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The micro-RWELL detector for the LHCb Muon system phase-2 upgrade

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The μ -RWELL is a single amplification stage resistive MPGD. The amplification stage is realized with a copper-clad polyimide foil patterned with a micro-well matrix coupled with the readout PCB through a DLC resistive film ($10\div 100\text{ M}\Omega/\text{square}$).

The detector is proposed for several applications in HEP that require fast and efficient triggering in harsh environment (LHCb muon-upgrade), low mass fine tracking (FCC-ee, CepC, SCTF) or high granularity imaging for hadron calorimeter applications (Muon collider).

For the phase-2 upgrade of the LHCb experiment, proposed for LHC Run-5, the excellent performance of the current muon detector will need to be maintained at 40 times pile-up level experienced during Run-2. Requirements are challenging for the innermost regions of the muon stations, where detectors with rate capability of few MHz/cm^2 and capable to stand an integrated charge up to $\sim 10\text{ C}/\text{cm}^2$ are needed.

In this framework an intense optimization program of the μ -RWELL has been launched in the last year, together with a technology transfer to the industry operating in the PCB field.

In order to fulfill the requirements, a new layout of the detector with a very dense current evacuation grid of the DLC has been designed.

The detector, co-produced by the CERN-EP-DT-MPT Workshop and the ELTOS Company, has been characterized in terms of rate capability exploiting a high intensity 5.9 keV X-ray gun with a spot size ($10\div 50\text{ mm}$ diameter) larger than the DLC grounding-pitch. A rate capability exceeding $10\text{ MHz}/\text{cm}^2$ has been achieved, in agreement with previous results obtained with m.i.p. at PSI.

A long term stability test is ongoing: a charge of about $100\text{ mC}/\text{cm}^2$ has been integrated over a period of about 80 days. The test will continue with the goal to integrate about $1\text{ C}/\text{cm}^2$ in one year, while a slice test of the detector is under preparation.

In-person participation

Yes

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