

New u-RWELL 2D layout and future 2026 TB



2D layouts performance with APV25

2x1D layout (2 u-RWELL with a 1D readout):

spatial resolution < 200 μ m (pitch 0.8 mm),
low gain operating point 700 (HV~520V),
efficiency $\geq 98\%$ (large eff. plateau)

CS layout (1 u-RWELL with 2D readout and Charge sharing readout):

spatial resolution < 200 μ m (with pitch 1.2 mm),
high gain operating point 4000 (HV $\geq$ 600V),
efficiency $\geq 98\%$

Top layout (1 u-RWELL 1D readout and segmented on the top amplification for the second coordinate):

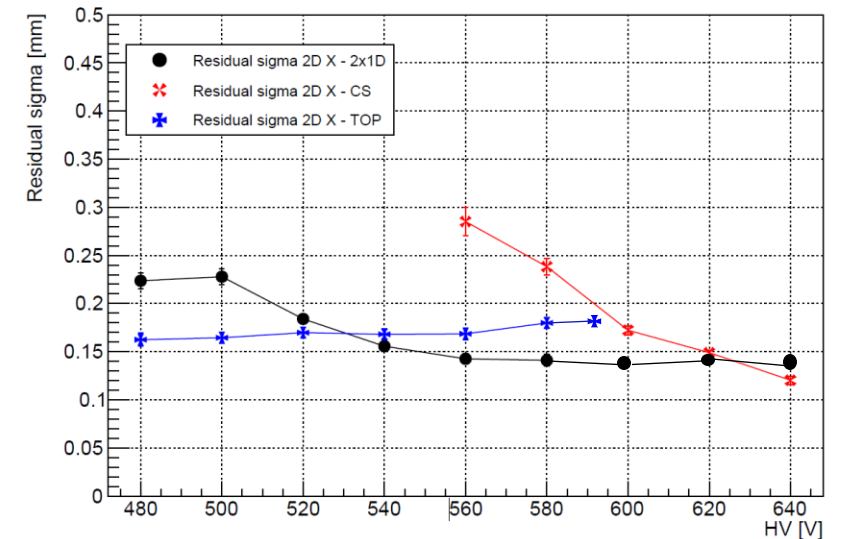
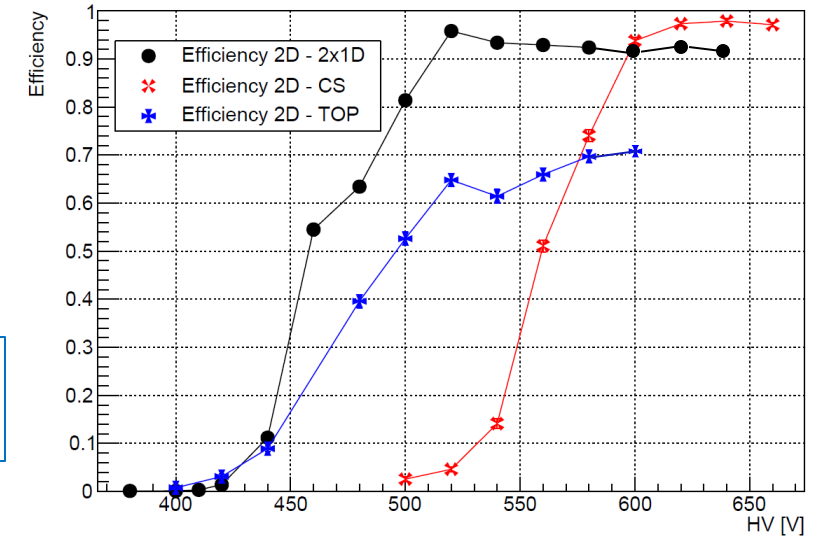
spatial resolution < 200 μ m (pitch 0.8 mm),
low voltage operating point ~520V,
efficiency ~ 70% (dead-zone)

Economic Impact:
Higher Cost

Disadvantage: Stability
Operation at the Limit

Limit: Reduced
Efficiency

The results are promising for this layouts [11], but they require same optimization as their performance is not yet ideal for the IDEA Muon system.



