BEPC - 1 -

Hosting Laboratory	Available period	Contact persons
BEPC	**01/08/2026 – 30/11/2026**	**Attilio Andreazza** **Mingyi Dong**

HV-CMOS Monolithic Pixel Detectors	**Daily activity, skills required and to be acquired**
HV-CMOS monolithic pixel detectors are the baseline choice for many of the next generation large area tracking systems at the LHC (LHCb upgrade) and at future Higgs factories. The **C**MOS Sens**O**r in **F**ifty-**F**iv**E** nm proc**E**ss (COFFEE) project is exploring the realization of these detectors in 55 nm CMOS technology, which is the highest integration scale tested for HV-CMOS detectors. The activity will consist in measurement and characterization of the 3rd generation COFFEE prototypes. It will include the measurement of the response to ionization, efficiency and rate capability.	The activity will be performed withing the electronics and instrumentation laboratories of CEPC. It will consist of electronics measurement. Basic knowledge of laboratory instrumentation (oscilloscopes and similar) and computing are required. The student will acquire expertise on advanced electronics instrumentation, a good understanding of the properties and operation of silicon detectors and their readout electronics.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Use of radioactive sources for detector calibration.

BEPC - 2 -

Hosting Laboratory	Available period	Contact persons
BEPC/IHEP	01/03/2026 – 01/11/2026	Gianluigi Cibinetto (INFN-FE) Giulio Mezzadri (INFN-FE)

CGEM-IT tracking algorithm development	**Daily activity, skills required and to be acquired**
The CGEM-IT is the new inner tracker of the BESIII experiments, installed in late 2024. In 2025, the commissioning with beam began and the first physics results can be extracted. As inner tracker, the CGEM-IT plays a crucial role in the vertex and secondary vertex reconstruction of weak decays of neutral strange hadrons (Λ^0, K^0_s). Developing new algorithms is crucial to extract all the information from data and gain the detector full potential. The focus will be on the position reconstruction with the microTPC readout, never developed for a CGEM in magnetic field, and secondary vertex reconstruction, to test the existing algorithms with the new CGEM-IT capabilities and to expand its performance.	The candidate will work with the CGEM-IT expert on the development and testing of tracking algorithm for secondary vertexing. The work will be based on the official software of BESIII, developed in C++, Python programming language and profits of CERN ROOT program for the histogramming and bookkeeping. Strong knowledge of two of these tools is required. Prior knowledge of the general working principles of a GEM detector is a plus. The candidate will develop skills in a rich environment, with simulated and real data, and will understand how tracking impacts the overall performance of a detector for high-energy physics.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 1 -

Hosting Laboratory	Available period	Contact persons
CERN	01/07/2026 – 01/10/2026	Brieuc Francois Patrizia Azzi

Reconstruction with GNN for FCC-ee	Daily activity, skills required and to be acquired
The first stage of the Future Circular Collider (FCC) project envisages e+e- collision at unprecedented luminosities at centre-of-mass energies between the Z pole and the top pair production threshold. After the support of the European Strategy, the collaboration is now in a pre-approval period where the physics studies will be improved and extended using the Full Simulation and reconstruction of the various detectors concept. In particular, the IDEA Detector Concept, features a tracking system composed by several layers of silicon sensors for vertexing and tracking and a complex drift chamber as main tracker, followed by a Dual Readout calorimeter system. The candidate will integrate the FCC Software and Computing team to work on the machine learning Particle Flow event reconstruction and its validation, focusing on the effect of machine backgrounds. The novel software framework, key4hep, represents the state-of-the-art approach to data processing, and the proposed reconstruction method with GNN has never been applied before to a collider experiment. All activities will be carried on in close synergy with both physicists, and software experts. Pure, efficient and fast event reconstruction is a critical component of any further analyses work.	**Daily activity:** The project consists of software development activities to be carried out on the CERN network in collaboration with software and detector experts. Candidates will be required to follow and share their progress in weekly technical meetings concerning Key4hep and Edm4hep, and monthly FCC Software meetings. **Required skills:** Some knowledge of C++ and python is required. Expertise with modern HEP analysis tools and development workflows, including a good mastering of C++ and Python, will be considered an advantage. **Skills to be acquired:** - Expertise in modern HEP analysis tools and development workflows - Knowledge of Particle Flow reconstruction - Knowledge of statistical analysis for performance interpretation - Experience of teamwork in international environment and presentation skills to communicate work

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
None apart from the mandatory CERN trainings for laboratory access

CERN - 2 -

Hosting Laboratory	Available period	Contact persons
CERN	01/04/2026 – 30/10/2026	Stefano Rosati Claudio Luci

ATLAS Muon Trigger Phase-II upgrade: RPC chambers and trigger electronics	**Daily activity, skills required and to be acquired**
One of the main upgrade projects of the ATLAS detector at the Large Hadron Collider (LHC) is dedicated to the Muon trigger in the barrel region of the experiment. The upgrade will consist of adding new detectors in the innermost layer of the barrel Muon Spectrometer. These new detectors are the Resistive Plate Chambers (RPC) with 1 mm gas gap, able to sustain the high rates that LHC will reach during its run-4. In addition, the trigger electronics of the whole barrel muon trigger will be completely replaced by newly designed devices. During the year 2026 the first full-scale modules of the detector chambers will become available and the first integration of the trigger electronics with the detectors and the readout will be possible. The tests of the trigger electronics, integrated with the detectors and their readout, will happen in the CERN BB5 area, within a dedicated tower for the reconstruction of cosmic tracks. This tower will reproduce an ATLAS trigger slice and will allow, for the first time, the implementation of algorithms analogous to those that will be used in the full-scale ATLAS experiment. The trigger algorithms will have to be studied and characterized in terms of efficiency, noise and background rejection capabilities. The project will consist of taking part in the trigger and detector integration workflow, in the setup of the measurements carried on with the cosmics tower, in the development of the trigger algorithms and the study of their performance with real data.	The candidate will participate in the detector setup and the electronics integration, in the daily data taking and analysis, and in all the activities of the working group. Skills to be acquired: - working principles of the Resistive Plate Chambers - setup and operation of the trigger system - development of trigger algorithms and data analysis software - understanding of the performances under varying operating conditions - definition of the expected trigger performance and connection to the general physics performance of the ATLAS detector - participation to a working group within a large international collaboration Depending on the timescale, comparisons with ATLAS collision data taken during the ongoing LHC run-3 could be also carried on.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Standard INFN and CERN safety trainings for working in a laboratory with electronic equipment and gaseous detectors (RPC).

CERN - 3 -

Hosting Laboratory	Available period	Contact persons
CERN	**01/06/2026 – 31/10/2026**	**Livia Soffi (INFN Roma, Sapienza)** **Bryan Cardwell (CERN)**

BTL Integration and Performance Validation for the CMS MIP Timing Detector	**Daily activity, skills required and to be acquired**
The **MIP Timing Detector (MTD)** is a major upgrade of the CMS experiment, designed to provide precise time information for charged particles during HL-LHC operations. With the extremely high pileup expected at the High-Luminosity LHC, event reconstruction will become increasingly complex; the MTD addresses this challenge by delivering timing resolutions of 30–40 ps, enabling improved vertex separation and overall detector performance. Within the MTD, the **Barrel Timing Layer (BTL)**—using LYSO:Ce crystals read out by Silicon Photomultipliers (SiPMs)—is currently in the construction and commissioning phase at CERN. As assembly progresses, **extensive testing and validation are required to ensure compliance with mechanical, thermal, and readout performance specifications** before installation in CMS. The student will contribute to **performance validation by characterizing the timing resolution, signal amplitude response, and noise behavior** of BTL modules under realistic operating conditions, using calibration scans, test-stand readout, and environmental monitoring to ensure each unit satisfies CMS performance requirements. The proposed summer-student project will be **framed within this broader effort** and will support the commissioning, validation, and installation preparation of the BTL detector at CERN.	The student will participate in hands-on activities directly connected to the integration of the detector within the Tracker Installation Facility (TIF), contributing to and performance studies. The planned activities include: **1)Participation in tray testing at the Tracker Installation Facility (TIF) at CERN**, verification of the mechanical, electrical, and operational quality of BTL trays before installation. **2)Characterization of the CO_2 cooling system performance**, ensuring thermal stabilization of SiPMs. **3)Measurements of the SiPM annealing response**, monitoring radiation-damage recovery and assessing long-term behavior. **4)Evaluation of the BTL readout performance**, including signal quality, timing precision and stability. Through these activities, the student will develop **practical skills in detector integration, operation of SiPM-based timing systems, CO_2 cooling procedures, and readout characterization.** The project will reinforce competencies in **experimental methods, data acquisition and analysis, subsystem diagnostics**. The student should have a basic understanding of particle detectors and be willing to learn to operate cooling systems, readout electronics, and data acquisition tools.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Standard CERN procedure needed to obtain a temporary dosimeter for the duration of the project.

CERN - 4 -

Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 30/09/2026	Ada Solano Valentina Avati

Studies of the performance of the silicon pixel tracker of the CMS Precision Proton Spectrometer	**Daily activity, skills required and to be acquired**
The CMS Precision Proton Spectrometer (PPS) reconstructs protons escaping intact from proton-proton interactions in the Large Hadron Collider (LHC) at CERN. It is located in the LHC tunnel about 200 m from the interaction point of the CMS experiment, on both sides. It has been collecting data since 2016, and its data are used for several published searches for rare Standard Model processes or signatures of New Physics. For the LHC Run3 (2022-2026) PPS detectors have been upgraded, have collected data, and will continue to take data in 2026. This project consists in contributing to the evaluation of the performance of the silicon pixel tracker of PPS and its evolution throughout the data taking.	The student will work in the CMS-PPS Detector Performance Group. He/She will learn the basics of the physics investigated at the LHC and of the CMS experiment, with particular focus on the processes studied by PPS and the operating principles of its tracking detectors. The task will involve contributing to the study of the performance of the pixel tracker of PPS during Run3, and participating in monitoring the detector performance through the standard tools available. Some familiarity with the Linux operating system environment is required. Programming skills in C++ and/or python are useful, that the student will have the opportunity to improve. Other skills to be acquired are a deeper knowledge of silicon tracking detectors, track reconstruction, and team working in an international environment.

Any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 5 -

Hosting Laboratory	Available period	Contact persons
CERN	01/07/2026 – 30/09/2026	Mia Tosi Felice Pantaleo

Heterogeneous inference in CMSSW: integration and benchmarking of PyTorch models with python-on-alpaka	**Daily activity, skills required and to be acquired**
The project aims to explore heterogeneous inference (CPU/GPU/accelerators) within the CMS software framework CMSSW. The student will work on integrating PyTorch models into CMSSW workflows using the newly introduced *python-on-alpaka* infrastructure, enabling Python code to run efficiently on heterogeneous backends. The activity includes developing small prototype applications, running benchmarks on reconstruction and trigger algorithms, and evaluating computing performance across different architectures.	The student will: • learn how to build and run CMSSW; • integrate PyTorch inference modules into existing CMSSW pipelines; • develop and test prototype algorithms using python-on-alpaka; • run benchmarking campaigns and analyze performance results. **Required skills:** Basic knowledge of Python and C++; interest in machine learning and computing performance. **Skills to be acquired:** Hands-on experience with CMSSW, heterogeneous computing, PyTorch deployment, and performance optimization techniques.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 6 -

Hosting Laboratory	Available period	Contact persons
CERN	**01/05/2026 – 30/10/2026**	**Stefano Argirò** **Giacomo Cucciati**

Upgraded readout electronics and DAQ of the CMS Electromagnetic Calorimeter	**Daily activity, skills required and to be acquired**
Starting from 2030 LHC will enter the High-Luminosity phase, in which the detectors will be challenged by the increased interaction rate. The CMS Electromagnetic Calorimeter (ECAL) will be equipped with a completely revised electronic readout to cope with the new running environment. INFN designed and produced an ASIC chip to sample the signal at high frequency and manage its transmission, which will equip the Very Front-End boards. An international team at CERN is following the production and test of the new electronics, and, at the same time, developing new data acquisition software and tools that will allow the test, commissioning and operation of the ECAL. A complete detector module is expected to be tested with an electron beam in Fall 2026.	The candidate will be involved in the setup of the environmental testing and calibration of the new Very Front-End cards. The student will familiarize with laboratory equipment, automation and control software. He will contribute to the setup of the databases needed to track construction parameters. Collection, storage and statistical analysis of the test results will be a very important aspect of the work. Python is expected to be the prime software and analysis tool, with SQL database backend. Basic FPGA programming skills might be useful. As the internship will happen during a period of running, the candidate will be encouraged to take part in data taking operations.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 7 -

Hosting Laboratory	Available period	Contact persons
CERN	01/02/2026 – 31/07/2026	Gemma Tinti Leonardo Plini

<u>4D tracking in the NA62 experiment</u>	Daily activity, skills required and to be acquired
The NA62 experiment is designed with the final purpose of studying the rare decay of a positive kaon to a pion and a neutrino-antineutrino pair, to improve our understanding of the Standard Model and probe potential new physics. The momentum and direction of the kaon are measured thanks to four stations of a silicon pixel detector called Gigatracker. The NA62 Gigatracker is the first 4-D tracking pixel detector in operation in an experiment, having a single hit timing resolution of ~150 ps. The project is focused on the improvement of the reconstruction of the Gigatracker using state-of-the-art deep learning techniques. The project's objective is to enhance the current tracking algorithm primarily by improving the clusterization phase. This will involve a first phase of investigating the clusters physical properties. The second phase of the project will be the investigation of the benefits of integrating additional variables, such as the time-over-threshold, into the machine learning tracking model.	**Daily activity:** The activity of this project focuses on learning the main characteristics of the NA62 Gigatracker silicon pixel detector, understanding the physical quantities involved in its calibration and reconstruction, and developing machine learning–based reconstruction algorithms in close collaboration with the detector group and operation experts. **Required skills:** General knowledge of particle physics, detectors, and c++/python. **Skills to be acquired:** By the end of the project, the student will have acquired a solid understanding of the principles of particle tracking, as well as strong skills in machine learning techniques and their application to particle physics experiments.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
General safety at CERN, safety to access radiation-controlled areas (CERN short term dosimeter) to access the experiment

CERN - 8 -

Hosting Laboratory	Available period	Contact persons
CERN	01/07/2026 – 30/09/2026	Fabio Ferrari Marianna Fontana

Misura del branching ratio del decadimento semileptonico raro $D^0 \to K^- \pi^+ e^+ e^-$	**Daily activity, skills required and to be acquired**
L'obiettivo principale dello studio è misurare con elevata precisione il branching ratio del decadimento $D^0 \to K\pi\, e^+ e^-$ rispetto al più abbondante canale $D^0 \to K\pi\pi\pi$, quantificando accuratamente le incertezze statistiche e sistematiche. La misura ottenuta costituirà un riferimento di normalizzazione fondamentale per ridurre l'incertezza sulle branching ratio dei canali rari $D^0 \to \pi\pi\, e^+e^-$ e $D^0 \to KKe^+e^-$, che verranno misurati rispetto al decadimento $D^0 \to K\pi e^+e^-$. In particolare, la determinazione del branching ratio di $D^0 \to K\pi\, e^+ e^-$ riveste un ruolo cruciale, poiché rappresenterà il fattore limitante della precisione nella misura dei canali più rari alla conclusione del Run 3 del LHC. L'analisi sarà basata sui dati raccolti dall'esperimento LHCb nel 2024 e nel 2025, con un'attenzione particolare al continuo confronto con gli esperti di trigger e ricostruzione, al fine di valutare l'incremento di efficienza reso possibile dall'upgrade del detector. Tale upgrade, che sostituisce il vecchio trigger hardware con un sistema ibrido basato su GPU e CPU, consente selezioni significativamente più inclusive e flessibili, migliorando la capacità di raccolta dei segnali rari.	L'attività principale consiste nell'analisi dei dati utilizzando strumenti avanzati basati sui framework ROOT e RooFit, con implementazioni sia in C++ che in Python. Le competenze richieste includono una conoscenza di base della programmazione e dei concetti fondamentali di analisi dati. Durante lo svolgimento del progetto, il candidato acquisirà familiarità con il software dell'esperimento LHCb, imparando a creare e gestire ntuple contenenti i dati da analizzare, oltre a sviluppare capacità avanzate di analisi statistica e modellizzazione dei dati sperimentali.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No.

