

TEAM DESCRIPTION

The IRFU-SPP and IRFU-SEDI teams have solid experience in design and construction of gaseous detectors for physics experiments. They contributed in the past to the construction of the TPCs for the ALEPH and DELPHI detectors, as well as T2K recently. They are presently involved in the existing linear and circular e^+/e^- collider projects. There is also at IRFU a strong expertise on the Micromegas detectors (invented and developed by IRFU teams) and their applications.

PROPOSED WORK

We propose in this thesis to study experimentally the distortions induced by positive ions on the charged tracks, and to study the amount of positive ions drifting back into the drift volume. This will be done using small to medium-scale detector prototypes. The measurements will be confronted to theoretical estimates from simulation. Building upon this study, the goal is to optimize the detector parameters, with the aim of minimizing the distortions. The student will have to master progressively the whole workflow, starting from the design of prototypes, their realization, up to the final experimental data acquisition and analysis. Data acquisition will be done using cosmic muons, radioactive sources and test-beams (at CERN-Geneva, or DESY-Hamburg). Finally, the measurements of the distortion will be used to predict the momentum resolution and invariant mass resolution of a complete detector system. The results on the resolutions will be used to check the expected detector performance for specific physics analyses, like the precision measurement of the Higgs boson mass in the HiggsStrahlung process.



Figure 2 : medium-scale(left) and small-scale TPC prototypes.

Candidates' requested qualifications: **Master-2 or equivalent in instrumentation or particle physics.**

Master-2 or equivalent academic level in instrumentation or elementary particle physics.

A basic knowledge of analog and digital electronics, of data acquisition systems and data processing techniques will be very useful.

ACQUIRED COMPETENCES

This thesis work will allow the successful candidate to acquire a global view of the design and detailed characterization of a detection system. It will allow him also to develop his understanding of particle physics, and it will give him many occasions for partnership with industrial companies. The international aspects of the collaboration will give the candidate many academic opportunities abroad.

Tentative timeline of the PhD preparation

[Detail content and duration of the various phases of the PhD work]

Publications related to the PhD subject: