Curriculum Vitae
Francesco Benfenati Gualandi

Education

2015 – 2018 Bachelor's Degree in Physics - Alma Mater Studiorum – Università di Bologna

- Final grade: 110/110 cum laude
- Bachelor's thesis: "Modello Statico a Quark degli Adroni Leggeri" | Supervisor: Bastianelli F.

2018 – 2021 Master's Degree in Physics - Alma Mater Studiorum – Università di Bologna

- Curriculum: "Nuclear and Subnuclear Physics"
- Final grade: 110/110 cum laude
- Master's thesis: "Validation of the Full White Rabbit setup in the context of the KM3NeT experiment"
- Supervisor: Margiotta A., Co-supervisor: Chiarusi T.

07/2019 Alma Mater Studiorum – Università di Bologna

Participation in the Summer School "Physical Sensing and Processing", focused on sensor technologies and their applications for measuring physical parameters. The school concluded with the presentation of a poster.

09/2022 Alma Mater Studiorum – Università di Bologna

Participation in the Summer School *"Science Storytelling Workshop"*, focused on techniques for science communication to the general public. Included participation in a group workshop on the role of contemporary art in science communication, concluding with the presentation of the concept for an artistic work.

2022 – 2025 PhD in Physics - Alma Mater Studiorum – Università di Bologna

- PhD thesis: "The KM3NeT experiment: methods for time, position and pointing calibration of the detector"
- Supervisor: Margiotta A., Co-supervisor: Spurio M.
- DOI: https://amsdottorato.unibo.it/id/eprint/12336/
- Evaluation: "Excellent"

06/2024 Alma Mater Studiorum – Università di Bologna

Participation in the Summer School *"15th International Neutrino Summer School"*, covering theoretical, experimental, and technological aspects of neutrino physics.

28/01/2025 Participation in the training course organized by the GARR Consortium: *"Possible Mission: One Day as Blue Team (Basic Level)"*

The course consisted of 8 hours of training, concluding with a final practical exercise successfully completed.
The course introduced concepts of threat modeling, risk management, detection of unauthorized access, and the implementation of countermeasures to mitigate risks and reduce the impact of ongoing cyberattacks. The practical exercise simulated a system under attack, followed by structured activities designed to realistically reproduce sequences of events that may occur in real-world scenarios.

30/10/2025 Participation in the INFN training course: "Register of Personal Data Processing Activities"

The course consisted of 4 hours of training, with a final assessment test successfully passed.
The objective of the course was to provide an in-depth overview of personal data processing and to deliver operational instructions for completing the register of personal data processing activities using the INFN tool called "RATP".

15/12/2025 - 19/12/2025 Participation in the FastLane training course: "RHCSA Rapid Track Course"

Five-day intensive course focused on the administration and configuration of **Red Hat Enterprise Linux**. The course introduced essential command-line tools and enterprise utilities, providing a foundation for the secure management of users, groups, and storage solutions. It also covered core skills for troubleshooting configuration issues and integrating RHEL systems into existing environments.

Employment contracts

09/2021 – 12/2021 Scientific Association Contract –– INFN Laboratori Nazionali del Sud

Holder of a scientific association contract with the Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali del Sud, within the framework of the KM3NeT Collaboration.

01/01/022 – 14/05/2023 Scientific Association Contract –– INFN Sezione di Bologna

Holder of a scientific association contract with the Istituto Nazionale di Fisica Nucleare - Sezione di Bologna, within the framework of the KM3NeT Collaboration.

2021 – present Member of the ANTARES/KM3NeT Collaborations

09/2021 – 12/2021 Research Fellowship - Laboratori Nazionali del Sud – INFN

Awarded a three-month research fellowship at the INFN - Laboratori Nazionali del Sud (call no. 23245) to contribute to the commissioning of the data acquisition system of the KM3NeT/ARCA detector.
During this period, I worked on the implementation and optimization of a new distributed process system running on multiple computing resources of the experiment control station, as well as on the data acquisition infrastructure at the detector integration site at the Laboratori Nazionali del Sud. I developed a real-time monitoring application based on InfluxDB and Grafana for optical parameters of network interfaces on selected servers of the experiment control station and electrical power parameters of power boards installed at the bases of the KM3NeT/ARCA Detection Units.