CERN - 9 -

Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 30/09/2026	Enrico Robutti Mario Deile

Studies on the new silicon pixel tracker of the CMS Precision Proton Spectrometer for HL-LHC	**Daily activity, skills required and to be acquired**
The CMS Precision Proton Spectrometer (PPS) reconstructs protons escaping intact from proton-proton interactions in the Large Hadron Collider (LHC) at CERN. It is located in the LHC tunnel about 200 m from the interaction point of the CMS experiment, on both sides. It has been collecting data since 2016, and its data has been used for several published searches for rare Standard Model processes or signatures of New Physics. The extension of its physics program to the high-luminosity phase of LHC, from 2029 (PPS2), has recently been approved. For that purpose, the detectors must be completely redesigned, to cope with very different working conditions. The project will be integrated into the framework of the ongoing studies for the new silicon pixel tracker: it will contribute to the development of a realistic and effective proposal for the new detector, possibly including different practical aspects, from the base layout of the readout electronics to relevant features of the support mechanics and studies on the cooling system.	The project is an interdisciplinary task and will require initiative and creativity. It will involve accurate, realistic evaluation of working conditions and performance required, and will need gathering information, through appropriate documentation or personal contacts, on projected operating environment and available technologies. This will be done in close contact and under the guidance of people already working on the detector design for PPS2. Basic notions of particle detectors, digital electronics and thermodynamics are required. The task may involve the development of simple simulations and participation in laboratory tests on site.
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	

CERN - 10 -

Hosting Laboratory	Available period	Contact persons
CERN	**01/06/2026 – 30/09/2026**	**Enrico Robutti** **Jonathan Hollar**

Identification of central exclusive production events using the CMS Proton Precision Spectrometer	**Daily activity, skills required and to be acquired**
The LHC beam protons often interact with each other without disintegrating. They may exchange for example photons, thereby modifying their momentum, and then continue their trip, effectively transforming in a way a proton collider into a photon collider. The interaction yields particles that are reconstructed by the central CMS detectors. Thanks to the CMS Proton Precision Spectrometer (PPS), the protons can be reconstructed, and the exchanged momentum determined. The matching between the momenta measured by CMS-PPS and by the central detectors imposes stringent kinematic constraints on the reconstructed particles, providing a unique tool to measure final states yielded by photon-photon collisions at very high energies, either precision measurements of standard model processes or searches for new physics.	The student will work within the data analysis group aimed at measuring cross sections of processes observed in central exclusive production, that can be collected thanks to the CMS-PPS detector. The student will work with senior physicists and with a group of other students that join the group every Summer. This is a unique opportunity to learn physics and advanced data-analysis techniques and to learn how to cooperate with fellows from other countries. The main task will be to apply a proper set of selections to separate signal events from background events by exploiting the opportunities offered by the combination of information from the central CMS detectors and CMS-PPS. The skills required are: basic programming in Python and ROOT, basic English, basic knowledge of particle physics. The skills to be acquired are: advanced C++ programming and python scripting, deeper knowledge of experimental physics challenges in high energy physics, and team working in an international environment.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 11 -

Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 30/09/2026	Fabrizio Ferro Valentina Avati

Code development for proton detectors with CMS-PPS	**Daily activity, skills required and to be acquired**
The CMS Proton Precision Spectrometer at the LHC detects the protons that survive the interaction and that are scattered at very small angles. These protons keep moving inside the beampipe with a trajectory slightly bent with respect to the beam protons that did not interact. Therefore, they can be detected ~200m downstream from the interaction point by means of detectors that access the beampipe up to a few mm close to the beam. The parameters of the track allow to reconstruct the proton momentum loss at the interaction point providing fundamental information about the scattering kinematics. The detector operation and data reconstruction require the development of code (mainly using C++ and python languages) to be integrated in the general CMS framework CMSSW. In 2026 PPS will take data with its tracking and timing detectors as in previous years. An extensive activity of maintenance, update and development of the code for reconstruction and simulation is foreseen throughout the entire year.	The student will work in the CMS-PPS Offline group with senior physicists and with a group of other students that join the group every Summer. It can be a unique opportunity to learn physics and software development from a team of experienced people and to share working and everyday life with students from other countries. The main task will be developing algorithms and applications devoted to physics studies and to the detector operations that are done within CMS-PPS. The skills required are: basic C++ programming, basic Python scripting, basic English, basic knowledge of particle physics. The skills to be acquired are: advanced C++ programming and python scripting, deeper knowledge of experimental physics challenges in high energy physics and team working in an international environment.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 12 -

Hosting Laboratory	Available period	Contact persons
CERN	1/7/2026 – 30/9/2026	Antonello Pellecchia (INFN Bari) Pieter Everaerts (University of Wisconsin–Madison)

The GEM Phase-2 upgrade of the CMS experiment: performance from construction to the level-1 trigger	**Daily activity, skills required and to be acquired**
The student will take part in the GEM project for the Phase-2 upgrade of the CMS experiment at the LHC, which consists of two stations of triple-GEM detectors: GE1/1, which complements the existing CMS muon system and has been part of CMS since the Run 3 of the LHC, and ME0, which will extend the CMS muon system acceptance to a higher pseudorapidity region and will be installed in 2027 during the LHC Long Shutdown 3. The student will learn the working principle of the CMS GEM detectors by assembling and testing a triple-GEM chamber for the ME0 station during the ongoing production at CERN. Then they will study the performance of a 20-degree "slice" of the ME0 station, made of six stacked ME0 chambers, by measuring the efficiency of each layer and the system time resolution for muon tracks (or "segments") using cosmic rays. Next, they will take cosmic data in a setup made of two ME0 stacks, acting one as a reference for the other, which will enable them to measure the stack efficiency and angular resolution for muon segments. Finally, the student will compare the performance measured using the offline data to the one obtained by running an emulator of the Level-1 trigger logic, to measure the performance of the ME0 trigger primitives and its adherence to the CMS physics requirements for Phase-2.	Ideally the student will start from basic Python skills, an early understanding of the essential physical principles of particle detectors and basic laboratory skills (e.g. using an oscilloscope). They will learn: • how to operate and understand the data acquisition system designed for a large-scale high-energy physics experiment; • how to apply reconstruction and tracking concepts to a particle physics experiment; • how to analyze the data of a medium sized setup using concepts and tools that can scale to a full-size experiment; • how the working principles of a particle detector, its readout electronics and its operation affects the system performance; • how to work in a team within the international and stimulating environment of a detector laboratory at CERN.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
None (the work will take place in the office and in the detector production laboratory; no use of radioactive sources nor access to controlled areas is foreseen).

CERN - 13 -

Hosting Laboratory	Available period	Contact persons
CERN Ep_CMX	01/02/2026 – 31/05/2026	Gabriella Gaudio Etiennette Auffray

R&D on scintillators	**Daily activity, skills required and to be acquired**
In the framework of detector development for future particle physics project, vigorous R&D is on calorimetry is ongoing The aim of this project will to the investigate new developed inorganic and organic scintillators in term of optical and scintillation properties and develop and improve dedicated characterization set-up for radioluminescence characterization.	Perform various characterisations using several instrumentation set-ups (transmission, Light out put, decay time, time resolution, etc.). Basic knowledge in calorimetry is required. Skill to be acquired: Learn about scintillating materials and detector based on scintillation detectors and method of characterization.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Use of radioactive sources, X ray, laser

CERN - 14 -

Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 30/09/2026	Ilaria Vai (ilaria.vai@unipv.it) Florian Maximilian Brunbauer (florian.brunbauer@cern.ch)

Picosec-MM characterization with ML techniques for Muon collider applications	**Daily activity, skills required and to be acquired**
The student will participate in the activities of the Picosec-MM collaboration devoted to the development of the namesake detector, a fast time resolution micropattern gaseous detector (MPGD) based on Micromegas (MM) coupled to Cherenkov radiator. The activity will be carried out in the laboratory of the collaboration, where the student will profit from dedicated instrumentation and from the experience of the researchers in an international stimulating environment. In particular, the student will take part in tests in laboratory and/or, if available, on beam of Picosec-MM. The detectors will be operated on with different gas mixtures. The analysis of the data will be carried out in a standard way, and the results will be compared to those obtained with ML techniques. The spectra of the signals will be used to extract interesting variables such as electron, ion and total charge and the time resolution as a function of the applied electric field and of the different mixture used. Moreover, muons arriving at a certain angle on the surface of the detectors will generate an inclined Cherenkov cone that could be not fully contained in its active area: ML techniques will be applied to the analysis of the waveforms to identify these cases and evaluate their impact on the performance of the detector itself. The results will be useful for the implementation of Picosec-MM in the Muon Collider experiment simulation.	Daily activity: • Laboratory measurements • Development of the analysis codes • Analysis of results obtained Skills required: • Basic knowledge of ML techniques and simulation tools • Basic knowledge of statistics and gaseous detector physics Skills to be acquired: • Hardware and software implementation of data acquisition system for gaseous detectors characterization • Ability to apply ML techniques to the analysis of sensors and detectors • Ability to work in an international research team
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	
The student will use calibration gamma radioactive sources and will have access to radiation-controlled areas.	

CERN - 15 -

Hosting Laboratory	Available period	Contact persons
CERN	**01/04/2026 – 31/07/2026**	**Gemma Tinti & Silvia Martellotti Matthew Moulson**

Photon veto detector studies at NA62	**Daily activity, skills required and to be acquired**
The NA62 experiment is designed with the final purpose of studying the rare decay of a positive kaon to a pion and a neutrino-antineutrino pair, to improve our understanding of the Standard Model and probe potential new physics. The Frascati group is responsible for the operation and performance of the Photon Veto detectors, which play a crucial role in suppressing the dominant background from the kaon decaying into a charged pion and a neutral pion. The Photon veto detectors consist of twelve lead glass stations for large angle coverage, and two shashlyk calorimeters for small angle coverage. The project consists in refining the timing calibration algorithm and the data-quality requirements used for the offline selection, as well as in studying possible improvements to the veto cuts employed in the main analysis by studying the effects on the photon rejection efficiency and the random veto.	**Daily activity:** The activity of this project focuses on improving the present photon vetoes calibration algorithms and physics performance. The presence at CERN allows participation in the data taking and contact with the detectors' experts. **Required skills:** General knowledge of particle physics, detectors, and c++/python. Basic knowledge of the ROOT library is an advantage. **Skills to be acquired:** By the end of the project, the student will have acquired a solid understanding of the operation of calorimeters and how to integrate the relevant physical quantities in an analysis workflow.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
General safety at CERN, safety to access radiation-controlled areas to access the experiment

CERN - 16 -

Hosting Laboratory	Available period	Contact persons
CERN	01/05/2026 – 30/09/2026	Biagio Di Micco Michela Biglietti

b-jet response correction for the HH →bbγγ channel analysis	Daily activity, skills required and to be acquired
The project is intended for a master student that will spend the time at CERN to work on his/her master thesis. The 3 months activity is divided into two activities. Two months will be dedicated to the analysis of ATLAS data on the hh → bbγγ channel. The ATLAS collaboration will be going to finish the full Run3 data acquisition and a strong effort to provide the full Run3 statistics results will be put in place. One of the most relevant aspect of the hh → bbγγ analysis is a kinematic fit that uses the total transverse momentum constraint, and the mass of the bb system in order to improve the energy response of jets in the hh decay topology. The kinematic fit uses resolution function for b-jet reconstruction, also known as Transfer Functions, in order to describe the energy response of jets and b-jets. B-jets with semileptonic B meson decays show a particular degradation of the response due to missing energy produced by the neutrinos that are present into the decay. This missing energy can be corrected with several techniques: a simple average correction based on MC prediction, the use of global event missing transverse energy that can be added to the b-jet momenta, a regression neural-network that can be used to improve the jet energy response and a combination of all the previous techniques. The candidate will study several regression and correction algorithms and will evaluate their impact on the kinematic fit response.	The project is divided in two parts: two months will be dedicated to the software development for the kinematic fit in the γγbb analysis and one month for the detector R&D study of Micromegas detector. The first month of the project the student will study the bbγγ analysis software and will start testing the b-jet regression techniques. The target is to perform a statistical analysis of the regression and correction technique algorithms comparing their performances in terms of b-jet energy calibration and resolution. The response functions will be studied with particular focus on the linearity and the resolution of the algorithm. The second month of the project the focus will be the implementation of the correction inside the ATLAS softwre and the study of the response of the kinematic fit, looking at the resolution functions obtained comparing the fitted jets with the input ones and the impact on the resolution on the invariant mass of the bb system. For this part it is required that the student has already advanced skills in c++ programming with the ROOT analysis framework. He/she will acquire competence in interfacing new code with the ATLAS analysis software working of the bbγγ analysis and will learn how to train and develop regression neural-network to correct for the missing ET in semileptonic B meson decays.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 17 -

Hosting Laboratory	Available period	Contact persons
CERN	**01/05/2026 – 30/09/2026**	**Leonardo Carminati** **Elena Mazzeo**

