Scientific and Academic Curriculum

Luca Ghislotti

Department of Engineering and Applied Sciences

University of Bergamo

Personal Details

Forename and Surname:	Luca Ghislotti
Place and Date of Birth:	Treviglio (BG), 03/02/1998
Nationality:	Italian
Address:	Via delle Crocette, SNC 24050 Ghisalba (BG)
Mobile:	+39 3331133825
Personal Email Address:	ghislottiluca@gmail.com
Academic Email Address:	luca.ghislotti@unibg.it
Skype:	Luca Ghislotti
GitHub:	github.com/lucaghislo
LinkedIn:	linkedin.com/in/luca-ghislotti
Google Scholar:	scholar.google.com
Personal Web Page:	https://lucaghislotti.com
Academic Web Page:	https://didattica-rubrica.unibg.it
Laboratory Web Page:	https://microlab-unibg.it/

Academic Education and Training

Doctor of Philosophy (Ph.D.) - Microelectronics for High Energy Physics

Università degli Studi di Bergamo, Bergamo (2022 - 2025).

Research Associate II at Columbia University

Astrophysics Laboratory - Columbia University, New York (August 1, 2023 - Ongoing).

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"

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).

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

Scholarships and Certificates

Ph.D. Scholarship

Dottorato di Ricerca in INGEGNERIA E SCIENZE APPLICATE (XXXVIII ciclo)
Università degli Studi di Bergamo, Bergamo
Years: 2022 - 2025

TOP 10 Student Program

Università degli Studi di Bergamo, Bergamo
Years: 2017 - 2018, 2020 - 2021, 2021 - 2022
Fee exemption award issued by Università degli Studi di Bergamo to best students

Io e Lode - Studenti Eccellenti Scuole Bergamasche

Confindustria Bergamo, Bergamo
Years: 2013 - 2014, 2014 - 2015, 2015 - 2016, 2016 - 2017
Award issued by Confindustria Bergamo to best upper secondary school students

FCE (B2 First)

Cambridge Assessment English, Cambridge (2017)

Memberships

INFN Memeber

Istituto Nazionale di Fisica Nucleare, Pavia
Member of INFN CSN2 group as Technological Ph.D., section of Pavia.

IEEE Student Member

IEEE Nuclear and Plasma Sciences Society Member

Institute of Electrical and Electronics Engineers
Membership number 97046986

SIE Member

Società Italiana di Elettronica

ORCID Account

ORCID ID https://orcid.org/0000-0002-7084-5979

SAO/NASA Astrophysics Data System (ADS)

Profile: https://ui.adsabs.harvard.edu/3A0000-0002-7084-5979

Language Skills

Italian:	Mother tongue
English:	Fluent (C1)
Spanish:	Intermediate (B2)

Scientific Activity

The scientific activity and research interest of Luca Ghislotti fall mainly in the design of low-noise, low-power analogue front-end integrated circuit for semiconductor detectors readout in high energy physics and their characterization. Starting from 2022, Luca Ghislotti is part of the GAPS collaboration with University of Bergamo and INFN Pavia affiliations (https://gaps1.astro.ucla.edu/gaps/people.php).

The research activity to date encompasses the following:

1. **Design of a 65 nm CMOS readout ASIC for the second flight of the Si(Li) tracker of the GAPS experiment**

   The research work is focused on the design of an improved version of the Application Specific Integrated Circuit (ASIC) currently employed for the readout of the Si(Li) detectors of the GAPS tracker by moving from the current 180 nm CMOS technology in which the integrated circuit has been designed, to a more scaled 65 nm CMOS technology. This new chip will be used during the second long duration balloon flight experiment that will take off from the McMurdo Station in Antarctica at the end of 2025.

2. **Characterization and calibration of the readout electronics of the Si(Li) tracker of the GAPS experiment**

   The research work consists in the validation of the flight items of the Si(Li) tracker of the General AntiParticle Spectrometer (GAPS) experiment scheduled for late 2024 from the McMurdo Station in Antarctica. The Characterization work is aimed at the validation of the readout electronics of the tracker and its calibration, with great concern for ultra-low noise performance and high energy particles detection accuracy.

3. **Characterization of radiation hard bandgaps**

   Luca Ghislotti is involved in the characterization of a radiation hard bandgap voltage reference for the ARCADIA project and a 28 nm bandgap voltage reference designed for high-energy physics application.

