PERSONAL INFORMATION

Sofia Strazzi

BRODOLINI 11 (VILLA POMA), BORGO MANTOVANO 46036 (MN)

+39 334 5094733 sofia.strazzi2@unibo.it, sofia.strazzi@cern.ch

Sex F | Date of birth 13/12/1997 | Nationality Italian

EDUCATION AND TRAINING

2011 - 2016 **Scientific High School** - G. Galilei, Mirandola

Score 100 / 100

2016 - 2019 **Bachelor's degree in Physics** - University of Bologna

Score 110 / 110

Main acquired skills
- I learned the main physics principles from various fields of Physics and how to apply them to different contexts
- Mathematical and computer tools useful to model physical systems and handle large amounts of data
- Ability to apply the scientific method for problem solving in a lot of areas
- Skills in the use of modern physical instruments and technologies

2019 – 2021 **Master's degree in Physics (Nuclear and Subnuclear Physics curriculum)** - University of Bologna

Score 110 / 110 with Honours

Main acquired skills
- Competencies that are the forefront of current research and its technological application (data taking and data processing, technical reports preparation, logical thinking, science outreach, innovation, entrepreneurship)
- Interdisciplinary skills and competencies for scientific communication and planning
- Strategic thinking, risk and uncertainty management and action competence
- Team working skills

2020 – 2021 **Teaching path (24 CFUs) - Anthropological, psycho-pedagogy disciplines and teaching methodologies and technologies** - University of Bologna

In parallel to the Master

Score With full marks

Main acquired skills
- Conceptual, epistemological, linguistic and educational nodes related to physics teaching
- Conceptual, cultural and professional tools necessary for the construction of educational pathways and laboratory activities
- How to apply learning processes of physics and mathematics
- Key concepts of psychology and anthropology

2021 – 2025 **PhD in Physics (Nuclear and Subnuclear Physics)** - University of Bologna

Score Excellent with Honours

Main activity Study and development of new silicon technologies for the ALICE 3 Time-Of-Flight detector

2023 – 2024 **1-year Doctoral Student Fellowship at CERN**

Main activity Study and development of new silicon technologies for the ALICE 3 experiment and operation of the ALICE Time-Of-Flight detector

2024 – ongoing **Post-doc Research assign**

Main activity Operations of the ALICE TOF detector and R&D on silicon sensors for the future ALICE 3 and ePIC experiments

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RESEARCH EXPERIENCE

2019 — Research activity related to the bachelor's thesis

Study of machine learning techniques for the reconstruction of charmed baryon Λ_c in ALICE at LHC

Supervisor Prof. Andrea Alici

Research activity During my thesis work, I analyzed and compared three different multivariate classification algorithms: rectangular cuts, neural networks, and Boosted Decision Trees (BDT). I aimed to understand how they works and the adopted configuration parameters to finally compare their performances. Specifically, I used the hadronic decay channel $\Lambda_c^+ \rightarrow p + K_s^0$ to reconstruct the charmed baryon Λ_c in ALICE at the Large Hadron Collider (LHC) as a reference. The measurement of Λ_c baryon production is crucial for studying the mechanisms of quark charm hadronization and the properties of Quark-Gluon Plasma created in heavy-ion collisions at the LHC. Due to the short average lifetime of the Λ_c baryon and the low signal-to-background ratio, this kind of measurement can be complicated and may require the use of multivariate analysis techniques. These techniques allow the consideration of multiple variables per event simultaneously and independently and the exploitation of all available information through machine learning methods. Such methods are capable of classifying analyzed signal candidates according to regularities that the selection algorithm learns directly from the data.

2021 — Research activity related to the master's thesis

Study of first thin LGAD prototypes for the ALICE 3 timing layers

Supervisor Prof. Andrea Alici

Co-supervisor Dr. Francesca Carnesecchi

Research activity The work concerned the characterization and the performance study of very thin Low-Gain Avalanche Detector (LGAD) prototypes; the goal was to evaluate if such a sensor is suitable for the Time-Of-Flight (TOF) system of the ALICE 3 experiment, a next generation heavy ion experiment (LHC Run 5 and 6). The first thin LGAD prototypes, with thicknesses of 35 and 25 μm, produced by FBK, were characterized; both single channel and matrices, with different inter-pad design and doping profile were compared to two 50 μm-prototypes. Preliminary tests with a laser setup allowed to evaluate the light-sensitive areas in terms of efficiency, uniformity of the response and edge effects. Finally, timing performances were analyzed. Promising results were found for the 25 μm-thick sensors, which showed a time resolution better than 16 ps for a gain 20 and reaching nearly 13 ps for a gain 30.

2022-2025 — Research activity done during the PhD thesis and during the 1-year Doctoral Student Felloship at CERN

Study and development of new silicon technologies for the ALICE 3 Time-Of-Flight detector

Supervisor Prof. Andrea Alici

Main research activity The primary goal of my research activity was to better understand the potentiality of one among a few of silicon-based technologies that showed promising timing capabilities, to determine whether such capabilities could be further improved to meet the requirements of the ALICE 3 Time-Of-Flight (TOF) detector. Indeed, extensive research on new generations of silicon sensors, including characterization measurements, performance studies, and simulations is being carried out:

- The research activity done until now has focused on the characterization and performance study of different types of silicon sensors. The main goal was to verify the possibility of improving their performance and especially their time resolution up to values close to 20 ps, which is the target for the TOF detector of the ALICE 3 experiment. I take care of the characterization, preliminary performance study in laboratory and beam tests (preparation, setup and analysis of the data) and simulations of several types of sensors:
  - **LGADs**: thanks to their already impressive timing performance, state-of-the-art LGADs, are planned to be used in many detector upgrades, but the demanding requirements of future experiments, like ALICE 3, have motivated significant R&D efforts. A wide range of LGADs, both single channel sensors and matrices, including different thickness, area, doping and inter-pad design have been fully characterized with laboratory measurements and studied first with a laser setup and subsequently using particle beams at CERN facilities. First tests of 25 μm and 35 μm LGADs compared to 50 μm-thick sensors highlighted the potential of a thinner design for improved time resolution. This prompted further investigations into progressively thinner sensors, arriving to test the first 15 μm-thick LGADs ever produced by FBK. Additionally, the innovative double-LGAD concept was introduced to address the challenge of small input signals in the electronics. Notably, this new concept not only yields the significant benefit of an enhancement of the charge at the input of electronics which allows for reduced power consumption, but also translates into an improvement in overall time resolution. Finally, a

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dedicated study has been performed to determine the impact of particle incidence angles on the time resolution, a crucial aspect to be taken into account in the ALICE 3 experiment. Overall, this R&D campaign on LGAD detectors, finally resulted in sensors that meet the time resolution requirements of ALICE 3 Time-Of-Flight detector, establishing them also as strong candidates for future-generation experiments.

- **Fully depleted CMOS sensors**: these sensors have the potential to offer both time resolution and complete coverage in a single layer with a true 2D monolithic design, offering a simpler and cheaper assembly. Extensive R&D has already started with the goal to significantly push the time resolution of CMOS sensors well beyond current values, by considering layouts with a thin gain layer that could allow them to reach the time performance requirements while maintaining a reasonable power consumption.
- **SiPMs**: a TOF layer equipped with SiPMs has the advantage that it can be also used as readout for a RICH detector being such sensors able to detect both charged particles and photons. Recently it has been demonstrated that SiPMs can directly detect charged particles thanks to Cherenkov light emission occurring in the protective layer typically placed above the sensor. Ongoing R&D involves the test of SiPMs with various materials and thicknesses of the protective layer. A time resolution of around 20 ps was measured.

- **Study of sensors connected to an electronic chain:** A test beam was done with a full electronic chain, composed by LIROC ASIC front-end and a TDC (picoTDC developed at CERN with a time resolution of 3 ps LSB), connected to the sensors, to study both the electronics itself and the performance of the sensors connected to a discriminator and a time-to-digital converter.

Data analysis on TOF performance

I'm one of the leading people in the **data analysis to measure the performance of the ALICE Time-Of-Flight system in Run 3**. This is done by evaluating the detector resolution and verifying the quality of the reconstructed data. The timing resolution of the detector is measured with Run 3 data collected with pp collisions at $\sqrt{s}$ = 13.6 TeV with two independent methods: the first one is a self-consistent measurement using only the data from the TOF and the second one by using the event times obtained with the TOF and the FT0 detectors, in order to have a cross-check. I'm the **chair of the Paper Committee** for the paper "Performance of the ALICE Time-Of-Flight detector in Run 3" currently in the last stage of IRC review.

ALICE Time-Of-Flight (TOF) detector activities

ALICE Time-Of-Flight (TOF) detector activities: during my first year of PhD, I was involved in maintenance activities of the TOF detector of the ALICE experiment, participating in the replacement of electronics modules. Currently stationed at CERN I have significantly enhanced my contributions to TOF operations on multiple levels. I've been an on-site expert for the TOF detector, providing fast resolutions to any hardware-related issues, but also actively involved in all detector maintenance operations during data-taking periods. During the LHC year-end technical stop (YETS), I helped in many maintenance and small upgrades activities. Since the 1st of July 2024, I am the System Run Coordinator (SRC) of the ALICE TOF detector, responsible for the proper working and data quality of the TOF during the ALICE data taking, and for the maintenance and development of the hardware and software components of the whole system.