Enhancing detector response simulation accuracy in ATLAS using Normalizing Flow	**Daily activity, skills required and to be acquired**
This project aims to leverage machine learning (ML) techniques to improve the simulation of particle interactions in the ATLAS detector. The most accurate simulation employs Geant4 to model the detector's response. Despite extensive advancements over the years, discrepancies persist between simulated and real collision data. These mismatches are particularly problematic in tasks such as photon identification. In ATLAS, several procedures are in place to align simulation and real data for the variables used in photon identification. However, these approaches typically rely on linear transformations applied to individual variables. Such methods are overly simplistic, as they fail to account for the complex differences between data and simulation, including correlations between variables. Among ML techniques, Normalizing Flows have demonstrated their effectiveness in learning transformations between datasets. Moreover, they enable the generation of synthetic datasets that closely mimic real collision data. In this project, Normalizing Flows will be applied to improve the simulation of the inputs used by the photon identification algorithm using data from the radiative decay of the Z boson. By learning the intricate transformations and correlations between simulated and real data, this approach seeks to provide a more accurate modeling of particle interactions and, ultimately, enhance the reliability of the analyses conducted within the ATLAS collaboration.	Daily activity will consist in guided and free coding sessions and study of existing literature. The project will be developed in autonomy by the candidate with frequent discussions with the supervisors. We foresee presentations in the relevant working groups meetings. For this project we expect students with a strong interest in working in software and computing areas. The project will require some basic knowledge of programming in C++ and python libraries. Some knowledge of the basics of ML algorithm would be beneficial although not strictly required. During the project the student will have the possibility to work on a real physics analysis learning how to deal with big bunches of data and MC events. In addition, the student will have the possibility to familiarize with the state-of-the-art machine learning tools.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No specific training procedures are foreseen

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Hosting Laboratory	Available period	Contact persons
CERN	01/05/2026 – 31/08/2026	Marco Lucchini Etiennette Auffray

Simulation and testing of an electromagnetic dual-readout crystal calorimeter prototype for FCCee	**Daily activity, skills required and to be acquired**
In the context of the DRD-Calo collaboration this project aims at simulating and testing the performance of a segmented crystal dual-readout calorimeter prototype for a Future Circular electron-positron Collider (FCC-ee). This innovative calorimeter concept will deliver an energy resolution for em particles of 3%/sqrt(E) while boosting the calorimeter granularity with respect to state-of-the-art crystal calorimeters and adding both dual-readout of cherenkov and scintillation light for precise measurement of hadronic showers and jets to meet the requirements of a future e+e- collider. A full containment electromagnetic prototype is currently under construction and will be ready for testing in May 2026. The student work will thus consist in evaluating the prototype performance with Geant4 simulation and in the analysis of the test beam data that will be collected at the CERN PS and SPS, foreseen in June-July 2026.	Daily activity: The candidate will work on simulating the performance of the calorimeter prototype with the Geant4 software and will test the scintillating crystals and SiPMs used in the prototype to implement their response in the simulation. In addition, the candidate will participate in the data analysis of the prototype characterization during the test beam foreseen during the duration of the project. Required skills: Basic knowledge of C++, python and ROOT. Acquired skills: The project is an opportunity for the candidate to get familiar with scintillators and photodetectors for application in high energy physics detectors with an outlook to the goals of future collider projects beyond the HL-LHC era as well as with the analysis tools and method.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN	**01/03/2026 – 31/09/2026**	**Mauro Dinardo and Styliani Orfanelli**

Data acquisition software and test system development for the CMS Phase 2 Inner Tracker	Daily activity, skills required and to be acquired
The High-Luminosity LHC (HL-LHC) is an upgrade of the CERN LHC expected to operate for 10 years starting in 2030. It will run at a nominal center-of-mass energy of 14 TeV with a 25 ns bunch-crossing period. In the ultimate performance scenario, the peak instantaneous luminosity will reach 7.5×10^{34} $cm^{-2}s^{-1}$ with an average of up to 200 overlapping pp collisions per bunch crossing. This will enable the CMS experiment to collect an integrated luminosity of up to 3000 fb^{-1} over its lifetime. The increased luminosity will greatly expand the physics potential of the LHC, allowing precision studies of the Standard Model and searches for rare beyond Standard Model processes. To this extent, CMS has carried out an upgrade program of its subdetectors, in particular, the vertex detector was re-designed to cope with the extreme radiation fluence expected at HL-LHC. The new silicon pixel sensors and readout chip are now in the production phase. At CERN a “System Test” stand is being set up to perform tests of the whole readout chain which includes the readout chips mounted on modules (i.e. multiple readout chips), together with ad-hoc current driven, rad-hard, power supplies, and a rad-hard optical readout. The successful candidate is required to assemble several complete readout chains, and develop software routines within the experiment Data Acquistion framework, to conduct comprehensive testing to identify potential weaknesses (including power supply noise and power performances). This testing is essential for validating critical aspects of the entire readout chain.	The project proposal is set in the experimental particle physics field. It consists of laboratory activities that involve the preparation of the experimental apparatus, the development of calibration routines, the acquisition of the relevant measurements, and ultimately the critical analysis of the collected data. More specifically the successful candidate must have a basic understanding of the C++ programming language, and the ROOT data analysis package. Experience with the Linux operating system, even though it’s not required, would be extremely beneficial. The candidate will acquire knowledge on cutting-edge readout systems, and vertex detectors.

Any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN	01/02/2026 – 30/11/2026	Francesco Terranova Filippo Resnati

Validation of the ProtoDUNE-VD Photon-Detection Efficiency After Xenon Doping	**Daily activity, skills required and to be acquired**
DUNE is the largest neutrino oscillation experiment currently under construction in the USA, utilizing an innovative liquid argon Time Projection Chamber (LArTPC) technology. Two 400-ton demonstrators, ProtoDUNE-HD and ProtoDUNE-VD, have been built at CERN and are being operated in 2024–2026. ProtoDUNE-VD is designed to detect cosmic rays and beam-produced charged particles from the CERN North Experimental Area, which interact with liquid argon, generating both ionization and scintillation light. In the forthcoming months, ProtoDUNE-VD will be doped with xenon. This technique allows the wavelength of the argon scintillation light to be shifted to values that are more amenable to detection and benefits from a reduced Rayleigh length, which in turn improves light detection efficiency. The aim of the proposed activity is the validation of the Photon Detection System of ProtoDUNE-VD in the xenon-doping data-taking phase. Such a validation includes the characterization of the response of the photon detectors in a cryogenic environment, the determination of the light detection efficiency with dedicated LED and cosmic-ray runs, and the systematic comparison of the detector features before and after the doping of argon with xenon.	The student will join the ProtoDUNE-VD onsite team, participating in data collection as a Photon Detection System shifter/expert and contributing to data analysis. The analysis will focus on detector stability and performance after the doping with xenon. The primary tool for this work will be a series of calibration runs conducted with LED sources, supplemented by physics runs with charged particles and cosmic muons. The student will gain expertise in liquid argon detector physics, analog and digital electronics, and data analysis. Required Skills: Basic knowledge of C++ programming and ROOT. Familiarity with Python is also welcome.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Working in a cryogenic environment and RP Supervised area

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Hosting Laboratory	Available period	Contact persons
CERN	**01/02/2026 – 30/11/2026**	**Francesco Terranova Laura Munteanu**

The science of the nuSCOPE monitored and tagged neutrino beam	**Daily activity, skills required and to be acquired**
nuSCOPE is a proposed high-precision neutrino beam designed to measure neutrino cross sections with a precision ten times greater than current standards. Following a successful R&D phase, CERN and the nuSCOPE Collaboration are now exploring the integration of this facility into the CERN accelerator complex and assessing its physics reach. During their stay at CERN, the student will investigate a key feature of nuSCOPE: the possibility of uniquely associating the neutrino observed in the neutrino detector with the parent meson tracked inside the beamline. This special “tagged sample” of neutrinos provides an almost perfect knowledge of the initial state in neutrino–nucleus scattering. The student will explore the physics reach of such a unique sample, in particular through the evaluation of the ν_e/ν_μ ratio using the virtual fluxes obtained from the ν_μ charged-current tagged sample.	The student will join the nuSCOPE CERN team, participating in the development of the software and analysis framework. The analysis will focus on the simulation of the tagged sample and neutrino reconstruction in a ProtoDUNE-like liquid argon Time Projection Chamber. The student will gain expertise in neutrino and liquid argon detector physics, Monte Carlo simulation, phenomenology of neutrino cross sections, and data analysis. Required Skills: Basic knowledge of C++ programming and ROOT.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN	01/05/2026 – 20/12/2026	Alessandro Rossi (INFN Perugia) Matteo Magherini (CERN)

Commisioning of a Cosmics-Rack with CMS Phase2 Outer Tracker Modules	**Daily activity, skills required and to be acquired**
The project aims to set up a Cosmics rack with CMS Phase2 Outer Tracker modules. The work will cover all the phases, from the assembly to the data readout and analysis. The candidate will perform reception test on the different Outer Tracker modules which will be integrated in the Cosmics rack, they will then integrate the modules in the mechanical structure and in the power and DAQ chain. Once these steps will be completed there will be a phase where all the modules will need an accurate calibration. It will cover the intrinsic sensor calibration – addressing noise performance, threshold optimization, and possible common-mode effects induced by neighboring modules – but also a set of data-taking–specific calibrations. These include the timing alignment of the readout between the two sensors of each module, the synchronization and matching of the two data stream (stubs and hits), and the inter-module delay calibration needed to correctly correlate hits across the detector and enable reliable track reconstruction. The final goal will be to have a functional Cosmics-rack which means a system able to correctly acquire data and, if possible, also a software able to analyze these data and perform tracks reconstruction.	The project consists of laboratory activities with hardware set-up to be installed, dedicated acquisition software to be developed and analysis of collected data to be performed. The main required skills are: • Knowledge of electronic lab equipment such as power supplies, digital scopes, pulse generator and so on. • Knowledge of C++ programming language and usage of ROOT data analysis framework. • Experience in Linux environment.
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	

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Hosting Laboratory	Available period	Contact persons
CERN	01/03/2026 – 31/10/2026	Andrea Benaglia (INFN Milano-Bicocca) Bryan Cardwell (CERN)

Commissioning and integration of the Mip Timing Detector Barrel for the CMS Phase 2 Upgrade	**Daily activity, skills required and to be acquired**
During the High-Luminosity LHC (HL-LHC) phase, the drastic increase in simultaneous collisions per bunch crossing (up to 200) will present significant challenges for event reconstruction. To mitigate pileup effects, the CMS experiment is undertaking a major upgrade program that includes the installation of the Minimum-Ionizing Particle Timing Detector (MIP Timing Detector, MTD) between the tracker and the calorimeters. With a time resolution of 30–60 ps, the MTD will enable full 4D vertex reconstruction and substantially improve track–vertex association and object identification. The detector consists of two subsystems: the Barrel Timing Layer (BTL), based on LYSO:Ce scintillating crystals read out by silicon photomultipliers, and the Endcap Timing Layer (ETL), built using low-gain avalanche detectors (LGADs). The BTL detector segments (“trays”) are currently being assembled at four remote production centers, and their integration inside the Tracker Support Tube at CERN is planned for Spring 2026. The selected student will take part in the crucial and exciting phase of tray reception, qualification, and commissioning, as well as their integration in the final detector environment. Thorough verification of each detector segment will be essential to ensure reliable operation of the BTL for more than a decade in CMS.	**Daily activity:** The selected candidate will contribute to the commissioning and integration of the CMS Barrel Timing Layer detector trays within the tracker support tube. They will become familiar with the relevant hardware and with the data-analysis tools used to evaluate the performance of detector modules based on scintillating crystals and silicon photomultipliers. **Required skills:** Basic knowledge of C++, Python, and ROOT. **Acquired skills:** Understanding of detector principles for precision timing measurements; rudiments of DAQ systems for big experiments; experience working within a large collaboration; ability to present and document one’s own results
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	

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Hosting Laboratory	Available period	Contact persons
CERN	01/03/2026 – 30/09/2026	Lucio Cerrito Thomas Dado (CERN)

Modelling of the b-quark hadronisation in top events with the ATLAS Detector	**Daily activity, skills required and to be acquired**
The top quark mass is a fundamental parameter of the Standard Model and its precise determination allows for consistency tests of the Higgs mechanism and the electroweak sector. The modelling of the fragmentation of the b-quark is one of the leading uncertainties in the precision measurement of the top quark mass. The project aims to identify and characterize an observable in the event configuration that is sensitive to the amount and features of gluon radiation from the b-quark. The data will be compared to Monte Carlo simulations using Pythia and featuring different b-quark gluon emission pattern (recoil options).	The selected Candidate will use a variety of simulated samples to define the optimal jet observable. The analysis will be done with the support of experts at CERN. **Skills acquired:** - advanced coding in Python/C++ and learning the ROOT/RooFit analysis framework. - Familiar with particle and event reconstruction at colliders - Familiar with Monte Carlo generators for collider physics - Data analysis - Ability to present own work at scientific communities **Skills required:** some knowledge of the Linux operating system is required. Basic programming skill in Python and C++ may be useful.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
None

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Hosting Laboratory	Available period	Contact persons
CERN	01/05/2026 – 31/07/2026	Marco Vanadia Alessandro Polini

BI RPCs Characterisation for ATLAS Upgrade Phase II	**Daily activity, skills required and to be acquired**
The construction and characterisation of new BI Resistive Plate Chambers (RPCs) is a crucial part of the upgrade activity included in the ATLAS Phase II program. The installation of a new layer of enhanced innovative RPC chambers in the inner barrel of the ATLAS muon spectrometer will significantly improve the performance of the muon trigger in the harsh conditions expected for the High Luminosity LHC data taking. The RPC chambers that will be produced will be thoroughly tested using cosmic data in the CERN laboratory at BB5. In this project the student will work on the development of the cosmic rays test stand facility, on the slow control and data acquisition code, and on the analysis software that will be used to characterise the performance of the chambers. The work on the test stand will include handling and testing the response of the RPC chambers on cosmic rays and with random triggers, qualifying efficiency, cluster size and time resolution, as a function of the HV applied to the chamber and of the Front End electronics performance, and to measure noise rates. The student will develop the existing analysis code to provide efficiency and resolution measurements for the chambers.	Daily activities will include preparing and operating the cosmic rays test stand and the RPC chambers to be tested, ensuring the good functioning of the DAQ, DCS and gas systems, test the RPCs in different conditions and setups, and working on the development of performance and tracking analysis software for the collected datasets. Basic programming skills in python are required. Basic knowledge of the ROOT framework is a plus. The student will learn how to operate a gaseous detector, will become familiar with DAQ and slow control (DCS) systems and will learn how to perform scientific data analyses with modern approaches in python and using the ROOT framework.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
None

