in *Proc. SIE 2022*, G. Cocorullo, F. Crupi, and E. Limiti, Eds., Cham: Springer Nature Switzerland, 2023, pp. 27–32, ISBN: 978-3-031-26066-7. DOI: 10.1007/978-3-031-26066-7_5.

[16]   E. Riceputi, M. Manghisoni, V. Re, *et al.*, "Experimental results from the characterization of a 32-channels mixed-signal processor for the GAPS experiment," in *2023 IEEE Nucl. Sci. Symp. Med. Imaging Conf. Int. Symp. Room-Temp. Semicond. Detect. NSS MIC RTSD*, Vancouver, BC, Canada: IEEE, Nov. 2023, pp. 1–1, ISBN: 979-8-3503-3866-9. DOI: 10.1109/NSSMICRTSD49126.2023.10338321.

Conference Presentations

2025   *A 65 nm CMOS Readout ASIC with DTMOS CSA Feedback for Dynamic Signal Compression in Balloon-Borne Spectrometry Applications.* L. Ghislotti, P. Lazzaroni, M. Manghisoni, L. Ratti, V. Re, E. Riceputi. LVI Annual Meeting of the Italian Society of Electronics (SIE) — Sensors, Microsystems and Instrumentation session, University of Naples "Parthenope", Naples, Italy, Jun 26. [Programme]

2024   *Low-Noise Wide Dynamic Range Charge Sensitive Amplifier in 65 nm CMOS Technology for the Second Flight of the GAPS Experiment.* L. Ghislotti, P. Lazzaroni, M. Manghisoni, E. Riceputi. PRIME 2024 — Photon and Particle Detection Circuits session, Larnaca, Cyprus, Jun 10. [Conference site]

2023   *Experimental results from the characterization of a 32 channels mixed signal processor for the GAPS experiment.* E. Riceputi, M. Boezio, L. Fabris, E. Cavazzuti, L. Ghislotti, P. Lazzaroni, M. Manghisoni, V. Re, L. Ratti, V. Vagelli, M. Xiao, G. Zampa. IEEE NSS, MIC and RTSD, Vancouver, Canada, Nov 9. [Session]

2022   *A 32-channels mixed-signal processor for the tracking system of the GAPS experiment.* V. Re, L. Ghislotti, P. Lazzaroni, M. Manghisoni, E. Riceputi, L. Ratti, M. Boezio, G. Zampa, L. Fabris. 15th Pisa Meeting on Advanced Detectors, La Biodola, Isola d'Elba, May 27. [PDF]

Conference Posters

2025   *The ANTARES4 Readout ASIC for the Second Flight of the GAPS Experiment.* L. Ghislotti, P. Lazzaroni, M. Manghisoni, E. Riceputi. Advances in Space AstroParticle Physics (AS-APP2025), Sant Feliu de Guíxols, Girona (ES), May 12–16. [Indico]

2024   *Design and performance of the readout chip in the Si(Li) tracker module of the GAPS experiment.* V. Re, L. Ghislotti, P. Lazzaroni, M. Manghisoni, E. Riceputi, L. Ratti, M. Boezio, G. Zampa, L. Fabris. 16th Pisa Meeting on Advanced Detectors, La Biodola, Isola d'Elba, May 26–Jun 1. [Poster]

2023   *32-channels mixed-signal processor for the tracking system of the GAPS dark matter experiment.* E. Riceputi, M. Boezio, L. Fabris, L. Ghislotti, P. Lazzaroni, M. Manghisoni, L. Ratti, V. Re, G. Zampa. TWEPP 2023 — Topical Workshop on Electronics for Particle Physics, Geremeas, Italy, Oct 1–6.

2023   *L'esperimento GAPS per l'indagine della materia oscura.* L. Ghislotti on behalf of the GAPS Collaboration. IFAE 2023 — Incontri di Fisica delle Alte Energie, Catania, Apr 12–14. [Agenda]

2022   *The 32 analog channels readout for the long flight GAPS balloon experiment tracking system.* E. Riceputi, M. Boezio, L. Fabris, L. Ghislotti, P. Lazzaroni, M. Manghisoni, L. Ratti, V. Re, G. Zampa. 53rd Annual Meeting of the Italian Electronics Society (SIE), Pizzo, Italy, Sep 7–9.