   On this topic, he contributed to the following work:
   G. TRAVERSI, D. FALCHIERI, L. GAIONI, M. MANGHISONI, M. PEZZOLI, L. RATTI, V. RE, *"A radiation hard bandgap voltage reference for the ARCADIA project"*, TWEPP 2022 Topical Workshop on Electronics for Particle Physics, 19-23 September 2022, Bargen, Norway.

4. **DSSC bare module testing for the European XFEL**

   Luca Ghislotti is involved in the characterization of the bare modules, composed of a pixelated sensor bump-bonded to readout ASICs, developed in the context of the DSSC (DEPFET Sensors with Signal Compression) project for the European XFEL in Hamburg. The collaboration has the aim of developing a MiniSDD-based 1-Megapixel Camera, that is, a 2-D imaging detector system optimized for photon science applications in the energy range between 0.25 keV and 6 keV.

5. **Development of a wearable device for medical applications**

   The research work is focused on the development of a microcontroller-based wearable device with the aim of monitoring arteriovenous fistulas in dialysis patients. The project is carried out in collaboration with Istituto di Ricerche Farmacologiche Mario Negri IRCCS.

6. **Study and characterization of gas sensors for air quality monitoring**

   The research work is focused on the analysis and characterization of gas sensors with the aim of developing artificial intelligence algorithms for the recognition of complex odor signatures and air quality monitoring. Ongoing research is being carried out in collaboration with the University of Brescia.

Publications

V. RE, <u>L. GHISLOTTI</u>, P. LAZZARONI, M. MANGHISONI, E. RICEPUTI, L. RATTI, M. BOEZIO, G. ZAMPA, 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, https://doi.org/10.1016/J.NIMA.2022.167617.

E. RICEPUTI, M. BOEZIO, L. FABRIS, <u>L. GHISLOTTI</u>, P. LAZZARONI, M. MANGHISONI, L. RATTI, V. RE, G. ZAMPA, *"The 32 analog channels readout for the long flight GAPS balloon experiment tracking system"*, Proceedings of SIE 2022: 53rd Annual Meeting of the Italian Electronics Society, Springer Nature Switzerland, https://link.springer.com/chapter/.

R. MUNINI on behalf of the GAPS Collaboration, *"Integration and Calibration of the GAPS Antarctic Balloon Payload"*, Volume 444 - 38th International Cosmic Ray Conference (ICRC2023) - Cosmic-Ray Physics (Direct, CRD), https://doi.org/10.22323/1.444.0180.

R. MUNINI on behalf of the GAPS Collaboration, *"The identification of the cosmic-ray light nuclei with the GAPS experiment"*, Volume 444 - 38th International Cosmic Ray Conference (ICRC2023) - Cosmic-Ray Physics (Direct, CRD), https://doi.org/10.22323/1.444.0179.

S.N. FELDMAN on behalf of the GAPS Collaboration, *"The GAPS Time-of-Flight Detector"*, Volume 444 - 38th International Cosmic Ray Conference (ICRC2023) - Cosmic-Ray Physics (Direct, CRD), https://doi.org/10.22323/1.444.0120.

A. STOESSL on behalf of the GAPS Collaboration, *"The GAPS experiment - a search for light cosmic ray antinuclei"*, Volume 444 - 38th International Cosmic Ray Conference (ICRC2023) - Dark Matter Physics (DM), https://doi.org/10.22323/1.444.1440.

T. ARAMAKI et al., *"GAPS contributions to the 38th International Cosmic Ray Conference (Nagoya 2023)"*, arXiv.org, 2023, https://arxiv.org/abs/2310.10181.

N. MARCELLI on behalf of the GAPS Collaboration, *"The GAPS experiment: Low-energy antinuclei measurements for dark matter searches"*, RICAP-22, 8th Roma International Conference on Astroparticle Physic, EPJ Web Conf., Volume 280, 2023, https://doi.org/10.1051/epjconf/202328007002.

M. MANGHISONI, <u>L. GHISLOTTI</u>, P. LAZZARONI, V. RE, E. RICEPUTI, L. RATTI, L. FABRIS, M. BOEZIO, G. ZAMPA, *"A 32-channels readout ASIC for X-ray spectrometry and tracking in the GAPS experiment"*, IEEE Transactions on Nuclear Science, vol. 71, no. 1, pp. 96-105, Jan. 2024, 10.1109/TNS.2023.3336192.