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Hosting Laboratory	Available period	Contact persons
CERN	**01/03/2026 – 30/11/2026**	**Giuliano Gustavino / Valerio Ippolito Stefano Veneziano**

Development of Fixed-Latency Graph Neural Network Algorithms for the ATLAS Phase-2 L0 Muon Trigger System	**Daily activity, skills required and to be acquired**
The Level-0 Muon Trigger system of the ATLAS experiment will undergo a major upgrade for the High-Luminosity LHC (HL-LHC) phase to cope with the increased instantaneous luminosity and strict timing constraints. The upgraded system will transfer raw hit data to off-detector processors, where advanced trigger algorithms will run on next-generation FPGAs. This project focuses on designing and implementing **Graph Neural Network (GNN)** algorithms optimized for FPGA deployment under **fixed-latency conditions**, enabling efficient real-time reconstruction of muon tracks. Starting from an existing GNN model validated for **single-muon identification**, the work will extend the approach to **multi-track scenarios** and validate performance on **new physics processes**, such as events involving **long-lived particles (LLPs)**. The student will contribute to the full cycle of algorithm development: architecture design, FPGA implementation, and physics validation using both simulated and real data.	**Daily activities:** • Study the current GNN model and FPGA implementation. • Optimise GNN architectures for track reconstruction, applying quantisation and pruning techniques for FPGA efficiency. • Implement and deploy the model on FPGA ensuring fixed latency and resource optimisation (logic, memory). • Validate algorithms on simulated and real datasets **Required skills:** • Basic knowledge of Python and deep learning frameworks (PyTorch, PyG). • Familiarity with FPGA concepts and VHDL programming (preferred but not mandatory). **Skills to be acquired:** • Advanced machine learning techniques for HEP. • Real-time hardware implementation of neural networks. • In-depth understanding of HEP trigger systems and low-latency design challenges.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 30/09/2026	Marco Sessa (CERN supervisor) Elvira Rossi (Local supervisor)

Operational Support and Quality Control of RPC Systems for ATLAS Phase-II Upgrade	**Daily activity, skills required and to be acquired**
Currently, the Resistive Plate Chambers (RPCs) provide the Level-1 Muon Trigger in the barrel region ($\|\eta\| < 1.05$) of the ATLAS detector. In view of the ATLAS Phase-II upgrade for the High-Luminosity LHC (HL-LHC), new-generation RPC detectors will be installed in the innermost layer of the muon spectrometer. These detectors feature innovative triplet structures with ultra-thin gas gaps and are designed to meet the extreme performance requirements of the HL-LHC environment. This three-month project aims to involve the candidate in the construction, testing, and certification of BIL-type RPC chambers at CERN, within the framework of the ATLAS Phase-II upgrade. The activities will include operations at the cosmic ray test stand for detector performance measurements and analysis of key detector parameters such as efficiency, cluster size, noise rate, dead/noisy channels, and time and spatial resolution in η and ϕ.	A good understanding of Python and C++ is essential, along with a strong familiarity with particle-matter interaction processes, particularly those relevant to the phenomena under study. Additionally, a basic knowledge of gaseous detectors detectors is required. Daily interactions with CERN experts will provide valuable opportunities to deepen the understanding of RPC detector working principles, signal formation, and the trigger and data-acquisition systems. By the end of the project, the candidate will have played an active role in the certification of the BIL-type RPC detectors.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 31/10/2026	Giovanni De Lellis Duccio Abbaneo

Development and Testing of a Silicon Detector Prototype for the upgrade of the SND@LHC experiment	**Daily activity, skills required and to be acquired**
The project is part of the upgrade program for the SND@LHC experiment at CERN to run during the High Luminosity of the LHC starting from its Run 4. The upgrade foresees the use of silicon strip technology to instrument, for the first time, a neutrino detector with a high-resolution tracking station that will allow complementing kinematical measurements with topological information at the vertex. The project will focus on the development and initial testing of a silicon detector prototype. The candidate will participate in the assembly of the experimental setup, integration of the silicon detector with the data acquisition system and testing at a CERN beamline. The work involves contributing to the test beam campaign, collecting data, and performing the first data analysis to evaluate the detector performance. This project provides a hands-on opportunity to work on state-of-the-art detector technologies and gain experience in experimental particle physics within the CERN environment.	The candidate will contribute to the development and testing of the first silicon detector prototype for the SND@LHC upgrade. Activities include assembling the detector, integrating it into the experimental setup, and participating in the test beam campaign. During the test beam, the candidate will assist with alignment, data acquisition, and troubleshooting, followed by an initial analysis of the collected data to assess detector performance. The project requires basic knowledge of detector physics and programming (e.g. Python, C++ and ROOT). At the end of the project, the candidate will have gained hands-on experience with silicon detector technologies, experimental setups, and test beam campaigns, as well as data analysis in a high-energy physics context.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 29 -

Hosting Laboratory	Available period	Contact persons
CERN	1/07/2026 – 31/12/2026	Francesco Di Capua Roberto Acciarri

Validation of a new Photon Detection System concept for the third Far Detector Module of DUNE	Daily activity, skills required and to be acquired
The Deep Underground Neutrino Experiment (DUNE) will address a wide range of fundamental questions through its extensive science program, using advanced liquid argon (LAr) detector technology. Key areas of investigation include the dominance of matter over antimatter in the early Universe, the mechanisms behind supernova neutrino bursts (SNBs), and the potential decay of protons. DUNE will feature two neutrino detectors positioned within a powerful neutrino beam generated at Fermi National Accelerator Laboratory (FNAL). The first near detector (ND), located at the FNAL, will record particle interactions near the beam's origin. The second, significantly larger far detector (FDs), initially composed of two large modules, will be situated more than a kilometer underground at the Sanford Underground Research Laboratory (SURF), 1300 kilometers downstream from the neutrino source. Construction of the first project phase (Phase I) is well underway, with ongoing assembly of detector components for the Far Detectors. Phase II of DUNE includes an upgraded of the neutrino beam, and two additional far detector modules. The Photon Detection System (PDS) is a crucial part of the detector, essential for improving the DUNE low-energy physics program. To enhance the performance of the PDS for the third far detector module at low incremental cost, an attractive solution involves the use of fully silicon-based large light-collection units with an area of approximately 100 cm^2, large panels of wavelength-shifting polyethylene naphthalate (PEN) foils, and large reflective foil panels. The selected student will take parts, at CERN laboratory, small-scale experiments using a 50-liter Time Projection Chamber, developed for R&D on liquid argon detection technique. This study aims at validating the feasibility of an innovative approach for the Photon Detection System in the third Far Detector module.	The required skills include a basic knowledge of data analysis tools such as Python, C++, and/or ROOT. A comprehensive understanding of radiation-matter interactions and the scintillation process is also essential. Daily tasks will concentrate on integrating and operating the proposed photon detection prototype within an existing Time Projection Chamber (TPC), taking and analyzing data and performing detailed Monte Carlo simulations of the setup. The candidate will develop substantial technical expertise in cryogenics, vacuum systems, and electronics, gaining practical experience with a working detector. The role will also develop expertise in a more sophisticated data analysis software, technical report composition, and the creation of specialized presentations.

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Hosting Laboratory	Available period	Contact persons
CERN	01/06/2026 – 31/08/2026	Marco Ferrero (INFN) Michael Moll (CERN)

Development and characterization of planar silicon sensor of interest in DRD3 collaboration	Daily activity, skills required and to be acquired
In the context of the future colliders and DRD3 (R&D in the field of Solid-State-Detectors) collaboration, there is an ongoing R&D activity to design and produce planar silicon sensors with internal gain with 4D-tracking capability, able to operate in an environment with very high levels of fluence. The compensated Low-Gain Avalanche Diode (LGAD) is currently considered one of the main candidate technologies of silicon sensors to operate at high fluence. To define a production process to successfully deliver radiation-resistant compensated LGAD, a batch of LGAD sensors on *p-in-n* substrates is recently produced by Fondazione Bruno Kessler. The purpose of this grant is to enable a master's degree student to take part in the characterization campaign of the *p-in-n* LGAD batch. In particular, the candidate will perform DC electrical characterizations with a probe station to assess the quality of different process parameters. Moreover, he/she will perform transient characterizations with TCT, TPA and radioactive sources (α, β) to quantify the gain response of the devices under test. The candidate will primarily perform the characterization of unirradiated silicon sensors. Then, the activity will evolve to the investigation of the radiation damage effects on the samples. Irradiations with protons and neutrons will be organized and coordinated by the CERN partners	The winning candidate will participate in sensor development and characterization activity at the Solid-State-Detector (SSD) laboratory at CERN, focusing on topics of significant interest for DRD3 collaboration. Knowledge of laboratory instrumentations and methodology (probe station, TCT and TPA) for the characterization of planar silicon sensors is required. Understanding the basic operation principles of silicon sensor operation is mandatory. Also, familiarity with the analysis techniques to elaborate the acquired data is expected. The candidate will daily work in a cutting-edge laboratory dedicated to the study and development of silicon sensors and participate in group meetings and day-to-day discussions with the SSD team members. Collaborating with top experts in the field will provide a valuable opportunity to enhance his/her expertise and skills.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
• Safety course for the use of laser instrument • Radioprotection course for the use of radioactive sources

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Hosting Laboratory	Available period	Contact persons
CERN	01/04/2026 – 30/06/2026	Jacopo Pazzini (UNIPD / INFN-PD) Matteo Migliorini (CERN)

Development of Multi-BX Anomaly Detection Techniques for Level-1 Data Scouting at CMS	**Daily activity, skills required and to be acquired**
The project focuses on developing deep-learning anomaly-detection techniques for the CMS Level-1 Data Scouting (L1DS) system, which records unfiltered trigger primitives for all bunch crossings (BX). The L1DS system allows the study of data collected continuously over consecutive BXs, and the possible identification of unexpected structures and time-correlated activity extending over multiple BXs, such as the case of slow-moving particles. The work will begin with a detailed study of the data collected by the L1DS during 2024 and 2025, especially to the study of the muon and calorimeter primitives. A dedicated deep neural-network architecture will be designed, combining autoencoder modules for unsupervised detection of rare features with recurrent units (LSTM/GRU) to model temporal sequences of trigger information. An initial implementation based on muon-system stubs will serve to establish the methodology, followed by an extension to calorimetric observables and global quantities. The performance of the developed techniques will be validated through controlled signal injections, including slow multi-BX signatures used exclusively as benchmarks, ensuring a robust and model-independent sensitivity to anomalous patterns.	The activity will take place at CERN within the CMS Trigger and DAQ area, with daily interaction with the Level-1 Trigger, Data Scouting, and Next Generation Trigger groups. The student will analyse L1DS datasets, studying the detector L1T objects. He/she will prepare and inspect the dataset to investigate across-BX correlations, and implement deep-learning models sensitive to multi-BX structures/patterns. The work will involve data preprocessing, design and optimisation of neural-network architectures, training procedures, and validation with benchmark signal injections. The candidate should already be familiar with machine-learning tools, including basic notions of deep learning and recurrent networks. The project will strengthen competencies in large-scale data analysis, trigger-level reconstruction, temporal modelling with LSTM/GRU networks, and the development of robust anomaly-detection algorithms for high-energy-physics applications.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

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Hosting Laboratory	Available period	Contact persons
CERN (NP08 Experiment) INFN-Napoli	12/01/2026 – 12/07/2026	Davide Sgalaberna Gianfranca De Rosa

Database for NP08 Experiment at CERN	**Daily activity, skills required and to be acquired**
The main objectives of the NP08 Experiment are the construction, commissioning, and integration of 900 under-water electronics units for the for the Hyper-K Far Detector. Each under-water electronics unit consists of (i) two PMT signal digitizer boards;(ii) a HV power supply module; (iii) a LV power supply and regulator module; (iv) a data processing board; (vi) a stainless-steel water-tight vessel where all the relative electronics boards are installed. The plans for assembly of all these parts are well-developed. The 900 under-water electronics units supply the high voltage and digitize the signal of about 20'000 20-inch PMTs and about 3’600 3-inch PMTs to be installed in the Hyper-K Far Detector starting in 2027. Assembly rate will be 6 units per day. QC plans for boards and completed modules are mostly developed. An area inside EHN1 will be used for the assembly of the underwater units and for the electronics tests out of water of the 900 under-water electronics units. During the mass production several tests will be carried out to evaluate and calibrate the digitizers for the HK experiment and results need to be stored in the database. The needs in terms of database for the calibrator tests as well as assembly tests are going to be finalized.	The proposed activity is focused on the defining of the structure of the database (DB) and PBS and preparation of QA/QC parameter registration. The activity will be focused on the testing for pre-mass production and preparation of the DB for tracking all the components and measured characteristics to be used during Hyper-K operational phase. The tests are performed sequentially at a given temperature. For each test sequence, the relevant information to be recorded has to be defined and raw data files (or ROOT files) stored on a local disk have to be linked into the database. The database should be a PostgreSQL database local DB will be integrated to HyperK DB. The activity at CERN will be conducted in collaboration with C. Bozza (INFN-Salerno) responsible for Hyper-K DB. Skills required: Established expertise in electronics, lab testing procedures, and DB systems. Skills to be acquired: DB organization, administration, and management.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 33 -

Hosting Laboratory	Available period	Contact persons
CERN	01/04/2026 – 30/10/2026	Andrea Massironi Simone Gennai

New rare and challenging Higgs boson decays searches: Higgs to Gluons	**Daily activity, skills required and to be acquired**
As of today, the ATLAS and CMS collaborations have studied the Higgs boson production at the LHC for several years, giving a lot of attention to its most probable production and decay mechanisms. To complete the overall picture about the Higgs boson decay searches, few additional and more challenging decay channels are missing from the current landscape, which are becoming accessible thanks to the increased statistics delivered by the LHC. A systematic test and optimization of a new analysis targeting the Higgs boson decaying into gluons will be developed with the data from CMS, based on run 2 and run 3 data. The analysis will be a detector level analysis with real CMS data.	Required skills: basic coding, c++, python Skills acquired: coding, working in a big collaboration, learn how to present results Daily activity: development of the CMS software code to perform new analyses, develop machine learning based approaches, and finalize new searches. The results will be then presented in working meeting and general CMS meetings

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 34 -

Hosting Laboratory	Available period	Contact persons
CERN	1/07/2026 – 31/12/2026	Francesco Di Capua Roberto Acciarri