Other activities

- **Construction of a tracking telescope:** we are currently developing a tracking telescope with the main purpose of providing precise reference track information of beam particles to measure the performance of ours DUTs in the next test beam campaigns. We constructed the telescope using ALTAIs sensors, we integrated the DAQ into EUDAQ2 and we configured all the programs to perform the reconstruction of the tracks with Corryvreckan framework. The whole system was then tested using cosmic data and a test beam setup to control that everything is working as expected.
- **Teaching activities:** I was the co-supervisor of several thesis, for bachelor and master students in Physics and Nuclear and Subnuclear Physics. I'm assigned supervisor of a summer student at CERN.
- **Outreach:** I collaborate in the organization of two masterclasses for high school students devised by the International Particle Physics Outreach Group and I am CERN guide for the ALICE Collaboration.
- **Presentations:** during the first year I presented the various results obtained with the different types of sensors in many national and international conferences, workshops and schools.
- **Publications:** many papers were published with the different results obtained with LGADs, SiPMs and CMOS LGADs sensors. In addition, an ALICE collaboration paper with the results coming from the data analysis on the performance of the ALICE Time-Of-Flight system in Run 3 is at the final stage of IRC review.

PERSONAL SKILLS

Mother tongue: Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1
French	B2	B2	B2	B2	B1

Computer skills

- In-depth knowledge of **MacOS, Windows** and **Linux** operating systems.
- Excellent knowledge of **C, C++, TeX** programming languages and **LabView** graphical programming environment; good knowledge of **Python.**
- Good knowledge of the data acquisition framework **EUDAQ2,** and of the data reconstruction framework **Corryvreckan.**
- In-depth knowledge of **data analysis and simulation packages**: **ROOT (TMVA, RooFit, RooStats), GEANT4** and **Weightfield2;** basic knowledge of **Garfield++.**
- In-depth knowledge of the main **Machine Learning techniques (Artificial Neural Networks, Boosted Decision Trees).**
- Basic knowledge of **Grid Computing, Cloud Computing, and scientific computing models.**
- Excellent mastery of the **Microsoft Office** suite's tools (Word, Excel, PowerPoint), Macintosh and open-source equivalents, and of many **Browsers** and **Google Services.**
- Mastery of cloud file sharing tools: **Dropbox, One Drive, Google Drive, CERNBox** and platforms for video conferencing and remote collaboration: **Microsoft Teams, Zoom, Google Meet, Skype.**
- Mastery of the more used **code hosting platforms** for version control and collaboration: **GitHub** and **GitLab.**

Communication and social skills

I've developed abilities in **public speaking**, **scientific communication** and **journalism**, especially applied to the physics context, through lectures and initiatives specifically geared toward developing **soft professional skills**. In addition, I took specific classes dedicated to **transversal skills** focused on **logical thinking, science outreach**, **innovation**, **entrepreneurship** and on the writing of **scientific projects**. Through these lecturers, I developed the skills which allow me to organize and elaborate very specific concepts to adapt them to civil, economic and cultural necessities of society.

Educational skills

In parallel to the master's degree, I followed an **Anthropological-psycho-pedagogy and teaching path**, in which I developed skills in general and applied didactics in the field of physics. During lectures and group works, I got the **conceptual, cultural and professional tools** needed to carry out reflections on physics topics and on **learning/teaching processes**, useful for designin pathways for students of all ages. I am well acquainted with the key outcomes of physics educational research in relation to **conceptual, epistemological, linguistic and pedagogical nodes** and **teaching approaches**, both traditional and innovative. I therefore possess the tools necessary to **comprehend, analyse and use a plurality of texts** of a didactic, historical-epistemological and popular nature and I can utilize this knowledge to assess the many teaching options and design specific activities.
This knowledge has positively influenced my study method and provided me **synthesis, critical analysis, functional exposition** abilities. In addition, it gives me a view of physics from a different perspective, enabling me to have a **lateral thinking approach** to deal with unexpected situations in both physics and other contexts.

