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Development of resistive Micromegas for sampling Calorimetry

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Micromegas, a micro pattern gaseous detector, is proposed as an active medium for sampling calorimetry. Future linear collider experiments or the High Luminosity LHC experiments can profit from those developments for Particle Flow Calorimetry. Micromegas possesses remarkable properties concerning gain stability, reduced ion feedback, response linearity, adaptable sensitive element granularity, fast response and high rate capability. Recent developments on Micromegas with a protective resistive layer present excellent results, resolving the problem of discharges caused by local high charge deposition, thanks to its RC slowed charge evacuation. Higher resistivity though, causes loss of the response linearity. We have scanned a wide range of resistivities and performed laboratory tests with X-rays that demonstrate excellent response linearity up to rates of 10s of MHz/cm², with simultaneous mitigation of discharges. Beam test studies at SPS/CERN with hadrons have also shown a remarkable stability of the resistive Micromegas and low currents for rates up to 5 MHz/cm². We will be presenting results from the aforementioned studies confronted with MC simulation as well as the potential in using Micromegas for sampling Calorimetry.

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