Light scintillation study in Liquid Argon and Xenon mixtures	Daily activity, skills required and to be acquired
The Deep Underground Neutrino Experiment (DUNE) will explore a broad spectrum of fundamental questions through its broad scientific program, utilizing high performances liquid argon (LAr) detector technology. Its primary research areas include understanding why matter dominates over antimatter in the early universe, studying the mechanisms behind supernova neutrino bursts (SNBs), and investigating the possibility of proton decay. DUNE will operate two neutrino detectors within an intense neutrino beam generated at Fermi National Accelerator Laboratory (FNAL). The near detector located at FNAL will capture particle interactions close to the beam's origin, while the far detector, made up of four large far detector modules (FDs), will be installed more than a kilometer underground at the Sanford Underground Research Facility (SURF), approximately 1300 kilometers downstream. Large detectors such as DUNE will benefit from xenon doping of liquid argon, which increases the Rayleigh scattering length of the scintillation light and reduces impurity contamination in the LAr. Investigating the light yield, scintillation components, and the shape of the scintillation signal is therefore essential for the future operation of the DUNE Photon Detection System. The selected candidate will work at CERN using a 50-liter Time Projection Chamber developed for R&D on liquid-argon detection technologies. This study aims to characterize the scintillation properties of the liquid argon as function of different xenon-doping concentrations, using photosensors sensitive to different wavelength regions.	The required skills include a basic knowledge of data analysis tools such as Python, C++, and/or ROOT. A comprehensive understanding of radiation-matter interactions and the scintillation process is also essential. Daily tasks will concentrate on integrating and operating the proposed photon detection prototype within an existing Time Projection Chamber (TPC), taking and analyzing data and performing detailed Monte Carlo simulations of the setup. The candidate will develop substantial technical expertise in cryogenics, vacuum systems, and electronics, gaining practical experience with a working detector. The role will also develop expertise in a more sophisticated data analysis software, technical report composition, and the creation of specialized presentations.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

CERN - 35 -

Hosting Laboratory	Available period	Contact persons
CERN	01/05/2026 – 31/10/2026	Sebastian Wuchterl (CERN) Angela Zaza (INFN Bari)

Novel H→cc analysis with CMS 2026 proton-proton data in the merged regime	Daily activity, skills required and to be acquired
Probing the Higgs boson properties is one of the highest priority goals of the LHC physics program. The Higgs boson coupling with charm quarks has not been measured yet and remains one of the open challenges and milestones in Higgs physics. The direct search for H→cc, the most promising avenue for measuring this coupling, is particularly challenging due to the difficulty in identifying final-state jets produced by the hadronization of charm quarks (c-tagging). In recent years, new machine learning techniques for jet tagging and background reduction have been explored, significantly enhancing the sensitivity to this process. While Higgs boson production in association with top quark pairs or vector bosons was already studied in detail, the investigation of additional Higgs production modes such as vector boson fusion (VBF) present a promising new channel to search for the H→cc decay. In parallel, the CMS collaboration developed and introduced new triggers to collect data, dedicated to this search channel. Of particular interest is a new trigger targeting events where the Higgs boson decay products are reconstructed as one large-radius (boosted) jet, employing cc-tagging for the first time at the CMS trigger. It uses the state-of-the-art "Global Particle Transfer" algorithm to be deployed for 2026. The selected candidate will investigate the newly collected data from this trigger and develop a preliminary analysis strategy for the boosted topology in VBF production.	The selected candidate will work on the design of the analysis strategy, the development of the code to perform data analysis, and explore machine learning (ML) approaches for background rejection. The candidate will work in a team of analysts at CERN and learn how to report their findings and interact with colleagues in an international and diverse environment. Skills required: • Good knowledge of Python and C++ programming • Basic knowledge of the ROOT data analysis framework Skills to be acquired: • Knowledge on the basics of ML and related software packages • Practical skills on the most common ML Python libraries • Expertise with the most common analysis frameworks • LHC data analysis and large data analysis • Presenting scientific results in meetings

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

DESY - 1 -

Hosting Laboratory	Available period	Contact persons
DESY	01/06/2026 – 30/11/2026	Sebastiano Raiz (DESY) Elisa Manoni (INFN Perugia)

Hadron reconstruction study with the Belle II electromagnetic calorimeter	**Daily activity, skills required and to be acquired**
At Belle II experiment, the hadron identification is especially important to distinguish among different B, D, and τ final states. This project focuses on studying hadron reconstruction in the Belle II electromagnetic calorimeter (ECL) by evaluating how different GEANT4 physics lists model hadronic interactions in simulation. Since hadrons such as charged pions, kaons, neutrons, and K_L^0 produce highly variable and often poorly modelled energy deposits in the ECL, the choice of physics list strongly impacts cluster shapes, secondary interactions, and energy–time correlations. Improving this modelling is essential for analyses sensitive to neutral-hadron signatures and calorimeter-based particle identification. The student will analyse simulated samples generated with multiple GEANT4 physics lists. The study will focus on observables that reveal differences in hadronic response, including cluster-shape parameters, and reconstruction efficiencies for various particle species. By comparing these predictions to Belle II control samples, the project aims to assess which physics list provides the most accurate description of hadronic interactions in the ECL, while remaining feasible for large-scale Monte Carlo production.	The student's daily activities will follow this path: generating dedicated Monte Carlo samples with different GEANT4 physics lists and reconstructing them with the Belle II software; comparing key observables across physics lists and with real data to assess the impact on physics analyses; studying computational performance to quantify the trade-offs between accuracy and resource consumption; presenting the results in Belle II meetings and writing an internal document. Acquired skills: GEANT4, event reconstruction, Monte Carlo production, and statistical validation techniques. Required skills: basic familiarity with particle physics, ROOT, and C++/Python is recommended, but can also be acquired during the project. Supervision will be provided by Dr. Sebastiano Raiz and his team, ensuring daily guidance.
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	

FNAL - 1 -

Hosting Laboratory	Available period	Contact persons
FNAL	01/07/2026 – 01/10/2026	Irene Zoi, Lorenzo Uplegger Patrizia Azzi

Testing and Grading Outer Tracker Modules for the CMS Phase-2 Upgrade	**Daily activity, skills required and to be acquired**
A key component of the CMS Phase2 Upgrade upgrade is the Outer Tracker, designed to provide precise tracking performance and contribute to Level-1 trigger decisions in the challenging environment of the High-Luminosity LHC. The new Outer Tracker will consist of over 13,000 modules with two closely spaced sensors, coming in two types: strip-strip (2S) and pixel-strip (PS). Ensuring these modules meet stringent performance and reliability standards before integration is critical for the success of the CMS Phase-2 detector. Fermilab will produce approximately 2,500 modules of both types and will be in full production during the student's tenure. The selected student will play a key role in testing the produced modules for reliable communication with all ASICs, stub formation and validation, noise levels, and performance. The testing setup includes cutting-edge systems such as a burn-in station and dedicated DAQ systems. Data collected during testing will be analyzed to grade the modules against established quality criteria. The student will have the opportunity to also contribute to software development and help refine grading standards common to all production centers. The student might then participate to the integration of the modules passing the highest standard. Both INFN and Fermilab are involved in module production and integration, and this project will further strengthen the collaborative ties between the institutes.	**Daily activity:** The project consists of laboratory activities, using the current developed setup. The student will have the opportunity to contribute to software development and help refine grading standards common to all production centers. **Required skills:** - basic understanding of silicon detector technologies - basic programming skills for data acquisition and analysis. - basic knowledge of electronic lab equipment. - basic experience in reading and understanding technical documentation. - basic skills for handling delicate silicon sensors **Skills to be acquired:** Students will acquire expertise in silicon sensor testing, data acquisition, and performance analysis and they will gain unique insights on the future CMS detector that will be taking valuable data for more than 10 years. They will also gain valuable programming skills in C++ or ROOT. Improved presentation and writing skills will be developed too.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
None apart the mandatory training for the Fermilab access

FNAL - 2 -

Hosting Laboratory	Available period	Contact persons
FNAL	16/02/2026 – 30/09/2026	Christian Farnese (INFN PADOVA) Angela Fava (FNAL)

Studies of muon neutrino interactions in ICARUS T600	**Daily activity, skills required and to be acquired**
The ICARUS T600 LAr-TPC detector has started its new physics runs in June 2022 at Fermilab within the SBN program. This detector is recording neutrino interactions from the Booster BNB neutrino beam to definitively clarify the open questions related to the possible existence of sterile neutrinos, as suggested by numerous observed experimental anomalies. In addition the recorded neutrinos from the NuMI off-axis beam are studied to perform neutrino-Argon cross section measurements. The focus of this proposed activity is the study of these neutrino events and the developments of selection and reconstruction tools in order to obtain an accurate evaluation of the neutrino energy, a fundamental parameter in view of the oscillation analysis that is foreseen within SBN. The candidate will start his/her activity studying the available reconstruction tools and will then introduce new improvements/features, applying them both to the data recorded and MC events to evaluate their performance. A special focus will be devoted to the muon neutrino charge current interactions fully contained in the detector.	Daily activity: the student will collaborate with the ICARUS team at Fermilab in order to learn the details of the reconstruction code used for the ICARUS analysis and to start to use it and contribute to the development of the selection/reconstruction procedures. The main task will be to contribute to the development of the tools for the measurement of the neutrino energy for the CC interactions recorded. The skills required for this project are: basic programming in Python, ROOT and C++ and basic knowledge of particle physics and in particular of neutrino physics. The skills to be acquired are: advanced programming and data analysis, deeper knowledge of experimental physics and in particular of the Liquid Argon detector technology.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No specific training is required, only the standard training required by Fermilab to access the laboratory.

FNAL - 3 -

Hosting Laboratory	Available period	Contact persons
FNAL	01/07/2026 – 01/10/2026	Irene Zoi Patrizia Azzi

<u>Development of ML polarization tagger for VBS events in CMS Run3 data</u>	**Daily activity, skills required and to be acquired**
Vector Boson Scattering (VBS) is a key process in particle physics involving the scattering of vector bosons (W/Z) into final state vector bosons, often with two additional quarks. At the LHC, VBS in proton-proton collisions provides insights into electroweak symmetry breaking (EWSB) and interactions predicted by the Standard Model (SM), including triple and quartic gauge couplings. The main objective of this project is to develop a ML tagger to determine the polarization of the fat jet from the boosted boson in events with a semi leptonic or all hadronic final state process using data collected during Run 3 of the CMS experiment at the LHC. Advanced machine learning algorithms will be implemented to effectively improve the signal purity. The student will be collaborating within a strongly connected group with excellent experience in VBS and ML that includes scientist from FNAL, INFN, KIT and Helsinki. The increased data and improved tools from Run 3 will allow to exploit to attempt the determination of the fat jet polarization in the semi-leptonic and all-hadronic final states, adding a significant contribution to the study of the properties of the VBS EWK processes.	The student will be hosted at the LPC at FNAL, working closely with supervisors on site and participating daily in CMS meetings and activities. The project will rely primarily on modern, columnar analysis frameworks and Python-based tooling widely used in contemporary HEP workflows. Curated datasets for signal and background will be provided, along with an initial version of the ML tagger to be further developed and validated. Prior experience with Python, C++, and possibly ROOT is preferred. The student will learn in depth about VBS production and its backgrounds at a proton–proton collider. They will become fluent in developing high-energy physics analyses using columnar data processing, scalable analysis ecosystems, and machine-learning–based classifiers, including performance optimization techniques. In addition, they will gain essential soft skills such as preparing clear presentations, creating effective slides, and discussing results in group meetings.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
NONE beyond the mandatory training for FNAL Laboratory access.

FNAL - 4 -

Hosting Laboratory	Available period	Contact persons
FNAL	**~1/05/2026 – ~1/09/2026**	**Daniele Gibin (INFN PADOVA)** **Giuseppe Cerati (FNAL)**

Studies of electron neutrino interactions in ICARUS T600	**Daily activity, skills required and to be acquired**
The ICARUS T600 LAr-TPC detector has started its new physics runs in June 2022 at Fermilab within the SBN program. This detector is recording neutrino interactions from the Booster BNB neutrino beam to definitively clarify the open questions related to the possible existence of sterile neutrinos, as suggested by numerous observed experimental anomalies. In addition, the recorded neutrinos from the NuMI off-axis beam are studied to perform neutrino-Argon cross section measurements. The focus of this proposed activity is the study of these neutrino events and the developments of selection and reconstruction tools to obtain a robust selection of the νe CC interactions collected by the detector, while effectively rejecting the background from cosmic rays and from the neutrino beam, and to provide a reliable estimate of the neutrino energy. The ability to select and measure νe CC interactions represents a key condition for the success of the SBN program, as well as of the forthcoming DUNE experiment. The candidate will start his/her activity studying the available reconstruction tools and will then introduce improvements and new features, optimized first with the support of MC events and then applied to the data recorded by ICARUS.	Daily activity: the student will collaborate with the ICARUS team at Fermilab in order to learn the details of the reconstruction code used for the ICARUS analysis and to start to use it and contribute to the development of the selection/reconstruction procedures. The main task will be to contribute to the development of the tools to select and measure the energy of νeCC interactions collected by ICARUS exposed to FNAL neutrino beams. The skills required for this project are: basic programming in Python, ROOT and C++ and basic knowledge of particle physics and in particular of neutrino physics. The skills to be acquired are: advanced programming and data analysis, deeper knowledge of experimental physics and in particular of the Liquid Argon detector technology.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No specific training is required, only the standard training required by Fermilab to access the laboratory.

FNAL - 5 -

Hosting Laboratory	Available period	Contact persons
Fermilab	15/4/2026 – 15/8/2026	Luca Morescalchi (PI) Ryan Rivera (FNAL)

Operation of the Mu2e calorimeter in the experimental hall	**Daily activity, skills required and to be acquired**
The Mu2e experiment at Fermilab aims to observe **Charged Lepton Flavour Violation** by searching for muon-to-electron conversion with a sensitivity **10^4 times better** than the current limit. Following the installation of the main subdetectors in late 2025, 2026 will be dedicated to commissioning, with the electromagnetic calorimeter playing a central role in measuring electron time and energy and providing triggers for electromagnetic particles. Operating the calorimeter in the experimental hall requires an intensive program of in-situ work to ensure stable performance ahead of beam delivery at the end of 2027. The main objectives are: • **DAQ development and debugging:** Cosmic-ray and calibration runs (laser and sources) will be used to refine the digitizer firmware and ensure synchronization with the global DAQ. • **Calorimetric trigger development:** A neural-network-based software trigger, trained on simulation, will be integrated into the global Mu2e trigger system for the first time in 2026. • **Slow Control and Data Quality Monitoring:** Continuous monitoring of event size, temperature, high voltage, channel occupancy, and gain will enable prompt detection of anomalies.	**Daily Activities** • Collection and analysis of data recorded by the Mu2e calorimeter • Interaction with DAQ and data quality systems • FPGA firmware programming and testing • Study of noise sources and their mitigation • Development of monitoring and analysis tools using ROOT and/or Python **Required Skills** • Basic experience with programming and data-analysis tools (ROOT, Python) **Skills to Be Acquired** • Hands-on understanding of detector operations, with emphasis on Data Acquisition procedures and monitoring tools • Enhanced programming and data-analysis skills • FPGA programming and simulation experience • Practical involvement in detector performance studies • Teamwork and effective reporting of results in internal meetings

any required training and/or safety procedures
- Mandatory Mu2e and Fermilab safety training modules are required to access the Mu2e building - No radiation-controlled area access or work-at-height training will be needed.

