

A scalable gas pixel detector based on μ -RWELL technology

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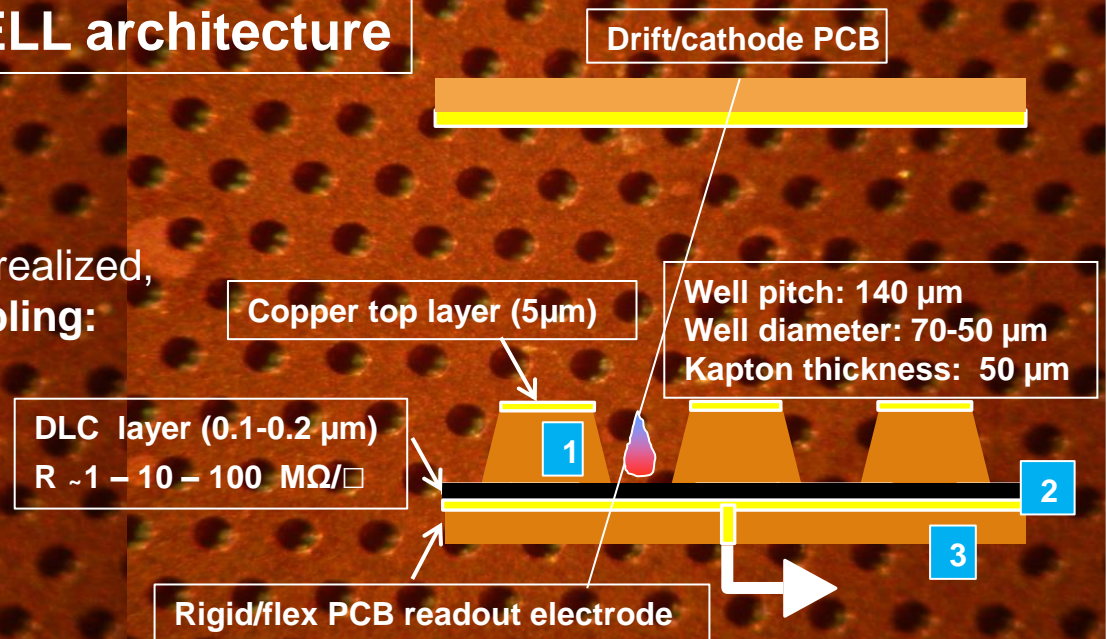
Abstract: the project aims in developing a scalable gas pixel detector based on the novel **micro-Resistive-WELL (μ -RWELL)** technology with a dedicated front-end electronics for both large area applications in HEP (as tracking device or active element of digital calorimeters) and industrial and medical applications (as X-ray and neutron imaging gas pixel detector). The novel architecture is a compact, spark-protected, single amplification stage Micro-Pattern Gas Detectors (MPGD – ref. ...)

The μ -RWELL architecture

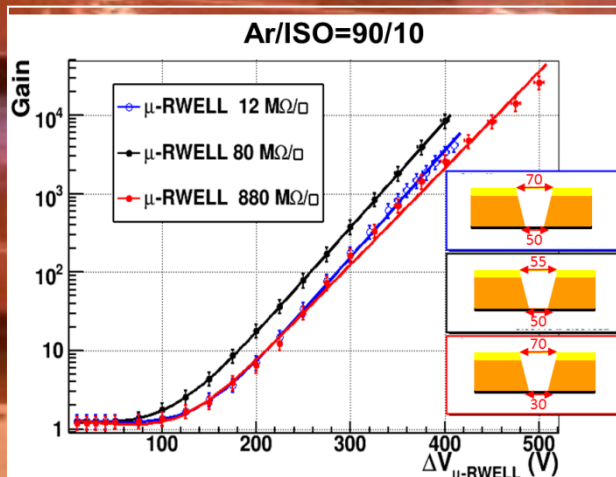
The μ -RWELL is composed of only two elements: the **Drift/cathode** and the **μ -RWELL_PCB**.