E. RICEPUTI, M. MANGHISONI, V. RE, <u>L. GHISLOTTI</u>, P. LAZZARONI, L. RATTI, L. FABRIS, M. BOEZIO, G. ZAMPA, M. XIAO, E. CAVAZZUTI, V. VAGELLI, *"Experimental results from the characterization of a 32-channels mixed-signal processor for the GAPS experiment"*, 2023 IEEE

Nuclear Science Symposium, Medical Imaging Conference and International Symposium on Room-Temperature Semiconductor Detectors (NSS MIC RTSD), Vancouver, BC, Canada, 2023, pp. 1-1, https://ieeexplore.ieee.org/document/10338321.

L. GHISLOTTI, M. BOEZIO, L. FABRIS, P. LAZZARONI, M. MANGHISONI, L. RATTI, V. RE, E. RICEPUTI, G. ZAMPA, *"Energy threshold calibration of the GAPS experiment Si(Li) tracker readout electronics"*, Il Nuovo Cimento C, vol. 47, no. 3, pp. 1-5, Apr. 2024, 10.1393/ncc/i2024-24121-1.

S. BOTTICINI, E. COMINI, S. DELLO IACONO, A. FLAMMINI, L. GAIONI, A. GALLIANI, L. GHISLOTTI, P. LAZZARONI, V. RE, E. SISINNI, M. VERZEROLI, D. ZAPPA, *"Index Air Quality Monitoring for Light and Active Mobility"*, Sensors 2024, 24, 3170, doi.org/10.3390/s24103170.

Conference Presentations

V. RE, L. GHISLOTTI, P. LAZZARONI, M. MANGHISONI, E. RICEPUTI, L. RATTI, M. BOEZIO, G. ZAMPA, L. FABRIS, *"A 32-channels mixed-signal processor for the tracking system of the GAPS experiment"*, 15th Pisa Meeting on Advanced Detectors, La Biodola, Isola d'Elba, May 27, 2022, https://agenda.infn.it/event/22092/contributions/167321.

E. RICEPUTI, M. BOEZIO, L. FABRIS, E. CAVAZZUTI, L. GHISLOTTI, P. LAZZARONI, M. MANGHISONI, V. RE, L. RATTI, V. VAGELLI, M. XIAO, G. ZAMPA, *"Experimental results from the characterization of a 32 channels mixed signal processor for the GAPS experiment"*, 2023 IEEE Nuclear Science Symposium, Medical Imaging Conference, and Room-Temperature Semiconductor Detectors Symposium, Vancouver, Canada, November 9, 2023, https://www.eventclass.org/contxt_ieee2023/.

Conference Posters

E. RICEPUTI, M. BOEZIO, L. FABRIS, L. GHISLOTTI, P. LAZZARONI, M. MANGHISONI, L. RATTI, V. RE, G. ZAMPA, *"The 32 analog channels readout for the long flight GAPS balloon experiment tracking system"*, 53rd Annual Meeting of the Associazione Società Italiana di Elettronica (SIE), Pizzo, Italy, 7-9 September 2022.

L. GHISLOTTI on behalf of the GAPS Collaboration, *"L'esperimento GAPS per l'indagine della materia oscura"*, IFAE 2023 - Incontri di Fisica delle Alte Energie, Catania, 12-14 Aprile 2023, https://agenda.infn.it/event/34702/.

E. RICEPUTI, M. BOEZIO, L. FABRIS, L. GHISLOTTI, P. LAZZARONI, M. MANGHISONI, L. RATTI, V. RE, G. ZAMPA, *"32-channels mixed-signal processor for the tracking system of the GAPS dark matter experiment"*, TWEPP 2023 Topical Workshop on Electronics for Particle Physics, Geremeas, Italy, 1-6 October 2023.

V. RE, <u>L. GHISLOTTI</u>, P. LAZZARONI, M. MANGHISONI, E. RICEPUTI, L. RATTI, M. BOEZIO, G. ZAMPA, L. FABRIS, *"Design and performance of the readout chip in the Si(Li) tracker module of the GAPS experiment"*, 16th Pisa Meeting on Advanced Detectors, La Biodola, Isola d'Elba, May 26-June 1, 2024, hhttps://agenda.infn.it/event/37033/contributions/poster-Elba2024_Re.pdf.

Paper Reviewing Activity

Starting from 2023, Luca Ghislotti has reviewed papers in the field of microelectronics and electronics design presented at the conferences listed below:

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

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

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

Visiting Periods

- In the context of the GAPS experiment, Luca Ghislotti visited the Space Sciences Laboratory (SSL) at the University of California, Berkeley (CA) in December 2022 and March 2023. During this time, Luca Ghislotti contributed to the assembly and calibration of the tracker of the GAPS instrument.

