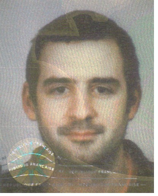


Resistive Micromegas for Sampling Calorimetry

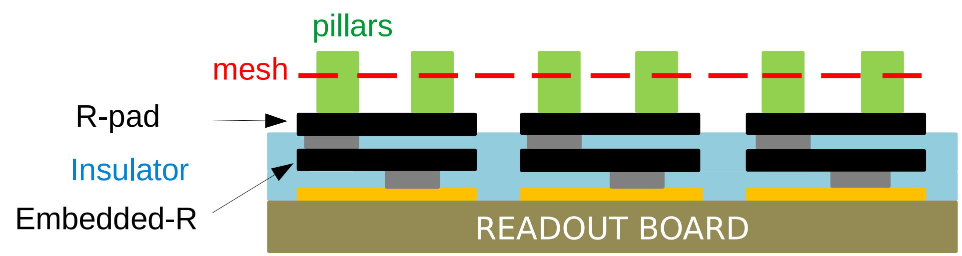
M. Chefdeville, Y. Karyotakis (IN2P3/LAPP, Annecy), T. Geralis (Demokritos, Athens), M. Titov (IRFU, Saclay)*

Calorimetry at future collider will be based on Particle Flow (PF)
→ highly segmented calorimeters (small pads, many layers)

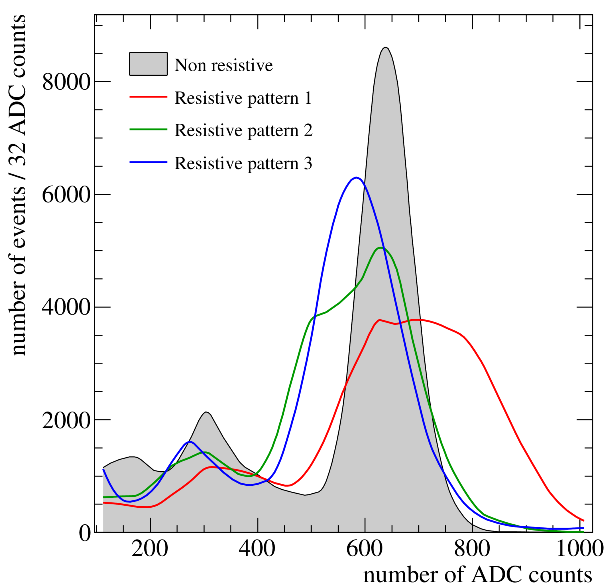
Micromegas meets most of the technical and performance requirements (m^2-size prototypes)...
...but sparking might result from dense shower ionisation (e.g. nuclear recoils, EM shower core)
→ spark suppression by means of resistive coatings

What resistive coating? Embedded resistor

Allows charge evacuation from top-to-bottom
→ no lateral charge dispersion
→ maintain calorimeter imaging capability

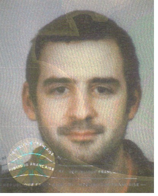


RC-constant controlled with embedded R-pattern



We observed:

- Full spark suppression in prototypes with R of 1-100 MΩ.
- Coupling between resistive/readout pad ~ 100%
- Still some issues with flatness (poor energy resolution)



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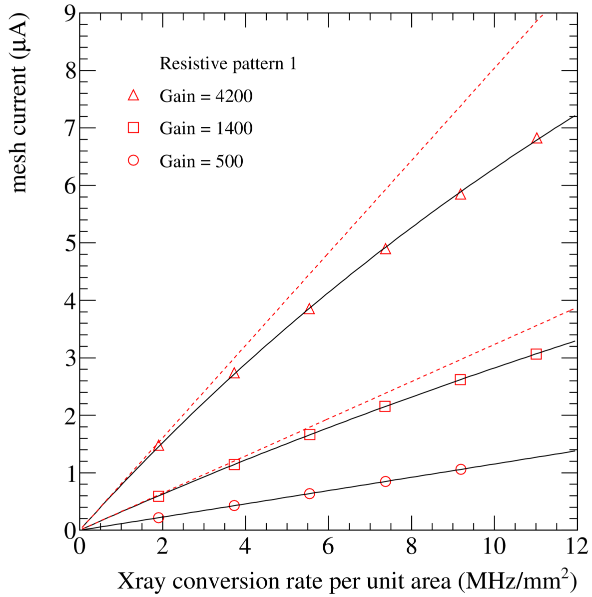
Our resistive Micromegas efficiently suppresses sparks through local charge-up of the R-pad

→ What is the effect on the response?

It depends on the detector current (i.e. rate Φ , primary charge dE/dx) and its time-constant τ

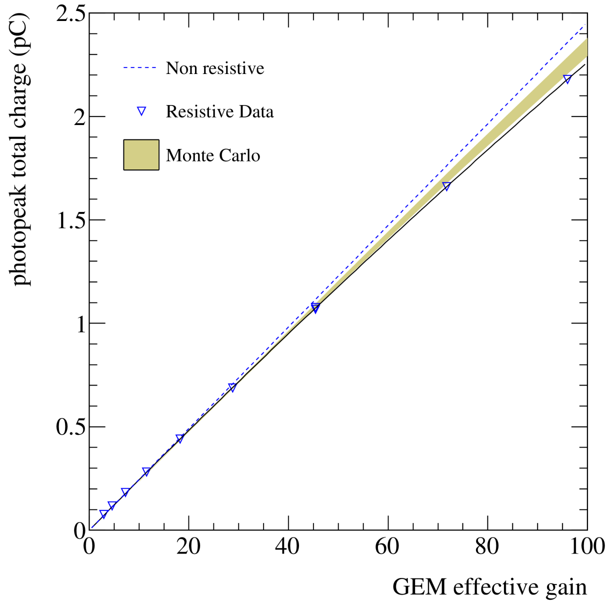
Case of high-rate tracking (1/Φ >> τ)

Balance between charge (Φ) & discharge (τ)
Steady regime reached after τ



Case of low-rate calorimetry (1/Φ << τ)

Pad mainly charges during event
Large dE/dx: last primary e- feel a reduced field



We observed charge-up effects under high rates (10 MHz/mm2) and under high primary ionisation (2000 MIPs). They are on the percent level in both cases.

Resistive Micromegas don't spark, have large dynamic range and withstand high-rates.