The μ -RWELL_PCB, the core of the detector, is realized, with standard photolithography technology, by coupling:

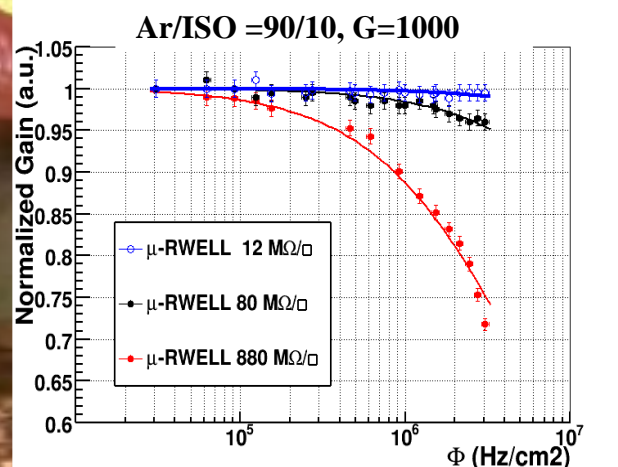
1. a suitable WELL patterned kapton foil as “amplification stage”
2. a “resistive stage” for the discharge suppression & current evacuation
3. a standard readout PCB (strips, pixel, pads)



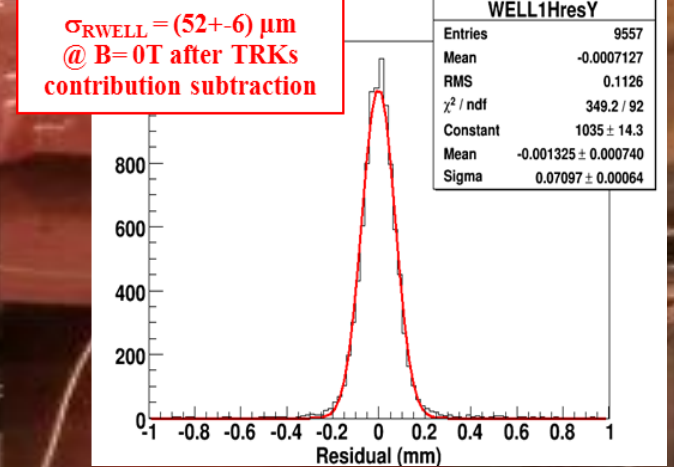
The μ -RWELL performance



Gas gain $\geq 10^4$



Rate capability up to 10^7 Hz/cm²



Space resolution ~ 50 μ m

The applications

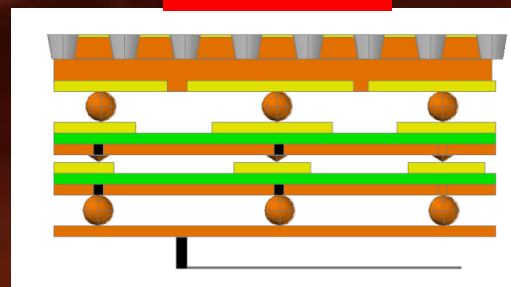
The technology is suitable for:

- **large area tracking devices** and compact **digital hadron calorimetry** in HEP experiments (the phase-2 upgrades of **CMS** and **LHCb** muon apparatus & target tracker of the **SHiP** experiment);
- **fine X-ray and thermal neutron** (using suitable lithium-fluoride or ¹⁰Boro coated cathode) **imaging** in industrial applications



to be done

For **X-ray and neutron imaging** the detector is designed with a **multi-pixel anode** (pitch ~ 1 mm) that coupled with an on-board **front-end electronics with Charge & Time readout** will allow a **full 3D-reconstruction** of the event (**μ -TPC mode**).



STACK LAYOUT

- μ -RWELL PCB
- Bump bonding
- A.S.D Front end chip
- Conic bump
- Readout chip
- Bump bonding
- Board/cabling connection

Conclusions: the μ -RWELL detector with **dedicated integrated electronics** is a high performance, wide impact, scalable device suitable for both **large area applications in HEP** (as tracking device) and industrial and medical applications (as **X-ray and neutron imaging gas pixel detector**).