[12] "The IDEA detector concept for FCC-ee", arXiv:2502.21223 [physics.ins-det]

Layouts under study

Solution under study to increase detector stability:

1. **μ -RWELL "well optimization"** → This study was done with GEM detectors but never with μ RWELL → well pitch from 140 μ m to 90 μ m with an increase in gain of about a factor of 2. **Protos @ LNF, ready to be tested with X-ray**

New layouts under study for Muon systems:

Evolution of CS layout

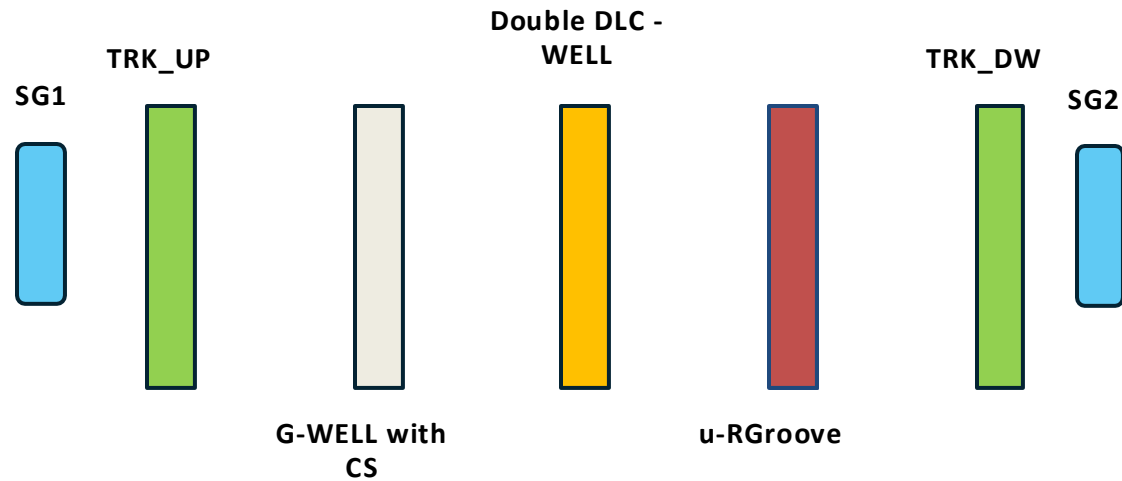
Increase in
Operating
Stability

New
layout

1. **GEM + CS μ -RWELL** → GEM pre-amplification stage, to lower the operating point, greatly improving the RWELL stability and maintaining high spatial performance with millimetric pitches. **GEM @ LNF. Need to be assemble and characterization with X-ray.**
2. **DOUBLE DLC FOIL μ -RWELL 10x10 CM2** → new idea of layout, where the first DLC foil will be used as standard resistive layer (100 M Ω /□), while the second one (1 M Ω /□) to spread the charge on the readout. **Protos will be arrive in Dec.**
3. **μ -RGROOVE 10x10 CM2** → new layout, where the amplification stage is not based on the «wells» but on the «grooves». This facilitates the realization of the strip readout on the top, without introducing dead-zones. **Protos @ LNF ready to be tested with X-ray**

Evoluti
on of
the Top
Layout

Possible TB setup in H8 - 2026



N.4 TRK u-RWELL → N.2 APV/det. → 8 APV → 8 ch Neg HV Channels
N.1 G-WELL with CS → N.2 APV/det. → 2 APV → 4 ch Neg HV Channels
N.1 Double DLC-WELL → N.2 APV/det. → 2 APV → 2 ch Neg HV Channels
N.1 u-RGroove → N.4 APV/det → 4 APV → 2 ch Neg HV Channels + 2 ch Pos HV Channels

TOT → 16 APV

Back up