FNAL - 6 -

Hosting Laboratory	Available period	Contact persons
FNAL	01/05/2026 – 31/07/2026	Pavel Murat - FNAL Simone Donati – INFN Pisa

Commissioning of the Mu2e straw-tracker	Daily activity, skills required and to be acquired
The Mu2e experiment will search for the neutrinoless muon-to-electron conversion in the field of an aluminum nucleus. Mu2e will improve the previous limit set by the SINDRUM II experiment by three orders of magnitude in Run I. To achieve the Mu2e sensitivity goals, an adequate level of detector complementarity/redundancy and sophisticated reconstruction algorithms are required. The Mu2e success depends on many factors, one of which is the performance of the tracker. The straw tracker, a gaseous detector, must provide an excellent momentum resolution, approximately 1 MeV/c FWHM, to distinguish the monochromatic conversion electron signal from the background. The tracker has a modular design and consists of 18 tracking stations. The commissioning of the tracker and vertical slice tests with cosmic muons is underway. This provides a student with the opportunity to study hands-on how a gaseous detector is commissioned, perform calibration studies by looking at the first set of data that we have collected using one of the tracker stations. In the coming months, we plan to turn on more stations to collect data together with the rest of the Mu2e sub-detectors like the calorimeter and cosmic ray veto system. On the track reconstruction development end, more than 90% of the hits in the nominal Mu2e event are expected to be from low energy electrons and positrons formed through Compton scattering, pair production, etc. Therefore, the first step in the reconstruction procedure is to identify such background hits and flag them as background. We intend to take an ML-based approach to cluster and identify such hits prior to the pattern recognition studies. This will be an intense hands-on introduction to Mu2e, Mu2e tracking, data acquisition, and data analysis and is aimed at students interested in lepton flavor physics and ML techniques applied in particle physics reconstruction and analysis.	**Required knowledge:** a general familiarity with particle and physics, particle accelerators and detectors, as well as a solid understanding of computing methods, the Unix/Linux environment, programming languages (C, C++, Python) and the Root framework. Pre-existing “beginner” expertise in statistical data analysis will be beneficial. **Acquired knowledge:** enhanced proficiency in C, C++, Python and Root framework; Improved skills in statistical data analysis; Understanding of the Mu2e detectors and reconstruction software, the Mu2e data acquisition system, GEANT4, the *art* framework, and the use of grid and cloud computing. Strengthened oral and written communication skills. **Daily activity:** development of analysis code, processing of data samples, generation of Monte Carlo samples, and participation in/reporting to weekly Mu2e meetings (“Tracker”, “Calorimeter”, “Simulation and Analysis”, “DAQ”, “General Groups”).

Any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No-specific training is required, other than the standard Fermilab trainings necessary for Laboratory access.

FNAL - 7 -

Hosting Laboratory	Available period	Contact persons
FNAL (Chicago, USA)	01/07/2026 – 30/09/2026	Gian Luca Raselli Angela Fava (afava@fnal.gov)

Calibrations of the ICARUS photo-detection system during 2026 beam shutdown	**Daily activity, skills required and to be acquired**
The ICARUS T600 experiment is a detector based on the technology of the liquid argon Time Projection Chamber (LAr-TPC). Since 2020, it has been exposed to the Booster Neutrino Beam at Fermilab (Chicago, USA) as part of the Short-Baseline Neutrino (SBN) program, with the goal of searching for short-baseline neutrino oscillations. The detector is also exposed to the NuMI off-axis beam for neutrino-argon cross-section studies and Beyond Standard Model (BSM) searches. The INFN Pavia group developed the ICARUS photo-detection system, which consists of 360 large-area PMTs designed to detect the LAr VUV scintillation light for triggering and timing purposes. The system has been working well since the start of data taking, but its stability in terms of gain and timing must be periodically checked. To this end, a calibration system was implemented, which uses controlled laser light to illuminate each PMT window. During the summer 2026 BNB beam shutdown, there will be an opportunity to perform periodic calibration runs to monitor the performance of the ICARUS PMTs after five years of operation. This will also allow for the evaluation of updated time calibration constants for all	Under the supervision of photo-detection system experts, the student will assist in setting up the ICARUS special calibration runs (approximately once per week). A few experts from the ICARUS data analysis team will be present at Fermilab during the summer shutdown to teach the student how to use the ICARUS analysis framework, which relies on ROOT-based macros. The initial skills required include a basic understanding of scintillators and photo-detectors, as well as some programming experience in C++, Python, and ROOT.

FNAL - 8 -

Hosting Laboratory	Available period	Contact persons
FERMILAB	**1/May/2026 – 1/Dec/2026**	**Simona Giovannella (LNF)** **Greg Rakness (FNAL)**

Commissioning and performance of the Mu2e detectors	**Daily activity, skills required and to be acquired**
Starting from spring 2026, the Mu2e detector will be fully installed in the so-called extracted position (i.e. outside of the Detector Solenoids) over its installation rails. The detector consists of a fast and precise CsI+SiPM calorimeter, a 3 meter long tracker with 20000 straws, and a portion (25 m^2) of the Cosmic Ray Veto system made of long scintillation counters readout by SiPMs. Throughout the summer and until the end of the year, a combined data taking with all three detectors will take place. This will support the preparation for beam data taking, foreseen in 2027, in several ways: - **Calibration of individual detectors** will be performed using cosmic rays events and specialized systems (Calorimeter Laser, Calorimeter source, Tracker Pulse, CRV gain runs), enabling final adjustments and fine tuning of the detectors. - **Performance studies** (resolutions, linearity, alignment) of the detectors will be conducted, with particular focus on cross-calibration among systems, such as tracker to calorimeter (or CRV) alignment, using track extrapolation. These studies will provide time and position calibration that will inform the future PID algorithms and other specialized studies, like the calibration of the calorimeter response along the crystal axis.	**Daily Activities** • Collection and analysis of data recorded by the Mu2e detector • Participation in detector calibration and reconstruction activities • Data analysis using ROOT and/or Python • Detector monitoring and data-quality checks during daily data-taking activities **Required Skills** • Some experience with programming and data-analysis tools (ROOT, Python) • Willingness to work in a team **Skills to Be Acquired** • Hands-on understanding of detector operations • Improved programming and data analysis skills • Expertise in calibration techniques and reconstruction algorithms • Experience with detector performance studies • Ability to reports results during internal meetings

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
- Mandatory Mu2e and Fermilab safety training modules to access the Mu2e building, which are pretty general safety trainings - In 2026, the Mu2e building is not expected to operate as a radiation-controlled area - No work at height will be required

FNAL - 9 -

Hosting Laboratory	Available period	Contact persons
FNAL	01/04/2026 – 01/10/2026	Matteo Tenti Angela Fava

Data Analysis in the ICARUS Neutrino Experiment	Daily activity, skills required and to be acquired
The ICARUS experiment at Fermilab employs a Liquid Argon Time Projection Chamber (LArTPC) to study neutrino interactions with high precision. One of its primary goals is to investigate the possible existence of sterile neutrinos, a candidate for physics beyond the Standard Model. The proposed student project will contribute to analyzing data collected during the initial ICARUS runs (2021–present), focusing on the charged-current quasi-elastic (CCQE) interaction channel of muon neutrinos. Using reconstructed event distributions, the student will compare the observed energy spectrum with the expected prediction under the standard three-neutrino framework. Deviations between these spectra could indicate oscillation effects involving a sterile neutrino state. This analysis will involve data selection, spectrum comparison, and statistical interpretation to assess the compatibility of observations with the sterile neutrino hypothesis.	The student will perform data selection, spectrum comparison, and statistical analysis using ICARUS datasets. Required skills include basic knowledge of Python, C++, and ROOT, plus fundamentals of neutrino interactions. The student will acquire expertise in LArTPC event reconstruction, Monte Carlo simulations, neutrino oscillation analysis, and sterile neutrino searches, gaining hands-on experience with real experimental data

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
The activity may involve ordinary risks associated with video display terminals (VDTs).

FNAL - 10 -

Hosting Laboratory	Available period	Contact persons
FNAL	**01/05/2026 – 31/07/2026**	**Donatella Torretta - FNAL** **Simone Donati – INFN Pisa**

Particle Identification in the ICARUS T600 LAr-TPC	Daily activity, skills required and to be acquired
The ICARUS T600 is part of the Fermilab Short Baseline Neutrino (SBN) program and began physics data-taking in June 2022. The primary goal of the SBN program is to record neutrino events from the Booster Neutrino Beam (BNB) to definitively assess the numerous experimental anomalies that appear to indicate the possible existence of sterile neutrinos at the $\sim 0.01 - 1\ \mathrm{eV}^2$ scale. In addition, ICARUS collects neutrinos from the NuMI off-axis beam to perform precise neutrino-Argon cross-section measurements, which will be valuable in preparation for DUNE. A crucial element for an efficient and accurate reconstruction and selection of neutrino events is the ability to identify the particles produced at the primary neutrino interaction vertex. The available particle identification (PID) tools rely on studying particle track properties, including precise measurements of the dE/dx and residual range. The proposed Training Program will focus on improving calorimetric event reconstruction, with particular attention to quantifying the differences between data and Monte Carlo. Understanding the sources of residual data/MC discrepancies, such as angular effects, wire-planes non-uniformities, and accidental track splitting, is essential to optimizing PID performance and assessing the impact of detector-related systematic uncertainties. In parallel, new particle identification tools based on advanced Machine Learning (ML) techniques, including Boosted Decision Tree (BDT) classifiers that incorporate full event tracking and calorimetric information, will be investigated. This will be an intense, hands-on Training Program designed for students interested in neutrino physics, neutrino event reconstruction in LAr-TPCs, and the application of ML techniques to particle-physics reconstruction and analysis.	**Required knowledge:** a general familiarity with particle and neutrino physics, particle accelerators and detectors, as well as a solid understanding of computing methods, the Unix/Linux environment, programming languages (C, C++, Python) and the Root framework. Pre-existing “beginner” expertise in statistical data analysis will be beneficial. **Acquired knowledge:** enhanced proficiency in C, C++, Python and Root framework; Improved skills in statistical data analysis; Understanding of the Icarus detectors and reconstruction software, the Icarus data acquisition system, GEANT4, the *art* framework, and the use of grid and cloud computing. Strengthened oral and written communication skills. **Daily activity:** development of analysis code, processing of data samples, generation of Monte Carlo samples, and participation in/reporting to weekly Icarus meetings (“Calibration”, “Systematics and Fitters”, “Analysis”, “Simulation/Reconstruction”, “SBN Oscillations”).

Any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.):
No-specific training is required, other than the standard Fermilab trainings necessary for Laboratory access.

FNAL - 11 -

Hosting Laboratory	Available period	Contact persons
FNAL	~01/06/2026 – ~01/09/2026	Filippo Varanini (INFN-PD) Angela Fava (FNAL)

Muon momentum measurement through Multiple Coulomb Scattering in ICARUS	**Daily activity, skills required and to be acquired**
The project intends to further the development of algorithms for the measurement of non-contained muon momentum via Multiple Coulomb Scattering. This algorithm will be developed and tested in the ICARUS experiment but can be applied to other liquid Argon TPCs, and is of crucial importance for nu_mu oscillation physics. The student will improve the existing algorithms, originally developed for ICARUS at LNGS, adding a better description of electric field distortions from cathode planarity, and assessing their impact on MCS measurement performance. If time allows, other field-distorting effects could be parameterized and studied, such as space charge and field cage imperfections. It will also validate the performance of this algorithms on contained events, comparing with the estimate from muon range, and compare it with alternative approaches, in terms of efficiency, bias and resolution. This will be first performed on simulated events, then applied to real ICARUS data collected at FNAL (both cosmic and muons from nu_mu charged current interactions).	The student will work within the existing icaruscode software environment, in the context of the Larsoft framework shared with all existing LAr-TPC experiments. They will be tutored by F. Varanini, original developer of the algorithm and convener of the ICARUS MCS task force. They will need a basic knowledge of C++ programming and, ideally, of Python software for data visualization and analysis. A previous experience with the larsoft framework would be preferred but not required. The student will acquire a deeper knowledge of the physics of Multiple Coulomb Scattering and of LAr-TPC detectors, and a rich experience of programming in the context of a particle physics experiment. Technically, they would largely improve their competence in C++ and Python languages.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No training/safety procedures will be required beyond the standard FNAL ones.

KEK - 1 -

Hosting Laboratory	Available period	Contact persons
KEK	**01/06/2026 – 30/11/2026**	**Alessandro Gaz** **Kenta Uno**

Study of the PID performance of the Belle II detector in Run2 data taking	Daily activity, skills required and to be acquired
The Belle II detector is currently in its Run2 phase of data taking. As the instantaneous luminosity and the associated machine backgrounds increase, the experiment is facing several challenges to maintain its performance and ensure that the detector will remain healthy throughout its expected lifetime. Particle Identification (PID) is one of the most critical areas of the experiment: many physics analyses rely on efficient capabilities of discriminating between particles of different species, but worsening background conditions and detector aging are a concern for the future. In this project, the student will work on the data collected in 2025-2026, selecting standard control samples and studying in detail the PID performance as a function of variables tightly connected with the background conditions and as a function of detector operating parameters (it is foreseen that the central drift chamber will run at reduced voltage, at least for a fraction of the time). Depending on the interest, the student might be involved in some detector studies/commissioning activities.	This will be mostly a data analysis project. The data necessary for the study will be available at the start of the project. In the first 2 weeks, the student will become familiar with the Belle II software analysis environment and will create the ntuples for one or more specific control channels. The data will include high and low background data taking periods and different detector operating conditions. In the following 4 weeks, the student will identify the variables that mostly correlate with the background conditions and loss of PID efficiency. In the final weeks, the student will summarize the findings, possibly discussing strategies aimed at minimizing the negative effects of the backgrounds. Prerequisites: some familiarity with python and C++ and with the ROOT analysis framework. In Summer 2026 Belle II will not be in data taking mode, so some hands-on detector work could be possible, if the student is interested.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Although not strictly required for this project, it might be useful for the student to have access to radiation-controlled areas, in case there will be the opportunity for some hands-on detector work.