Organisational, managerial and problem-solving skills

In the past few years, schools, conferences and the work environment encouraged the comparison with people from different universities and fields of Physics, allowing me to develop **teamwork skills** and learn to **combine personal initiative with group ideas**, while **respecting objectives and deadlines**, and understand the importance of **externalizing opinions in a constructive way**, based on empathy and friendliness. These **organizational and collaboration skills** have been enhanced through volunteering and sports experiences, which have allowed me to also develop **strategic thinking** and **planning skills**, **risk and uncertainty management** and **action competence**. In addition, especially during the work in the laboratory and beam tests, I acquired **problem-solving** skills and learned how to approach unexpected issues with critical thinking and different approaches in order to come up with **creative and high-performance solutions.**

ADDITIONAL INFORMATION

Certifications

- **Cambridge English** Level 1 **Certificate** in ESOL International (First)

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Schools and cultural exchanges and other learning activities

- **Cultural exchange** in Germany with a **COMENIUS scholarship** (May 2011)
- **Cultural exchange** in the Netherlands (April 2013)
- **Training internships in the "Science in practise"** laboratory at the Fondazione Golinelli, Bologna (March-April 2016)
- Winner of a **University orientation course in the "Normale" University of Pisa**. I took part in multidisciplinary and laboratory activities and discussions about significant topics of current scientific and cultural relevance, having the opportunity to dialogue with lecturers from all the Italian universities and exponents of the main fields of research. (July 2016)
- **Hadron Collider Physics School (HASCO) at the University in Goettingen** (Germany) focused on Particle Physics at hadronic colliders, new experimental and analysis techniques and programming languages. (18-26th July 2021)
- **INFN School of Statistics di Paestum** focused on statistical methods and multivariate analysis, with complete hands-on sessions on the main computer tools used to apply them in a Physics context. (15-20th May 2022)
- **International School of Subnuclear Physics 2022 in Erice** "58th Course: Gravity and matter in the subnuclear world" focused on experimental and theoretical Subnuclear and Astroparticle Physics. (15-24th June 2022)
- **International School on Particle Detectors "Giornate di studio sui rivelatori" 2023** (June 2023, Cogne)
- **CERN course of French Level A2**
- **"A mots decouverts" French course Levels B1/B2**

Conferences, workshops and congresses

- **VCI2022 - The 16th Vienna Conference on Instrumentation** (21-25th February 2022, online)
- **"Trento" Workshop on Advanced Silicon Radiation Detectors** (2-4th March 2022, online)
- **ALICE Upgrade Week** (2-4th May 2022, online)
- **3rd Allpix Squared User Workshop** (9-11th May 2022, online)
- **10th Edition of the Large Hadron Collider Physics Conference** (16-20th May 2022, online)
- **108° SIF National Congress** of Italian Physics Society (12-16th September 2022, Milano)
- **ALICE Upgrade Week** (19-23rd September 2022, Prague)
- **TREDI 2023, 18th Trento Workshop on Advanced Silicon Radiation Detectors** (28th February-2nd March 2023, Trento)
- **IFAE 2023 Incontri di Fisica delle Alte Energie** (12-14th April 2023, Catania)
- **11th Beam Telescopes and Test Beams Workshop at DESY** (17th-21st April 2023, Online)
- **3rd ALICE Upgrade Week** (May 2023, CERN)
- **13th workshop on picosecond timing detectors, electronics and applications** (28th May – 1st June 2023, Elba Island)
- **International School on Particle Detectors "Giornate di studio sui rivelatori" 2023** (26th June 2023, Cogne)
- **157th LHCC Meeting** (November 2023, CERN)
- **4th ALICE Upgrade Week** (December 2023, Torino)
- **"ALICE 3" Days: 1st edition** (25th-27th March 2024)
- **16th International Pisa Meeting on Advanced Detectors** (May 26th – June 1st 2024, La Biodola, sola d'Elba)
- **"ALICE 3" Days** (24th-26th June 2024, CERN)
- **5th ALICE Upgrade Week** (7th-11th October 2024, Krakow, Poland)
- **"ALICE 3" Days** (18th-20th March 2025)
- **International Conference on Resistive Plate Chamber and Related Detectors RPC2024** (9th-13th September 2024, Santiago de Compostela, Spain)