Paper Reviewing Activity

Since 2023, Luca Ghislotti has served as a reviewer in the field of microelectronics and electronics design for the following international conferences:

- *International Conference on Modern Circuits and Systems Technologies (MOCAST) on Electronics and Communications*, Athens, Greece (2023).

- *International Conference on Applications in Electronics Pervading Industry, Environment and Society (ApplePies)*, Genova, Italy (2023).

- *International Conference on Modern Circuits and Systems Technologies (MOCAST) on Electronics and Communications*, Sofia, Bulgaria (2024).

- *International Conference on Applications in Electronics Pervading Industry, Environment and Society (ApplePies)*, Turin, Italy (2024).

Visiting Periods

- **Dec 2022 & Mar 2023 — Space Sciences Laboratory (SSL), University of California, Berkeley (CA)** Contributed to the assembly and calibration of the GAPS tracker modules. These visits were focused on hands-on integration of the readout electronics with the silicon detector layers, including noise performance validation and threshold tuning.

- **Jun 2023 — National Technical Systems (NTS), Los Angeles (CA)** Participated in the Thermo-Vacuum (TVAC) qualification test of the GAPS tracker. In this context, worked on the thermal system of the instrument and collaborated directly with engineers from the Japan Aerospace Exploration Agency (JAXA) to validate the thermal performance under simulated flight conditions.

- **Aug 2023 — Pupin Physics Department, Columbia University, New York (NY)** Attended the GAPS Collaboration Meeting, contributing to technical discussions on tracker performance, calibration strategy, and the preparation for integration activities.

- **Jan & May 2024 — Nevis Laboratories, Columbia University, Irvington (NY)** Engaged in the assembly and system-level testing of the GAPS payload. Activities included functional verification of the Si(Li) tracker electronics, DAQ integration, and support to calibration campaigns with cosmic-ray muons.

- **May 2024 — NASA Columbia Scientific Balloon Facility (CSBF), Palestine (TX)** Participated in the full payload integration and testing at the CSBF facility. Conducted a dedicated Thermo-Vacuum (TVAC) validation test of the instrument power supply system and contributed to pre-flight checks in preparation for long-duration balloon operations.

- **Nov 2024 — NASA Long Duration Balloon (LDB) facility, McMurdo Station, Antarctica** Selected and qualified to take part in the Antarctic launch campaign under the NSF United States Antarctic Program (USAP). Responsibilities included integration and testing of the GAPS payload at the LDB site, coordination of tracker operations, and direct support to launch activities of the long-duration balloon mission.

Ph.D. Schools and Courses

During his Ph.D. studies, Luca Ghislotti attended the following specialized schools and training courses in the field of high-energy physics detectors and microelectronics:

- *Giornate di Studio sui Rivelatori — Scuola F. Bonaudi e E. Chiavassa*, June 26–30, 2023, Sala del Palazzo Comunale, Cogne (AO), Italy. (gsr.to.infn.it)

- *EURIZON Detector School 2023*, July 17–28, 2023, Bergische Universität Wuppertal, Germany. Delivered the student talk *"The GAPS experiment for the indirect search of dark matter"* during the session *Making engaging scientific presentations*, organized by Lucie Linssen (CERN) and David Barney (CERN). (indico.cern.ch)

- *SIE Ph.D. School 2023*, September 4–7, 2023, Università degli Studi di Messina, Italy. Organized by SIE (Società Italiana di Elettronica).

- *SystemVerilog for Design*, March 18–21, 2024, Microelectronics Support Centre, UKRI STFC Rutherford Appleton Laboratory, Harwell Campus, Didcot (UK). Organized by EUROPRACTICE. (europractice.stfc.ac.uk)

- *SIE Ph.D. School 2025*, June 23–25, 2025, Università degli Studi della Campania Luigi Vanvitelli, Napoli, Italy. Organized by SIE (Società Italiana di Elettronica).

Academic Activity

Teaching Activity

Since 2022, Luca Ghislotti has carried out teaching assistant activities for the degree programs in *Engineering and Management for Health*, *Mechatronics and Smart Technology Engineering*, and *Computer Engineering* at the University of Bergamo. A detailed list by academic year follows:

2022–2023
- Biomedical Sensors (6 CFU), M.Sc. in Engineering and Management for Health.
- Sensors (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Industrial IoT (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.

