Istituto Nazionale di Fisica Nucleare
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Design, construction and test of resistive gaseous detectors (μ-RWELL) for the Phase-II LHCb experiment upgrade

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Radiation detectors are essential in particle physics, allowing precise measurements of particle properties such as position, energy, and timing. Among these, gaseous detectors have become fundamental in high-energy physics (HEP) due to their versatility in design and application. To meet the rising demands of modern HEP experiments, the Micro Pattern Gaseous Detector (MPGD) family was developed, specifically designed for high-rate particle environments. The **μ-RWELL** is a resistive MPGD that combines high-rate capability with simplified manufacturing [3]. The **LNF Detector Development Group (DDG)** is pioneering its design and application. The μ-RWELL detector is proposed for the upgrade of the muon system of the **LHCb experiment**, instrumenting the innermost region where muon flux is expected to reach 1 MHz/cm^2. This R&D aims to produce a high-rate detector with precise time resolution, in order to function as a **trigger** in such harsh environment [1].

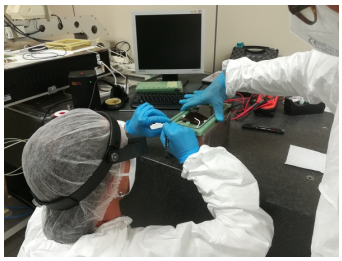
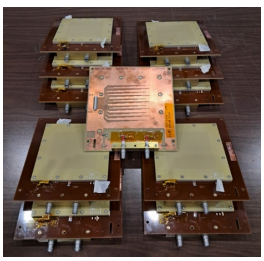
As a master's student, you will engage in **every phase of the R&D**, including: concept and PCB design, the production phase (with CERN and industrial partners), gain practical experience in the lab, conducting tests using X-rays and cosmic rays with analog front-end and NIM electronics, final validation in beam test facilities.

While the primary focus will be on μ-RWELL detectors for the LHCb upgrade, working within the DDG you will gain valuable exposure to a **wider range of cutting-edge technologies**. The DDG extends its research on μ-RWELL for tracking applications, including studies for the Future Circular Collider (FCC-ee) [4]. Additionally, the group is developing other gaseous detector technologies, such as the **sRPC** [2]. Both μ-RWELL and sRPC technologies also serve as the basis for ATHENA, an industrial spinoff focused on thermal neutron detection [5].

Through its long-standing collaborations with the **national and international MPGD community**, the DDG offers students unique opportunities to engage with leading experts in the field. This experience not only enhances technical skills in detector development but also builds professional connections across the global particle detection community, offering a comprehensive and enriching research environment.

Relevant skills developed: detector design and assembly, clean room operation, production of prototypes with industrial partners, cosmic rays and X-rays characterization, tests with particle beam

Required at least 75% of the master course exams completed.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