- In June 2023, Luca Ghislotti participated at the Thermo-Vacuum (TVAC) test of the GAPS tracker at the National Technical Systems (NTS) laboratories in Los Angeles, CA. On this occasion, he also worked on the instrument thermal system collaborating with *Japan Aerospace Exploration Agency* (JAXA) engineers.

- In August 2023, Luca Ghislotti participated at the 2023 GAPS Collaboration Meeting held at Pupin Physics Department of Columbia University in New York.

- In January 2024 and May 2024, Luca Ghislotti took part in the assembly and testing of the GAPS experiment payload at Columbia University's Nevis Laboratories in Irvington, New York.

- In May 2024, he worked on the GAPS experiment integration and testing at the NASA Columbia Scientific Balloon Facility (CSBF) in Palestine, Texas, where he also conducted a Thermo-Vacuum (TVAC) validation test of the instrument power supply.

Ph.D. Schools and Courses

During his Ph.D. studies, Luca Ghislotti participated to the following Ph.D. schools and courses in the context of high energy physics detectors and associated readout electronics:

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

- *EURIZON detector school 2023*, July 17th - 28th, Bergische Universität Wuppertal, Wuppertal, Germany. On this occasion, Luca Ghislotti held the talk *"The GAPS experiment for the indirect search of dark matter"* during the student presentations session "Making engaging scientific presentations" organised by Lucie Linssen (CERN) and David Barney (CERN) (https://indico.cern.ch/event/1224299/contributions/5516488/).

- *SIE Ph.D. School 2023*, September 4th - 7th, Università degli Studi di Messina, Messina, Italy. Organised by SIE, Società Italiana di Elettronica.

- *SystemVerilog for Design*, Microelectronics Support Centre, UKRI STFC Rutherford Appleton Laboratory, Harwell Campus, Didcot, UK. The course was held from March 18th to March 21st, 2024 and organised by EUROPRACTICE (https://www.europractice.stfc.ac.uk/training/).

Academic Activity

Teaching Activity

Starting from 2022, Luca Ghislotti has carried out teaching assistant activities for *Engineering and Management for Health* and *Mechatronics and Smart Technology Engineering* degrees at the University of Bergamo. A detailed list of the aforementioned activities, with the corresponding academic year, follows:

- **2022 - 2023**: Teaching assistant for the course "Biomedical Sensors" (6 CFU), master degree in Engineering and Management for Health.

- **2022 - 2023**: Teaching assistant for the course "Sensors" (3 CFU), master degree in Mechatronics and Smart Technology Engineering.

- **2022 - 2023**: Teaching assistant for the course "Industrial IOT" (3 CFU), master degree in Mechatronics and Smart Technology Engineering.

- **2023 - 2024**: Teaching assistant for the course "Biomedical Sensors" (6 CFU), master degree in Engineering and Management for Health. During this course, Luca Ghislotti held the seminar *"Tiny Technologies, Big Impact: Lab-on-Chip Devices, Microfluidics, and MEMS in Biomedical Engineering"* focused on SAW-based microfluidic and MAGFET lab-on-chip devices.

- **2023 - 2024**: Teaching assistant for the course "Sensors" (3 CFU), master degree in Mechatronics and Smart Technology Engineering.

- **2023 - 2024**: Teaching assistant for the course "Industrial IOT" (3 CFU), master degree in Mechatronics and Smart Technology Engineering.

Thesis Supervising Activity

During his Ph.D. studies, Luca Ghislotti has been co-supervisor or reviewer of the following dissertations at the department of Engineering and Applied Sciences of the University of Bergamo:

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

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

Projects and Awards

In 2023, Luca Ghislotti participated to 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 during the award ceremony held at Bosch Sensortec's headquarters in Milan on April 14, 2023. In this context, he and his team have been invited at Bosch Sensortec's main headquarters in Reutlingen, Germany, to present the winning project on July 4, 2023.

Interests and Activities

Electronics, Hi-Fi, Analog audio reproduction, Photography, Aerospace.

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 article in the event of a false declaration.
Pursuant to the Legislative Decree (D.Lgs.) no. 196/2003 and the Regulation (UE) 2016/679, the undersigned declares to be well-informed that his personal data being collected here will be treated, also in electronic form, exclusively for the scope of the procedure related to this declaration and authorizes the collection of personal data for the fulfillment of this procedure.

Bergamo, 27/05/2024

Luca Ghislotti