2022 – 2023 PhD Fellowship in Physics - Alma Mater Studiorum – Università di Bologna

Awarded a PhD fellowship for the 37th cycle of the PhD program in Physics at the University of Bologna (PON 2022 call).

2022 – present University Teaching Tutor

Awarded multiple tutoring contracts for teaching support activities, including classroom problem-solving sessions, for the course *"General Physics T-A"* within the Bachelor's Degree Program in Civil Engineering at the University of Bologna (professor: Prof. A. Margiotta).
Tutoring contracts were held during the semesters of 2022 and 2023 and renewed for 2024, 2025, and 2026. Each tutoring contract includes 30 hours of teaching activities.

14/05/2023 – present Fixed-term Level III Technologist Contract at Istituto Nazionale di Fisica Nucleare - Sezione di Bologna

Winner of a national public competition for a Level III Technologist fixed-term position within the framework of the PNRR – Mission 4, Component 2, Investment 3.1, Project IR0000002 – KM3NeT4RR. Research activities are focused on supporting data acquisition systems for the Italian infrastructures of the KM3NeT Collaboration.

Scientific activity

2021 – present 1. Time Synchronization and Network Architecture (White Rabbit)

During my Master's thesis activity, I worked on the implementation and validation of a data acquisition setup at the *Bologna Common Infrastructure* laboratory, designed to replicate the future network architecture of

KM3NeT/ARCA (Phase 2).
My work focused in particular on the time synchronization of the optical module acquisition boards using White Rabbit technology. The main objective of the thesis was to verify compliance with the required accuracy and precision of time synchronization among acquisition boards, as well as the stability and integrity of data transmission. This activity was of significant importance in view of the detector's expansion toward its final configuration. The results of this work were included in the Phase 2 Product Readiness Review (2024) of the experiment, an evaluation conducted by international experts to assess readiness for production of the proposed technology, contributing to its approval. I also developed a real-time web-based monitoring system for synchronization parameters of the detector's electronic boards.Subsequently, first as a PhD fellowship holder and later as a Level III Technologist, I defined and commissioned the time calibration strategy for the Phase 2 White Rabbit switches and optical modules. This activity, presented during the Product Readiness Review, led to a direct collaboration with the CERN White Rabbit Collaboration for the definition of a technical specification document for switch calibration.
I also contributed to the development and refinement of the White Rabbit switch firmware/software used in ARCA to increase reliability and prevent potential failure modes.

09/2021 – 12/2021 2. Distributed Data Acquisition Systems

During a research fellowship at the INFN National Laboratories of the South, I collaborated with the KM3NeT Data Acquisition Working Group on the development and optimization of a distributed system based on Ansible for managing data aggregation, triggering, and filtering processes. The system enables modular deployment of processes via Docker containers across multiple servers at the experiment's control and integration stations, allowing scalability with increasing data traffic as new optical modules are installed in the detector. During the same period, I also developed a monitoring system based on the SNMP protocol for optical parameters of network interfaces on selected switches at the KM3NeT/ARCA control station and electrical power parameters of power boards installed at the bases of the KM3NeT/ARCA Detection Units. Monitoring data are stored in an InfluxDB database and made available to the collaboration through the Grafana web application.