KEK - 2 -

Hosting Laboratory	Available period	Contact persons
KEK (Tsukuba)	**01/05/2026 – 31/10/2026**	**Laura Zani Marcela Garcia (KEK)**

AI-based event selection for tau decays at Belle II	**Daily activity, skills required and to be acquired**
Leptons are powerful tools for searching for new physics beyond the Standard Model. Particularly, tau leptons offer an ideal testbed since they are the only lepton heavy enough to decay into hadrons, allowing for precision tests of the Standard Model, through the measurement of several fundamental parameters, interactions structure, and investigation of the mechanism of hadronization. Belle II experiment at the electron-positron asymmetric energy collider SuperKEKB will collect the largest data set of more than ten billion tau pairs at the end of its data taking. However, taus reconstruction is challenging. Tau leptons decay before being detected into final states including neutrinos, and they need to be reconstructed from the stable particles produced in their decays. Machine-learning techniques can be trained to identify tau events with neutral pions in the final state. Exploiting the information from dedicated sub-detectors and the reconstructed kinematics of the event, the aim is to achieve a pure selection of tau decays with neutral pions in the final states to precisely measure branching fractions, invariant mass distributions and spectral fractions. The goal is to improve the current knowledge of hadronic decays of the tau lepton, which is crucial also for many SM parameters determination.	A basic knowledge of python, root and C++ is essential and candidates should try to acquire it before the start of the grant. Principles of interaction of particles with matters must be already known and mastered. Reference groups are available to train the interested student, before going to KEK, to the basic usage of Belle II software. Work at KEK will consist mainly in software activity: selecting specific final state topologies for tau samples, running the reconstruction software, and prepare training samples for the AI-based classifier. Performance figures as efficiency and purity of the selected samples will be also measured. The project will be closely supervised by Dr. Marcela Garcia, a senior post-doc researcher based at KEK, who is a tau physics expert. Dr. Garcia will be in touch daily with the student.
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.). NONE	

KEK - 3 -

Hosting Laboratory	Available period	Contact persons
KEK	01/06/2026 – 31/09/2026	Luigi Corona Shohei Nishida

Search for dark sector particles at Belle II	**Daily activity, skills required and to be acquired**
Dark matter is one of the strongest hints of physics beyond the Standard Model, and light dark sector particles in the MeV–GeV range are among the most exciting possibilities. Such particles could shed lights on dark matter nature and explain longstanding tensions between theory and experiment. In these scenarios, dark matter interacts only very feebly with Standard Model particles through new, light dark sector mediators. With its excellent low-multiplicity and missing-energy reconstruction performance, and low-multiplicity dedicated triggers, Belle II (in Tsukuba, Japan) offers a unique opportunity to probe unexplored dark sector models. This project focuses on assessing the feasibility of searches for non-Standard Model particles and potential dark-matter candidates, and invites the candidate to contribute directly to these searches. The work includes a broad spectrum of activities: theoretical model studies, the generation and simulation of signal events, signal reconstruction-efficiency evaluations, preliminary background-rejection strategies, and estimating Belle II sensitivity to key scenarios. Potential channels include dark photon and long-lived dark Higgs production in e^+e^- collisions, lepton-flavour-violating resonances produced in association with muons in e^+e^- collisions, and dark photons from charm-meson decays. Depending on the candidate's interests and the duration of their involvement, the project can focus on one or more of these high-impact topics.	The candidate will join a team of experts and work under the guidance of an experienced tutor. The project offers hands-on experience in high-energy physics analysis, with a focus on dark sector searches and the feasibility of discovering non-Standard Model particles and potential dark-matter candidates. The candidate will learn the fundamentals of dark sector analysis: the relevant physics; event generation, simulation and reconstruction; the study of kinematic features to distinguish signal from background; and the statistical treatment to asses experimental sensitivity to dark sectors. The candidate will also develop the software needed for a preliminary data analysis within the the Belle II Analysis Framework. Required skills: basic knowledge of major operating systems; experience with ROOT and Python analysis tools; and, preferably, a study program or thesis in experimental high-energy physics.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

LABORATORI NAZIONALI DI FRASCATI - 1 -

Hosting Laboratory	Available period	Contact persons
Laboratori Nazionali di Frascati	01/06/2026 – 01/10/2026	Mauro Raggi (Sapienza) Tommaso Spadaro (LNF)

New PADME target optimization for Run V	**Daily activity, skills required and to be acquired**
The "ATOMKI anomaly" refers to a long-standing claim for the existence of a new particle with a mass of about 17 MeV, known as X17. Recent developments in X17 searches have deepened the puzzle. While evidence from the ATOMKI laboratory continues to grow, the MEG II experiment at PSI reported a null result from a similar search in the summer of 2025. However, the MEG exclusion remains compatible with ATOMKI observations. Meanwhile, the PADME experiment at LNF has presented the analysis of its Run III dataset, revealing a local excess of 2.5 sigma at 16.9 MeV, consistent with the mass reported for the ATOMKI X17 particle. Clarifying this situation is of utmost importance. The sensitivity of PADME to X17 in resonant production critically depends on the electron motion within the target material. The current PADME diamond target was not designed for resonant searches and therefore does not represent the optimal choice. The present project, "Investigation of a New Target Design for the PADME Experiment", aims to identify the most suitable target material for X17 resonant searches. Alongside MC studies for the material choice and its impact on experimental data taking conditions, the student will also measure the prototype target thickness.	The first part of the project will require the student to modify the present PADME MC program introducing a new target material to compare detector occupancy, signal rates and establish proper target thickness. This first parts requires C++ programming skill and will allow acquiring knowledge of Geant4 Monte Carlo simulation framework. In the second part of the project an X-ray based setup will be used to measure the target thickness. In this part the student will acquire data acquisition and data analysis skills based on the CERN root tool.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No special training needed

LABORATORI NAZIONALI DI FRASCATI - 2 -

Hosting Laboratory	Available period	Contact persons
LNF	01/04/2026 – 30/06/2026	Chiara Arcangeletti Tommaso Spadaro

Analysis of PADME Run IV data of micromegas detectors	**Daily activity, skills required and to be acquired**
For its fourth run, PADME has installed two new micromegas based gas detectors: a 650x650 mm^2 chamber hosting two 50-mm wide gaps, upstream and downstream of the beam direction. Each region is readout in both horizontal coordinates by 1.2-mm spaced strips. The reconstruction is made somewhat challenging by the high level of occupancy, reaching 40% in certain regions. The project aims at developing reconstruction algorithms and at evaluating the related performance in terms of hit time and position resolutions, hit efficiency and track-level efficiency and angular resolutions.	Skills required: c++, python programming, partial knowledge of gas detectors for particle physics Skills to be acquired: data analysis, particularly related to reconstruction and tracking algorithms.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

LABORATORI NAZIONALI DI FRASCATI - 3 -

Hosting Laboratory	Available period	Contact persons
Laboratori Nazionali di Frascati	**01/02/2026 – 31/12/2026**	**Davide Piccolo**

Characterization of RPC and RCC particle detectors with ecological gas mixtures	**Daily activity, skills required and to be acquired**
We propose a research project aimed at investigating the performance of Resistive Plate Chambers (RPC) and Resistive Cylindrical Chambers (RCC) using ecological gas mixtures with cosmic rays. RPCs are widely utilized detectors in high-energy physics and in LHC experiments at CERN. They consists of a gas volume sandwiched between two planar electrodes, across which a strong electric field (approximately 50 kV/cm) is applied. When a charged particle passes through the RPC, it ionizes the gas molecules, producing electrons. Under the influence of the electric field, these electrons undergo multiplication, generating an electrical signal that can be measured. The best performance of this device is obtained by using fluorinate gases that are greenhouse gases. The project focus on the study of alternative ecological mixtures to operate the RPCs and to study the performance of the RCC that is a new detector recently introduced as an extension of the planar RPCs to the cylindrical geometry. This new device aims to address some of the challenges associated with RPCs and represents an intriguing alternative that requires systematic investigation. The objective of this project is to study the performance of RCCs and to compare the results with those obtained from planar RPCs, as well as with outcomes from simulation programs.	The student will: participate in the preparation of the experimental setup for data acquisition, conduct daily measurement campaigns by varying the operational parameters of the detectors (RPC and RCC), analyze the collected data and compare the results with outcomes from simulation studies. Required skills are: Laboratory work aptitude and a meticulous approach to data collection. Systematic approach to conducting experiments and recording results. Basic experience in using software tools. At the end of the project the student will get ability to define and implement the most suitable measurement program for the experiments. Enhanced laboratory skills through hands-on experience with detection technologies. Basic experience in data analysis tools such as ROOT and c++, including Monte Carlo simulations. The length of the activity program can be easily tailored according to the period of the scholarship.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
No special training is required. The activities will be done in laboratory without use of radioactive sources.

LABORATORI NAZIONALI DI FRASCATI - 4 -

Hosting Laboratory	Available period	Contact persons
LNF (Frascati, IT)	01/03/2026 – 31/10/2026	Pasquale Di Nezza (LNF) Marco Santimaria (LNF)

R&D activities for the fixed target at LHCb	**Daily activity, skills required and to be acquired**
The internal gas target at LHCb offers exceptional opportunities for an extensive physics program spanning heavy-ion, hadron, spin, and astroparticle physics. The combination of a storage cell placed in the LHC primary vacuum, an advanced Gas Feed System, the availability of multi-TeV proton and ion beams, and the recent upgrade of the LHCb detector make this project unique worldwide. In 2024, LHCb collected exceptional beam-gas data, demonstrating that fixed target collisions can occur simultaneously with collider mode operations without compromising efficient data acquisition and high-quality reconstruction of beam-gas and beam-beam interactions.	The current fixed target system provides unpolarized collisions. The ongoing R&D efforts aims to upgrading the system to a polarized target system, which would be the only way to achieve polarized collisions at the LHC. The student activity will focus on understanding and studying the polarized Atomic Beam Source and addressing other key aspects to ensure the system compliance with the LHC. Skills required: basic programming Skills to be acquired: spin physics, slow control
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	

LABORATORI NAZIONALI DI FRASCATI - 5 -

Hosting Laboratory	Available period	Contact persons
LNF	1/03/2026 – 1/05/2026	Gianfranco Morello

Advanced gas detector R&D and performance studies for Phase II LHCb Muon System	Daily activity, skills required and to be acquired
In this project, several layouts of micro-pattern gaseous detectors (MPGDs), specifically micro-RWELL devices, will be investigated as tagging detectors with pad readout. The study will focus on optimizing gas gain, detection efficiency, time resolution, and rate capability, with the aim of meeting the stringent requirements of the inner and small-angle regions of the LHCb Muon System Phase II Upgrade. Through this project, the candidate will acquire comprehensive scientific and technical training, encompassing the development and characterization of novel MPGD detectors, as well as hands-on experience in experimental setup, data collection, and performance evaluation, thereby gaining a thorough understanding of both detector physics and practical operation.	The proposed project will provide the candidate with a solid scientific and technical training in the following areas: • development and characterization of novel micro-pattern gaseous detectors (MPGD); • analysis and optimization of the performance of complex data acquisition systems. This research program is fully consistent with the objectives of the Phase II Upgrade of the LHCb Muon System, particularly for the inner and high-rate regions. It provides the candidate with a comprehensive, multidisciplinary experience, offering a deep understanding of the physical phenomena underlying gas detectors, the study of their performance through both laboratory measurements and beam tests, and the use of complex electronics systems for data acquisition and analysis.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
The candidate will also receive the necessary training and follow safety procedures to work in radiation-controlled areas and handle radioactive sources.

LABORATORI NAZIONALI DI FRASCATI - 6 -

Hosting Laboratory	Available period	Contact persons
LNF	01/04/2026 – 30/06/2026	Mario Antonelli Tommaso Spadaro

Sensitivity of a PADME upgraded setup to an X17 resonance	**Daily activity, skills required and to be acquired**
After the analysis of Run III data, the PADME collaboration produced the result for the search of a narrow resonance in e+e- annihilation with a mass of around 17 MeV, the so-called X17. The result shows a two-sigma global excess for a mass around 16.90 MeV, which is clearly not enough to claim any conclusion on the existence of such beyond-the-SM particle. The data from PADME Run IV should probe for the X17 with an expected sensitivity that, albeit being improved with respect to Run III, is not expected to lead to any claim above 3—4 sigma. The idea is to modify significantly the setup to allow a search based on different observables than those available up to now: the e+e- final state invariant mass, the cross section as a function of the center-of-mass emission angles, the forward-backward asymmetry, etc. The activity will therefore involve simulating different setups and understanding the expected performance, the acceptance and the signal-over-background figure of merit.	Skills required: c++, python programming, tracking detectors for particle physics. Skills to be acquired: evaluation of expected sensitivities, optimization of detector parameters.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).

LABORATORI NAZIONALI DI FRASCATI - 7 -

Hosting Laboratory	Available period	Contact persons
LNF	30/04/2026 – 31/07/2026	Marco Poli Lener

R&D on Micro-Pattern Gaseous Detectors for the IDEA Experiment at FCC	Daily activity, skills required and to be acquired
In this project, several layouts of micro-pattern gaseous detectors (MPGDs), specifically micro-RWELL devices, will be investigated as two-dimensional tracking detectors with strip readout. This technology is being developed to meet the requirements of the future IDEA muon system at the Future Circular Collider (FCC). The different configurations will be studied and compared with the aim of optimizing detector gain, spatial resolution, and the number of required electronic readout channels. To support these studies, the project will also provide the candidate with solid scientific and technical training, including the development and refinement of a data-reconstruction workflow based on the Corryvreckan analysis framework. Furthermore, the student will design and operate a dedicated setup for both laboratory cosmic-ray measurements and beam-test campaigns of micro-RWELL prototypes, enabling a thorough assessment of detector performance across diverse experimental conditions.	The proposed project will provide the candidate with comprehensive scientific and technical training in the following areas: • development and optimization of a data reconstruction framework based on the Corryvreckan analysis software; • design and implementation of a cosmic-ray and beam test setup for novel micro-pattern gaseous detectors (MPGD), enabling detailed studies both with cosmic rays and subsequently under beam conditions. This research program is fully aligned with the R&D objectives of the IDEA detector at FCC, offering the candidate a rigorous and multidisciplinary experimental experience. The candidate will gain interdisciplinary training in gas detector physics, performance evaluation in both laboratory and beam tests, and the use of advanced electronics for data acquisition and analysis.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
The candidate will also receive the necessary training and follow safety procedures to work in radiation-controlled areas and handle radioactive sources.

