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

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The IDEA detector concept has been designed to operate at a future large circular e+e- collider, like FCC-ee or CEPC. The IDEA detector has an innovative design with a central tracker enclosed in a superconducting solenoidal magnet. Going outwards, a preshower system followed by a dual readout calorimeter is foreseen. In the iron yoke, that closes the magnetic field, are then located three stations of muon detectors. The preshower and muon detectors are based on the μ-RWELL technology that inherits the best characteristics of the GEM, in particular the layout of the amplification stage, and Micromega detectors, that inspired the presence of a resistive stage.
To profit of the industrial production capabilities of this technology, a modular design has been adopted for both systems: the μ-RWELL "tile" will have an active area of 50x50 cm2, but with a pitch between the readout strips of 400 μm for the preshower and about 1 mm for the muon system. Other requirements are: a spatial resolution of the order of 100 μm for the preshower and a reasonable total number of front-end channels for the muon system.
To optimize the resistivity and the strip pitch, we have built 2 sets of prototypes, each made of 5 detectors for the preshower and 3 detectors for the muon, with active area of 16x40 cm2 and 40 cm long strips. For the preshower prototypes the DLC resistivity ρs is ranging from 10 to 200 MOhm/square, while for the muon ones ρs is about 20 MOhm/square. All these detectors have been exposed in October 2021 to a muon/pion beam at the CERN SPS. The very positive results obtained pave the way for a completely new and competitive MPGD tracking device for high energy physics experiments. Preliminary results on a long detector stability measurement will also be presented.

Collaboration

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