2022 – present 3. "Bologna Common Infrastructure" – System Administration, Development, and Management

During my PhD and in my role as Level III Technologist, I contributed to the development, maintenance, and management of the *Bologna Common Infrastructure* laboratory, becoming its co-responsible.
The laboratory, used by numerous members of the collaboration, faithfully reproduces the entire data acquisition chain of the experiment. Since 14 May 2023, I have served as system administrator of the laboratory, managing the network infrastructure (a cluster of 16 nodes and 8 switches, including White Rabbit switches), data acquisition servers and access control systems, ensuring security, operational continuity, and adaptation to the scientific requirements of the experiment. Since 14 May 2023, I have also been responsible for the creation of the "Bologna Laboratory for User Ports", a setup integrated within the Bologna Common Infrastructure that reproduces, at reduced scale, an instrumentation line equipped with oceanographic sensors similar to those used in KM3NeT for detector calibration studies.
This setup supported the KM3NeT Collaboration in the development of the sensor control interface and its integration with the detector data acquisition system.
The activity was carried out within a collaboration with the company Communication Technology (Cesena), specialized in the development and testing of environmental oceanographic sensors.

2022 – 2024 4. Data analysis

As a PhD student, I worked on the analysis of ARCA detector data to determine the telescope pointing accuracy through the study of the deficit in atmospheric muon flux produced by cosmic rays in the direction of the Moon. These results were crucial in determining the directional uncertainty of the event KM3-230213A, the most energetic neutrino event ever detected to date. The results were included in the paper *"Observation of an ultra-high-energy cosmic neutrino with KM3NeT"*, published in Nature (2025).

14/05/2023 – present 5. Support to Italian Data Acquisition Infrastructures

In my role as Level III Technologist, I provide support to the data acquisition infrastructures and activities at the Italian KM3NeT/ARCA integration, testing, and calibration sites, as well as at the Portopalo di Capo Passero control station.
My responsibilities include operational and technical support for network systems, data acquisition hardware, and software infrastructures.

2021 – oggi 6. Role within the Collaboration

Over the years, I have regularly presented updates and developments of my work at general collaboration meetings and working group meetings.
I have routinely participated in data acquisition shifts for both the ANTARES and KM3NeT experiments.
On behalf of the collaboration, I have presented the results of my activities at several international conferences, in the form of posters and oral presentations.

Roles of Responsibility and Scientific Coordination

2021 – present On-shore Marine Operations Support

I have participated, as a data acquisition system expert, in the installation and commissioning phases of the KM3NeT/ARCA optical modules, taking responsibility for adapting the computing infrastructure and for the development and deployment of the required software.
In collaboration with colleagues at the Portopalo di Capo Passero control station, I have supported the teams involved in the marine operations for the deployment of optical modules during the annual installation campaigns from 2021 to the present.

09/2022 – 12/2022 Run Coordinator

I served as Run Coordinator for KM3NeT, with responsibility for the organization and coordination of shift personnel and for ensuring the correctness and continuity of data taking for the ARCA and ORCA detectors. This role also required close interaction with experts from the various working groups to manage critical situations and resolve issues arising during detector operation.
In particular, I was responsible for handling problems related to the computing and network infrastructure of the control stations and the data acquisition software.

06/2025 – present Co-Coordinator of the Data Acquisition Working Group

In June 2025, I was appointed Co-Coordinator of the KM3NeT Data Acquisition Working Group, assuming responsibility for planning, supervising, and directing the activities of a team of approximately 20 members. This role includes the regular organization of weekly group meetings and the reporting of results and progress during Steering Committee meetings and general collaboration meetings. As a member of the experiment's organizational structure and Steering Committee, I participate directly in the decision-making processes related to the design and operation of the data acquisition system.

Outreach activities

2022-2025 Participation in the "Researchers' Night" – 2022 / 2023 / 2024 / 2025 editions

I coordinated the setup of a stand dedicated to the KM3NeT experiment during the European Researchers' Night from 2022 to 2025.
The initiative, promoted by the European Commission, involves thousands of researchers and research institutions every year and is aimed at bringing science closer to the general public.

07/04/2025 Public outreach talk "The Underwater Telescope in Search of Cosmic Neutrinos in the Mediterranean Sea"

I was invited to give a public outreach seminar at the INFN Bologna Division entitled *"The Underwater Telescope in Search of Cosmic Neutrinos in the Mediterranean Sea"*.
The talk presented the scientific research and technological innovation of the KM3NeT experiment, the milestones achieved within the KM3NeT4RR project, and the ongoing activities at the INFN - Sezione di Bologna.

Languages

Italian (Native speaker), **English** (Fluent - C1: IELTS certificate (2013) Score 8/9)

IT skills

Programming skills	**C++, ROOT, Python, Bash Linux, LabVIEW** (CLAD N.I. 24/02/2017)
Operating systems	**Linux, Windows, MacOS**
Software & applications	**Microsoft Office, Suite Apple**

Presentazioni a congressi/conferenze

02/2021 **ANTARES/KM3NeT Collaboration Meeting – online**

Oral presentation for the KM3NeT DAQ Working Group

06/2021 **ANTARES/KM3NeT Collaboration Meeting – online**

Oral presentation for the KM3NeT DAQ Working Group

11/2021 **ANTARES/KM3NeT Collaboration Meeting – online**

Presentazione orale per il DAQ working group della Collaborazione KM3NeT

02/2022 **ANTARES/KM3NeT Collaboration Meeting – online**

Oral presentation for the KM3NeT DAQ Working Group

05/2022 **ANTARES/KM3NeT Collaboration Meeting – Athen, Greece**

Oral presentation for the KM3NeT DAQ Working Group

10/2022 **ANTARES/KM3NeT Collaboration Meeting – Roma, Italy**

Oral presentation for the KM3NeT DAQ Working Group

03/2023 **ANTARES/KM3NeT Collaboration Meeting – online**

Oral presentation for the KM3NeT DAQ and Calibrations Working Groups

06/2023 **ANTARES/KM3NeT Collaboration Meeting – Salerno, Italy**

Oral presentation for the KM3NeT Calibrations Working Group

07/2023 **38th International Conference on Cosmic Ray physics – Nagoya, Japan**

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – *The KM3NeT/ARCA Calibration Unit* – Poster presentation

09/2023 **16th Conference on Innovative Particle Radiation Detectors – Siena, Italy**

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – *The KM3NeT4RR project in Bologna: status and perspectives* – Oral presentation (plenary session)

02/2024 **ANTARES/KM3NeT Collaboration Meeting – Bologna, Italia**

Oral presentation for the KM3NeT DAQ Working Group

03/2024 **Mediterranean and Antarctic Neutrino Telescope Symposium – Bochum, Germany**

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – KM3NeT timing calibration in the Standard White Rabbit design – Oral presentation (plenary session)

06/2024 **ANTARES/KM3NeT Collaboration Meeting – Texel, Netherlands**

Oral presentation for the KM3NeT DAQ Working Group

09/2024 9th Roma International Conference on AstroParticle Physics – Roma, Italy

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – The evolution of the KM3NeT Data Acquisition System for Phase-2 of the experiment – Oral presentation (parallel session)

11/2024 ANTARES/KM3NeT Collaboration Meeting – online

Oral presentation for the KM3NeT DAQ Working Group

06/2025 ANTARES/KM3NeT Collaboration Meeting – Caen, France

Oral presentation for the KM3NeT DAQ Working Group

07/2025 39th International Conference on Cosmic Ray physics – Geneve, Switzerland

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – The data acquisition system for the complete KM3NeT/ARCA neutrino telescope – Poster presentation

09/2025 21st International Workshop on Neutrino Telescopes – Padova, Italy

F. Benfenati Gualandi (on behalf of KM3NeT Collaboration) – The data acquisition system for the complete KM3NeT/ARCA neutrino telescope – Oral presentation (parallel session)

Autorizzo il trattamento dei dati personali presenti nel CV ai sensi del D.Lgs. 2018/101 e del GDPR (Regolamento UE 2016/679).