LABORATORI NAZIONALI DI FRASCATI - 8 -

Hosting Laboratory	Available period	Contact persons
LNF	01/04/2026 – 01/10/2026	Gabriele Sirri Antonio Di Domenico Danilo Domenici

Development and Testing of the SAND Detector for the DUNE Near Detector Complex	Daily activity, skills required and to be acquired
The SAND detector is part of the near detector complex of the DUNE experiment at Fermilab, designed to precisely characterize the neutrino beam and reduce systematic uncertainties in oscillation measurements. This project involves hands-on work at the INFN Frascati laboratories, where the student will take part in a test-beam campaign at the BTF for a drift chamber prototype that will serve as the tracking detector inside SAND. In addition, the student will help refurbish the calorimeter modules of the SAND detector to ensure optimal performance for future data-taking. Activities include mechanical assembly, electronics integration, and preliminary calibration procedures. The student will gain practical experience in detector hardware and beam test operations, acquiring skills essential for experimental particle physics.	The student will work on calorimeter module refurbishment, including mechanical assembly and electronics checks, and participate in the drift chamber test beam campaign. Required skills include basic electronics, mechanical assembly, and familiarity with particle detectors. The student will acquire hands-on experience in detector hardware, calibration techniques, beam test operations, and quality assurance for high-energy physics experiments.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
The activity may involve risks associated with compressed gases, along with common laboratory hazards such as mechanical risks (impacts, collisions, compression injuries) and electrical risks related to the use of electronic devices and high-voltage (HV) power supplies. Access rules for the BTF area are described at https://btf.lnf.infn.it/access-documentation . For the radioprotection “the BTF area is not classified as ‘zona controllata (controlled area)’ from the point of view of radiation protection, thus users do not need an individual dosimeter or film-badge."

PSI - 1 -

Hosting Laboratory	Available period	Contact persons
PSI	**01/06/2026 – 31/10/2026**	**Francesco Renga (INFN Roma)** **Malte Hildebrandt (PSI)**

Optimization of the design of a future μ -> e γ experiment	**Daily activity, skills required and to be acquired**
The search for **charged Lepton Flavour Violation (cLFV)** is one of the most promising probes for New Physics beyond the Standard Model. The muon sector provides some of the most stringent limits on cLFV, and the **MEG II experiment** at PSI, searching for the μ -> e γ, currently leads the field. However, the absence of positive signals so far pushes for a further step in sensitivity to be performed in the next decade. A new experiment is currently being proposed, incorporating a high-granularity magnetic spectrometer for positron detection and a photon detector exploiting the conversion into e^+e^- pairs in matter. The appointed student will contribute to the optimization of the experimental design by developing simulations of the apparatus, including geometry and response of the detectors, and different options for the magnetic field configuration.	The appointed student is supposed to be proficient in C++. A basic knowledge of the simulation toolkit GEANT4 is preferable but not strictly necessary. Daily activities will include discussing with experts the expected response of the detectors and examining the relevant literature, building detector models in GEANT4, and analyzing the simulation results. The appointed student will learn how to develop the simulation of a state-of-the-art experimental apparatus, and acquire the knowledge on detector physics that is necessary to develop accurate models of the response of the detectors.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
radiation-controlled area, use of radioactive sources

PSI - 2 -

Hosting Laboratory	Available period	Contact persons
PSI	01/06/2026 – 31/10/2026	Francesco Renga (INFN Roma) Philipp Schmidt-Wellenburg (PSI)

Characterization of the muonTPC of the muEDM experiment	**Daily activity, skills required and to be acquired**
The **muEDM experiment** will search for a possible non-zero electric dipole moment of the muon, with a sensitivity of 10^{-23} e cm. It would provide evidence of **CP violation** beyond the Standard Model, one of the necessary ingredients to explain the matter-antimatter asymmetry in the Universe. In this experiment, muons are stored within an electromagnetic field, and the precession of their spin is measured. To suppress systematic uncertainties, an accurate knowledge of the muon beam phase space at injection into the magnet is required. This is provided by a **gaseous Time Projection Chamber (TPC)** instrumented with GridPix detectors, reconstructing the trajectory of the muons right after the injection. The appointed student will participate in the installation of the detector within the experimental apparatus and in the data taking on the PSI muon beam lines. A careful calibration of the detector will also be needed to guarantee the necessary accuracy. It will be performed with benchtop experiments using calibration sources and cosmic rays.	The appointed student is supposed to have a basic knowledge of instrumentation for particle detectors, as acquired in master's degree laboratory courses, and basic programming skills in either C++ or Python. Daily activities will include arranging small experimental setups, running the detector services (high voltage, gas distribution, control sensors, etc.), operating the data acquisition, and developing computer programs to analyze the collected data. The appointed student will learn how to operate cutting-edge particle detectors, acquire a substantial knowledge of the physics behind the functioning of gaseous detectors and familiarize with the most used techniques and tools for the analysis of experimental data.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
radiation-controlled area, use of radioactive sources

PSI - 3 -

Hosting Laboratory	Available period	Contact persons
PSI	01/06/2026 – 31/10/2026	Francesco Renga (INFN Roma) Malte Hildebrandt (PSI)

Development of a GEM-TPC for future searches of charged Lepton Flavor Violation	**Daily activity, skills required and to be acquired**
The search for **charged Lepton Flavour Violation (cLFV)** is one of the most promising probes for New Physics beyond the Standard Model. The muon sector provides some of the most stringent limits on cLFV, and the **MEG II experiment** at PSI, searching for the $\mu \to e \gamma$, currently leads the field. However, the absence of positive signals so far pushes for a further step in sensitivity to be performed in the next decade. A new experiment is currently being proposed, searching for $\mu \to e \gamma$ through the conversion of photons into e^+e^- pairs in matter, which will require an extremely precise magnetic spectrometer for very low momentum positrons and electrons. The appointed student will participate in the first stages of the development of a Time Projection Chamber (TPC) with GEM readout specifically designed for tracking e^+e^- pairs down to a few MeV/c in momentum. The project will include tests on the PSI beam lines and benchtop experiments with cosmic rays and radioactive sources.	The appointed student is supposed to have a basic knowledge of instrumentation for particle detectors, as acquired in master's degree laboratory courses, and basic programming skills in either C++ or Python. Daily activities will include arranging small experimental setups, running the detector services (high voltage, gas distribution, control sensors, etc.), operating the data acquisition, and developing computer programs to analyze the collected data. The appointed student will learn how to operate cutting-edge particle detectors, acquire a substantial knowledge of the physics behind the functioning of gaseous detectors and familiarize with the most used techniques and tools for the analysis of experimental data.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
radiation-controlled area, use of radioactive sources

PSI - 4 -

Hosting Laboratory	Available period	Contact persons
Paul Scherrer Institute	**01/05/2026 – 30/11/2026**	**Giovanni Gallucci (INFN – Pisa)** **Angela Papa (PSI)**

MuEDM positron tracker detector development and **commissioning**	**Daily activity, skills required and to be acquired**
The Electrical Dipole Momentum (EDM) of fundamental particles are intimately connected to the violation of time invariance T and the combined symmetry of charge and parity CP. The MuEDM experiment, using for the first time worldwide the innovative frozen spin technique, aims to measure the muon EDM with heightened sensitivity studying the asymmetry up/down of the positron from the muon decay. The muon beam of Paul Scherrer Institute (PSI) will enter in a uniform magnetic field region, and the muons will be trapped inside the region. The positron from decay will be measured by a dedicated scintillating fibers detector coupled with silicon photomultipliers (SiPMs) and read by CAEN FERS electronics. The contract holder will be involved in the different phases of the tracker development: SiPMs and readout electronics; construction, assembly and integration of the detector; tracker commissioning during the beam time 2026. During the contract period, she/he will benefit of deep interactions with local experts and other collaboration members for the above-mentioned activities.	The candidate will collaborate with the detector and electronic experts responsible for the positron tracker. At the beginning of the activity the contract holder must have a good knowledge of particle detector physical principles especially of scintillating materials and SiPM. A basic experience in C++ programming language and a good autonomy in the use of analysis software like ROOT will be useful.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Radiation-controlled area. Use of calibration radioactive sources.

PSI - 5 -

Hosting Laboratory	Available period	Contact persons
Paul Scherrer Institute	01/05/2026 – 30/11/2026	Giovanni Gallucci (INFN – Pisa) Angela Papa (PSI)

Muon beam for MuEDM experiment	Daily activity, skills required and to be acquired
A new experimental program is taking shape at PSI with the goal of searching for the muon EDM with a final sensitivity of 10^{-23}e·cm, using for the first time worldwide the frozen-spin technique in a compact storage ring. This search for a non-zero muon EDM (muEDM) offers a unique opportunity to explore previously uncharted territory and to test theories Beyond the Standard Model. The experiment will follow a two-stage approach, with the first stage—the so-called precursor experiment—aiming to collect an initial data sample by 2026. The key objective is to accumulate muons in the correct storage orbit and measure the asymmetry of the positrons from their decays as the signature of a non-zero muon EDM. Precise control of the main systematic effects—particularly the alignment of the electric and magnetic fields—is crucial for the success of the measurement. We will alternate CW and CCW injections with opposite field polarities while maintaining identical initial muon conditions, selected through time-of-flight measurements and monitored with dedicated beam-diagnostic detectors. As part of this project, the student will contribute to the study of the dominant systematic effects and to the construction of the TOF and beam-monitoring detectors, based on very thin plastic scintillators coupled to silicon photomultipliers. They will also run MC simulations and perform analyses of the collected data.	The candidate will collaborate with the detector experts responsible for the muon beam and TOF. At the beginning of the activity the contract holder must have a good knowledge of particle detector physical principles especially of scintillating materials and SiPM. A basic experience in C++ programming language and a good autonomy in the use of analysis software like ROOT will be useful.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Radiation-controlled area. Use of calibration radioactive sources.

PSI - 6 -

Hosting Laboratory	Available period	Contact persons
Paul Scherrer Institute	**01/05/2026 – 30/11/2026**	**Giovanni Gallucci (INFN – Pisa)** **Angela Papa (PSI)**

Commissioning of the MEG-II detectors	**Daily activity, skills required and to be acquired**
The MEGII experiment is searching for the lepton flavor violating decay $\mu \rightarrow e\gamma$ with unprecedented sensitivity. Several detector and calibration procedures will be commissioned for the run 2026: among the others, a cylindrical drift chamber (CDCH), with unprecedented positron track performances, a full custom trigger and an acquisition (TDAQ) system, that efficiently selects signal candidate events with a background rejection of 7 orders of magnitudes. She/he will be involved in one or both of the following activities: 1) for CDCH, the detector commissioning and calibration, using cosmic ray events to calibrate and compare the obtained results with the performances measured by means of muon and positron beam induced events. 2) for TDAQ system, the preliminary data taking to tune the trigger variables and optimize the background rejection and data taking. During the contract period, she/he will benefit of deep interactions with local experts and other collaboration members for the above-mentioned activities.	The candidate will collaborate with experts responsible for calibrations and detectors commissioning. At the beginning of the activity the contract holder must have a good knowledge of particle detector physical principles. A basic experience in C++ programming language and a good autonomy in the use of analysis software like ROOT will be useful for TDAQ and CDCH.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Radiation-controlled area. Use of calibration radioactive sources.

PSI - 7 -

Hosting Laboratory	Available period	Contact persons
Paul Scherrer Institute	1/04/2026 – 31/10/2026	Matteo De Gerone (INFN), Lorenzo Ferrari Barusso (INFN), Angela Papa (PSI)

Commissioning of the pTC detector for MEGII 2026 run	**Daily activity, skills required and to be acquired**
The MEG II experiment is pursuing the search for the lepton-flavor-violating decay $\mu \rightarrow e\gamma$ with unprecedented sensitivity. In preparation for the 2026 run, the pixelated Timing Counter (pTC)—the detector responsible for high-precision positron timing—will undergo a comprehensive commissioning and calibration campaign. The selected candidate will take part in the commissioning, calibration, and performance validation of the pTC, with responsibilities including timing calibrations using laser-based systems and Michel data; analysis of the collected calibration and physics data to evaluate timing resolution, channel synchronization, detector stability, and long-term performance; participation in data-taking sessions and verification of detector response under different operating conditions; collaborative work with the pTC detector team and other detector experts, contributing to troubleshooting, optimization procedures, and the refinement of calibration strategies. Throughout the contract period, the candidate will engage in close interaction with experienced members of the MEG II collaboration, acquiring practical expertise in precision timing detectors, calibration techniques, and data analysis for high-energy physics experiments.	The daily activities will focus on the operation and calibration of the pixelated Timing Counter. The candidate will carry out regular calibration runs—such as laser-based timing scans—and analyze the resulting data to verify timing offsets, identify problematic channels, and ensure detector stability. She/he will also contribute to the analysis of Michel positron events to evaluate the pTC timing performance under physics conditions. During MEG II data-taking periods, the candidate will monitor the detector, maintain optimal operating conditions, and document its behavior. All activities will be conducted in close collaboration with the pTC group and other detector experts, supporting troubleshooting efforts, refining calibration procedures, and ensuring the system's readiness for physics data collection. Required skills**:** basic knowledge of particle physics and basic programming skills in C++ and Python.
any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).	
Work in radiation-controlled areas	

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Hosting Laboratory	Available period	Contact persons
Paul Scherrer Institute	**1/05/2026 – 30/11/2026**	**Matteo De Gerone (INFN), Lorenzo Ferrari Barusso (INFN) Angela Papa (PSI)**

Design and development of the new timing counter for future μ → eγ experiment	**Daily activity, skills required and to be acquired**
The MEG II experiment searches for the charged lepton flavour–violating decay μ → eγ with unprecedented sensitivity, and is now entering its final year of data taking, aiming to reach its ultimate sensitivity of 6×10^{-14}. A further upgrade is currently being designed to push the sensitivity down to a few times 10^{-15}. Achieving this goal will require a significant increase in muon beam intensity, which in turn demands a substantial redesign of all MEG II detector systems. Within this framework, the selected student will contribute to the R&D of the Timing Counter (TC), the detector responsible for precise positron timing measurement. The current MEG II TC achieves a resolution of about 40 ps using plastic scintillator pixels read out on both sides by SiPM arrays, but further improvements are required. Possible upgrades under investigation include optimization of pixel geometry and readout schemes, as well as testing of new SiPM technologies and scintillating materials. The student will also participate in the development of a simulation of the upgraded detector, aimed at assessing timing performance, mechanical feasibility, cost, and readout complexity, ultimately identifying the optimal configuration for the final experiment.	The candidate will work alongside the experts who developed the MEG and MEG II detectors, combining hardware and software activities. Daily work will include the construction and characterization of scintillation counters, the preparation and calibration of SiPM readout systems, and performance measurements in laboratory and – possibly - beam tests. In parallel, the candidate will analyze the collected data and carry out simulations to study alternative geometries and detector configurations. This combined approach will support the optimization of the Timing Counter and contribute to the design choices for the final upgraded detector. The project will require a basic understanding of programming in C++ and Python.

any required training and/or safety procedures (work in cryogenic environments, radiation-controlled areas, use of radioactive sources, work at height, etc.).
Possible usage of radioactive source (90Sr) for scintillating tiles testing.