2023–2024
- Biomedical Sensors (6 CFU), M.Sc. in Engineering and Management for Health. Included the seminar *"Tiny Technologies, Big Impact: Lab-on-Chip Devices, Microfluidics, and MEMS in Biomedical Engineering"*.
- Sensors (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Industrial IoT (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.

2024–2025
- Biomedical Sensors (6 CFU), M.Sc. in Engineering and Management for Health.
- Sensors (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Smart Sensors and Electronic Systems (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Industrial IoT (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Progettazione dei Sistemi Elettronici (6 CFU), M.Sc. in Computer Engineering. Delivered introductory lessons on PCB design with Altium Designer 25 (schematics, component libraries, PCB layout, DRC, manufacturing files).

2025–2026
- Smart Sensors and Electronic Systems (3 CFU), M.Sc. in Mechatronics and Smart Technology Engineering.
- Elettronica Industriale (6 CFU), B.Sc. in Computer Engineering.

Thesis Supervising Activity

During his Ph.D. studies, Luca Ghislotti has served as co-supervisor or reviewer for the following theses at the Department of Engineering and Applied Sciences, University of Bergamo:

- *"Characterization and calibration of a rad-hard bandgap voltage reference designed for high-energy physics applications"*, M.Sc. in Computer Engineering, A.Y. 2022/2023.

- *"Development of a MicroPython firmware in mbed-flash mode for a wearable platform"*, B.Sc. in Computer Engineering, A.Y. 2022/2023.

- *"Progetto e caratterizzazione di canali di lettura per SiPM impiegati nella rivelazione di muoni da radiazioni cosmiche"*, B.Sc. in Computer Engineering, A.Y. 2023/2024.

- *"Progettazione e sviluppo di un sistema embedded low-power per il monitoraggio di fistole artero-venose"*, B.Sc. in Computer Engineering, A.Y. 2024/2025.

Public Engagement and Outreach Activities

- **Seminar: "L'indagine della materia oscura con l'esperimento GAPS"** Museo di Scienze Naturali "E. Caffi", Bergamo (December 14, 2024). Public seminar delivered as part of the University of Bergamo initiative *"Chiedilo all'acqua – Voci dall'Antartide"*, focused on the GAPS experiment and personal experience in Antarctica.

- **Article Appearance: Corriere della Sera** Featured in the article *"L'acqua da indagare – Missione in Antartide"*, published on December 14, 2024 (Bergamo edition). The article highlighted Luca Ghislotti's role in the GAPS experiment and his participation in the Antarctic balloon launch campaign.

- **Invited Talk at the 30th Anniversary of Centro Studi Leonardo da Vinci** Bergamo (May 9, 2025). Invited talk to students and faculty during the school's 30th anniversary. Shared academic and professional journey from Leonardo da Vinci studies to international collaborations, emphasizing the importance of technical education, following one's passions, and his Antarctic mission with the GAPS experiment.

Projects and Awards

In 2023, Luca Ghislotti participated in the Bosch Sensortec *Making Sensor Tec! Challenge* with the project *"Exhaust gas pattern analysis for environmental monitoring and predictive maintenance"*. He and his team won first prize at the award ceremony held at Bosch Sensortec's headquarters in Milan (April 14, 2023) and were subsequently invited to present the project at Bosch Sensortec's main headquarters in Reutlingen, Germany (July 4, 2023).

Interests and Activities

Hi-Fi and analog audio reproduction, mechanical watches, analog and digital photography, aerospace, hiking and mountaineering.

Volunteer Experience

Contributor at *Informatici Senza Frontiere ONLUS* (2018 – ongoing).

Pursuant to art. 46 and 47 of Presidential Decree 445/2000, I declare that the information included in my CV is true, being aware of the possible application of Article 76 of the same decree in the event of a false declaration.

Pursuant to Legislative Decree (D.Lgs.) no. 196/2003 and Regulation (UE) 2016/679, the undersigned acknowledges that his personal data collected here will be processed, including in electronic form, exclusively for the purpose related to this procedure and authorizes their use accordingly.

Bergamo, 01/10/2025