Talks and posters

- Talk, **ALICE Upgrade Week** "LGAD: status and R&D plans" (4th May 2022, online)
- Poster, **International School of Subnuclear Physics** in the Ettore Majorana Center "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" (15th July 2022, Erice)
- Talk, **International School of Subnuclear Physics** in the Ettore Majorana Center "Performance study of Low-Gain Avalanche Detectors (LGADs) for the ALICE detector upgrade" (21st July 2022, Erice)
- Talk, **108° SIF National Congress** of Italian Physics Society "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" (16th September 2022, Milano)
- Talk, **ALICE Upgrade Week** "Silicon R&D: LGAD performance" (20th September 2022, Praga)
- Talk, **TREDI 2023, 18th Trento Workshop on Advanced Silicon Radiation Detectors** "Performance study of very thin Low Gain Avalanche Detectors (LGADs) and investigation of the new "double LGAD" concept" (March 2023, Trento)
- Talk, **IFAE 2023 Incontri di Fisica delle Alte Energie**, "Studio di rivelatori al silicio avanzati per l'esperimento ALICE 3 nel Run 5 e 6 di LHC" (13th April 2023, Catania)
- Talk, **3rd ALICE Upgrade Week** "Results from test beam: LGADs" (10th May 2023, CERN)
- Talk, **13th workshop on picosecond timing detectors, electronics and applications "Advancements in Low Gain Avalanche Detectors (LGAD) performance study: latest results on very thin sensors and investigation of the new "double-LGAD" concept"** (29th May – 1st June 2023, Elba Island)
- Poster, **International School on Particle Detectors "Giornate di studio sui rivelatori" 2023** "Timing performance of

thin Low-Gain Avalanche Detectors (LGADs)" (26th June 2023, Cogne)
- Poster, **157th LHCC Meeting - Poster Session** "A 20 ps silicon device for the ALICE 3 Timing Layers" (27th November 2023, CERN)
- Talk, **4th ALICE Upgrade Week** "LGADs and SiPM: status and perspectives" (6th December 2023, Torino)
- Poster, **16th International Pisa Meeting on Advanced Detectors** "Innovations in silicon detector technologies for next-generation experiments: improving timing precision of LGADs for ALICE 3" (May 26th – June 1st 2024, La Biodola, sola d'Elba)
- Talk, **2nd ALICE 3 days** "News from latest beam test: sensors and readout" (25th June 2024, CERN)
- Talk, **International Conference on Resistive Plate Chamber and Related Detectors RPC2024** "15 Years Young: the ALICE TOF detector in LHC RUN 3" (9th-13th September 2024)

Volunteering

- Voluntary activity in the municipality of Villa Poma, collaborating with a cooperative which organizes recreational and cultural activities (2015 - 2016).
- Volunteer in *Casa delle Farfalle*'s program for children and young people with autism spectrum disorders (2014 - 2018).
- Member of the church youth group, which organizes cultural, recreational, and topical issues activities (since 2012).
- Member of "Gruppo Giovani Villa Poma", an association which organizes events for the city and hosts cultural gatherings, collaborating with other non-profit organizations (2017 - 2023).

Honours and awards

- Due to my grades, during my high school years, I received 5 ***'Doti di Merito'***.
- I won a **COMENIUS scholarship** for a cultural exchange in Germany.
- I obtained 4 merit and economic-based **academic scholarships** from ER.GO.
- The communication at the SIF National Congress 2022 entitled "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" was selected by the Scientific Committee for the **"Best Communications".**
- **Young Scientists Award at the International Pisa Meeting on Advanced Detectors**, by Frontier Detectors for Frontier Physics Association "for a brilliant contribution in the development of detection techniques in High Energy Physics"

Publications

Papers in which I am one of the main authors:

- **S. Strazzi**, Study of machine learning techniques for the reconstruction of charmed baryon Λ_c in ALICE at LHC (Bachelor thesis)
- **S. Strazzi**, Study of first thin LGAD prototypes for the ALICE 3 timing layers (Master thesis) https://amslaurea.unibo.it/id/eprint/24382/
- **F. Carnesecchi et al.**, Direct detection of charged particles with SiPMs, 2022 JINST 17 P06007
- **F. Carnesecchi, S. Strazzi et al.**, Beam test results of 25 um and 35 um thick FBK ultra fast silicon detectors. Eur. Phys. J. Plus 138(99), 1-8 (2023). https://doi.org/10.1140/epjp/s13360-022-03619-1
- **F. Carnesecchi, G. Vignola et al.,** Understanding the direct detection of charged particles with SiPMs. Eur. Phys. J. Plus 138, 337 (2023) https://doi.org/10.1140/epjp/s13360-023-03923-4
- **F. Carnesecchi, S. Strazzi, *et al.*** A new low gain avalanche diode concept: the double-LGAD. *Eur. Phys. J. Plus* 138, 990 (2023). https://doi.org/10.1140/epjp/s13360-023-04621-x
- **S. Strazzi**, Timing performance of thin Low Gain Avalanche Detectors (LGADs) IL NUOVO CIMENTO 46 C (2023) 104 DOI 10.1393/ncc/i2023-23104-0
- **F. Carnesecchi, *et al.*** Measurements of the Cherenkov effect in direct detection of charged particles with SiPMs. *Eur. Phys. J. Plus* 138, 788 (2023). https://doi.org/10.1140/epjp/s13360-023-04397-0
- **S. Strazzi**, Study on Advance Silicon Detectors for the ALICE 3 experiment at the LHC Run 5 and 6, IL NUOVO CIMENTO 47 C (2024) 103, C, YEAR 2024 - ISSUE 3 - MAY-JUNE Incontri di Fisica delle Alte Energie - IFAE 2023. DOI 10.1393/ncc/i2024-24103-3 https://www.sif.it/riviste/sif/ncc/econtents/2024/047/03/article/39
- Follo, U. et all., First results on monolithic CMOS detector with internal gain., Journal of Instrumentation, 19(07), P07033. DOI: 10.1088/1748-0221/19/07/P07033 https://iopscience.iop.org/article/10.1088/1748-0221/19/07/P07033
- ALICE Collaboration paper (at last step of IRC review), Time resolution of the ALICE Time-Of-Flight detector with the first Run 3 pp collisions at $\sqrt{s} = 13.6$ TeV
- **S. Strazzi**, Innovations in silicon detector technologies for next-generation experiments: improving timing precision of LGADs for ALICE 3, Nuclear Instruments and Methods in Physics Research, A https://doi.org/10.1016/j.nima.2024.169893
- **S. Strazzi**, 15 Years Young: the ALICE TOF detector in the LHC RUN 3, on publication on Nuclear Inst. and Methods in Physics Research, A
- **S. Strazzi**, **Study and development of new silicon technologies for the ALICE 3 Time-Of-Flight detector** (PhD thesis) http://cds.cern.ch/record/2929067

A COMPLETE LIST OF THE 172 PUBLICATIONS CAN BE FOUND HERE https://inspirehep.net/authors/1974003)

Outreach activity

- I participate in the organization of International Masterclasses aimed to get students insight into topics and methods of basic research in Particle Physics, with lectures from active scientists, hands-on sessions using real data and a videoconference for the discussion of the data like an international research collaboration.
  - **International masterclass 2022** (IPPOG, CERN) as a tutor in Bologna
  - **International masterclass 2023** (IPPOG, CERN) as a tutor in Bologna
  - **International masterclass 2025** (IPPOG, CERN) as a moderator from CERN
- **CERN guide** for the ALICE Collaboration and other facilities at CERN
- I participate in **events dedicated to high school and undergraduate students** to inform them about the opportunities available for continuing their studies and education at the University of Bologna:
  - Alma Orienta 2023
  - Magistralmente 2023
  - Alma Orienta 2024
  - Magistralmente 2024

Teaching activity

- **Co-supervisor** of the Physics thesis of Gaia Fabbri "Studio e caratterizzazione di sensori Silicon PhotoMultiplier (SiPM) per applicazioni di timing nell'esperimento ALICE 3"
- **Co-supervisor** of the Physics thesis of Edoardo Rovati "Caratterizzazione di sensori Low Gain Avalanche Detector (LGAD) per il sistema di tempo di volo dell'esperimento ALICE 3 a LHC"
- **Co-supervisor** of the Physics thesis of Matteo Bonazzi "Studio e caratterizzazione di sensori Silicon PhotoMultiplier (SiPM) per rivelatore Time Of Flight (TOF) dell'esperimento ALICE 3"
- **Co-supervisor** of the Physics thesis of Massimo D'Alessandro Schmidt "Studio e caratterizzazione di Low Gain Avalanche Detectors (LGAD) di 15 e 20 µm di spessore per il Time-Of-Flight detector del futuro esperimento ALICE 3"
- **Co-supervisor** of the Physics thesis of Marta Grenno "Caratterizzazione e studio della risoluzione temporale tramite laser di LGAD singoli e doppi per il TOF del futuro esperimento ALICE 3 a LHC"
- **Co-supervisor** of the Nuclear and Subnuclear Physics thesis of Edoardo Rovati "Study and characterisation of Low Gain Avalanche Diode (LGAD) for the Time-of-Flight system of the ALICE 3 experiment at LHC"
- **Co-supervisor** of the Nuclear and Subnuclear Physics thesis of Lorenzo Tomba "Study with CERN-PS test beam of the LGAD detectors time resolution for the ALICE 3 experiment"
- **Supervisor** of a summer student at CERN (Hannah Appius) with the project "Exploring LGAD technology for the future ALICE 3 experiment"

