The µ-RWELL technology for the preshower and muon detectors of the IDEA detector

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IDEA (Innovative Detector for an Electron-positron Accelerator)
- detector concept for \( e^+ e^- \) collisions
- considered both by FCC-ee and CEPC
- two of those sub-detectors are constituted by µ-RWELL technology
- mass production is needed

Pre-shower:
allows the identification and measurement electromagnetic showers that originate in the material of the solenoid before reaching the calorimeter

Muon detector:
outside the calorimeter is located within the iron return yoke that closes the magnetic field.

Technology:
1. single stage amplification
2. resistive Diamond-Like-Carbon (DLC) layer for charge dispersion and spark suppression
3. readout PCB embedded to DLC and amplification in a single foil

Operation:
1. charged particles ionize the gas volume
2. primary electrons drift to the amplification stage
3. the signal is induced capacitively, through the DLC layer, to the readout PCB

R&D and test:
1. test the µ-RWELL performance in a DLC resistivity scan \([10-80]\ \text{MΩ} \square\]
2. strip length 40 cm -> close to the final one
3. well known gas mixture: \( \text{Ar/CO}_2/\text{CF}_4 (45/15/40) \)
4. muon beam of 140 GeV/c interacting with trackers and test chamber

Results:
An HV scan shows a large range of operability with a cluster size range \([1-5]\) and a cluster charge range \([10-100]\) fC.

The spatial resolution is preliminary but it shows results better than 100 µm with a strip pitch of 400 µm and center of gravity algorithm.

The dependence on the DLC resistivity is smaller in the range \(40-80\ \text{MΩ} \square\) for cluster charge and cluster size, while the major dependency are observed in the spatial resolution behavior.