Roles of responsibility in the ALICE Collaboration

- **System Run Coordinator (SRC)** of ALICE Time-Of-Flight (TOF) detector since July 1st, 2024 (ongoing)

CONTRIBUTIONS TO THE ALICE EXPERIMENT

R&D for ALICE 3 TOF

- The primary goal of my research activity during the master, the PhD and the research assign was to better understand the potentiality of one among a few of silicon-based technologies that showed promising timing capabilities, to determine whether such capabilities could be further improved to meet the requirements of the **ALICE 3 Time-Of-Flight (TOF) detector**. **Indeed, extensive research on new generations of silicon sensors, including characterization measurements, performance studies, and simulations is being carried out on LGADs, SiPMs and CMOS-LGADs**. The main goal was to verify the possibility of improving their performance and especially their time resolution up to values close to 20 ps. I took care of the **characterization**, **preliminary performance study** in laboratory, **simulations** and studies in **8 beam tests** at CERN-PS and DESY, where I took care of the preparation, setup and analysis of the data.
- Construction of a Tracking telescope for the R&D tests
- I presented the results in many international conferences and workshops on behalf of the ALICE Collaboration

ALICE ANALYSYS

- **Study of machine learning techniques for the reconstruction of charmed baryon Λ_c in ALICE at LHC**
- I'm one of the leading people in the **data analysis to measure the performance of the ALICE Time-Of-Flight system in Run 3**. I'm the **chair of the Paper Committee** for the paper "Performance of the ALICE Time-Of-Flight detector in Run 3" currently in the last stage of IRC review and I presented the results in an international conference on behalf of

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the ALICE Collaboration

SHIFTS AND ROLES OF RESPONSIBILITY

- Since the 1st of July 2024, I am the **System Run Coordinator (SRC) of ALICE Time-Of-Flight (TOF)** detector, responsible for the proper working and data quality of the TOF during the ALICE data taking, and for the maintenance and development of the hardware and software components of the whole system.
- During my first year of PhD, I was involved in **maintenance activities of the TOF** detector of the ALICE experiment, participating in the replacement of electronics modules.
- Currently stationed at CERN since 2023, I have significantly enhanced my contributions to TOF operations on multiple levels. I've been an **on-site expert, doing numerous shifts** for the TOF detector, providing fast resolutions to any hardware-related issues, but also **actively involved in all detector maintenance operations during data-taking periods**. During the LHC year-end technical stop (YETS), I helped in many **maintenance** and small **upgrades activities**.

TEACHING ACTIVITIES

- **Co-supervisor of seven ALICE theses**
- **Supervisor** of a summer student at CERN with the project "Exploring LGAD technology for the future ALICE 3 experiment"

CONFERENCES WITH PRESENTATIONS RELATED TO ALICE RESULTS

- Talk, **ALICE Upgrade Week** "LGAD: status and R&D plans" (4th May 2022, online)
- Poster, **International School of Subnuclear Physics** in the Ettore Majorana Center "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" (15th July 2022, Erice)
- Talk, **International School of Subnuclear Physics** in the Ettore Majorana Center "Performance study of Low-Gain Avalanche Detectors (LGADs) for the ALICE detector upgrade" (21st July 2022, Erice)
- Talk, **108° SIF National Congress** of Italian Physics Society "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" (16th September 2022, Milano)
- Talk, **ALICE Upgrade Week** "Silicon R&D: LGAD performance" (20th September 2022, Praga)
- Talk, **TREDI 2023, 18th Trento Workshop on Advanced Silicon Radiation Detectors** "Performance study of very thin Low Gain Avalanche Detectors (LGADs) and investigation of the new "double LGAD" concept" (March 2023, Trento)
- Talk, **IFAE 2023 Incontri di Fisica delle Alte Energie**, "Studio di rivelatori al silicio avanzati per l'esperimento ALICE 3 nel Run 5 e 6 di LHC" (13th April 2023, Catania)
- Talk, **3rd ALICE Upgrade Week** "Results from test beam: LGADs" (10th May 2023, CERN)
- Talk, **13th workshop on picosecond timing detectors, electronics and applications "Advancements in Low Gain Avalanche Detectors (LGAD) performance study: latest results on very thin sensors and investigation of the new "double-LGAD" concept"** (29th May – 1st June 2023, Elba Island)
- Poster, **International School on Particle Detectors "Giornate di studio sui rivelatori" 2023** "Timing performance of thin Low-Gain Avalanche Detectors (LGADs)" (26th June 2023, Cogne)
- Poster, **157th LHCC Meeting - Poster Session** "A 20 ps silicon device for the ALICE 3 Timing Layers" (27th November 2023, CERN)
- Talk, **4th ALICE Upgrade Week** "LGADs and SiPM: status and perspectives" (6th December 2023, Torino)
- Poster, **16th International Pisa Meeting on Advanced Detectors** "Innovations in silicon detector technologies for next-generation experiments: improving timing precision of LGADs for ALICE 3" (May 26th – June 1st 2024, La Biodola, sola d'Elba)
- Talk, **2nd ALICE 3 days** "News from latest beam test: sensors and readout" (25th June 2024, CERN)
- Talk, **International Conference on Resistive Plate Chamber and Related Detectors RPC2024** "15 Years Young: the ALICE TOF detector in LHC RUN 3" (9th-13th September 2024)

PAPERS FOR THE ALICE 3 R&D AND FOR ALICE

Papers in which I am one of the main authors:

- **S. Strazzi**, Study of machine learning techniques for the reconstruction of charmed baryon Λ_c in ALICE at LHC (Bachelor thesis)
- **S. Strazzi**, Study of first thin LGAD prototypes for the ALICE 3 timing layers (Master thesis) https://amslaurea.unibo.it/id/eprint/24382/
- **F. Carnesecchi et al.**, Direct detection of charged particles with SiPMs, 2022 JINST 17 P06007
- **F. Carnesecchi, S. Strazzi et al.**, Beam test results of 25 um and 35 um thick FBK ultra fast silicon detectors. Eur. Phys. J. Plus 138(99), 1-8 (2023). https://doi.org/10.1140/epjp/s13360-022-03619-1
- **F. Carnesecchi, G. Vignola et al.,** Understanding the direct detection of charged particles with SiPMs. Eur. Phys. J. Plus 138, 337 (2023) https://doi.org/10.1140/epjp/s13360-023-03923-4
- **F. Carnesecchi, S. Strazzi, *et al.*** A new low gain avalanche diode concept: the double-LGAD. *Eur. Phys. J. Plus* 138, 990 (2023). https://doi.org/10.1140/epjp/s13360-023-04621-x
- **S. Strazzi**, Timing performance of thin Low Gain Avalanche Detectors (LGADs) IL NUOVO CIMENTO 46 C (2023) 104 DOI 10.1393/ncc/i2023-23104-0
- **F. Carnesecchi, *et al.*** Measurements of the Cherenkov effect in direct detection of charged particles with SiPMs. *Eur.*

Phys. J. Plus 138, 788 (2023). https://doi.org/10.1140/epjp/s13360-023-04397-0

- **S. Strazzi**, Study on Advance Silicon Detectors for the ALICE 3 experiment at the LHC Run 5 and 6, IL NUOVO CIMENTO 47 C (2024) 103, C, YEAR 2024 - ISSUE 3 - MAY-JUNE Incontri di Fisica delle Alte Energie - IFAE 2023. DOI 10.1393/ncc/i2024-24103-3 https://www.sif.it/riviste/sif/ncc/econtents/2024/047/03/article/39
- Follo, U. et all., First results on monolithic CMOS detector with internal gain., Journal of Instrumentation, 19(07), P07033. DOI: 10.1088/1748-0221/19/07/P07033 https://iopscience.iop.org/article/10.1088/1748-0221/19/07/P07033
- ALICE Collaboration paper (at last step of IRC review), Time resolution of the ALICE Time-Of-Flight detector with the first Run 3 pp collisions at $\sqrt{s} = 13.6$ TeV
- **S. Strazzi**, Innovations in silicon detector technologies for next-generation experiments: improving timing precision of LGADs for ALICE 3, Nuclear Instruments and Methods in Physics Research, A https://doi.org/10.1016/j.nima.2024.169893
- **S. Strazzi**, 15 Years Young: the ALICE TOF detector in the LHC RUN 3, on publication on Nuclear Inst. and Methods in Physics Research, A
- **S. Strazzi**, **Study and development of new silicon technologies for the ALICE 3 Time-Of-Flight detector** (PhD thesis) http://cds.cern.ch/record/2929067

A COMPLETE LIST OF THE 172PUBLICATIONS AND AS PART OF THE ALICE COLLABORATION CAN BE FOUND HERE https://inspirehep.net/authors/1974003)

OUTREACH

- **ALICE International masterclass 2022** (IPPOG, CERN) as a tutor in Bologna
- **ALICE International masterclass 2023** (IPPOG, CERN) as a tutor in Bologna
- **2 ALICE International masterclass 2025** (IPPOG, CERN) as a moderator from CERN
- **CERN guide** for the ALICE Collaboration and other facilities at CERN

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