X-Ray test of a 10x10 cm^2 Single-GEM chamber with single-mask foil (beta release)

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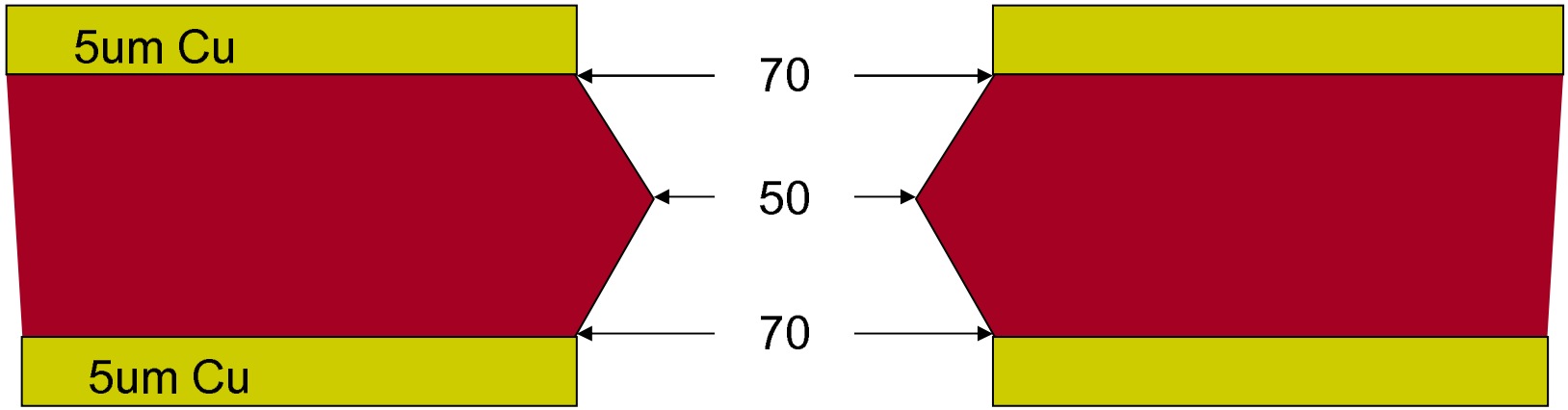
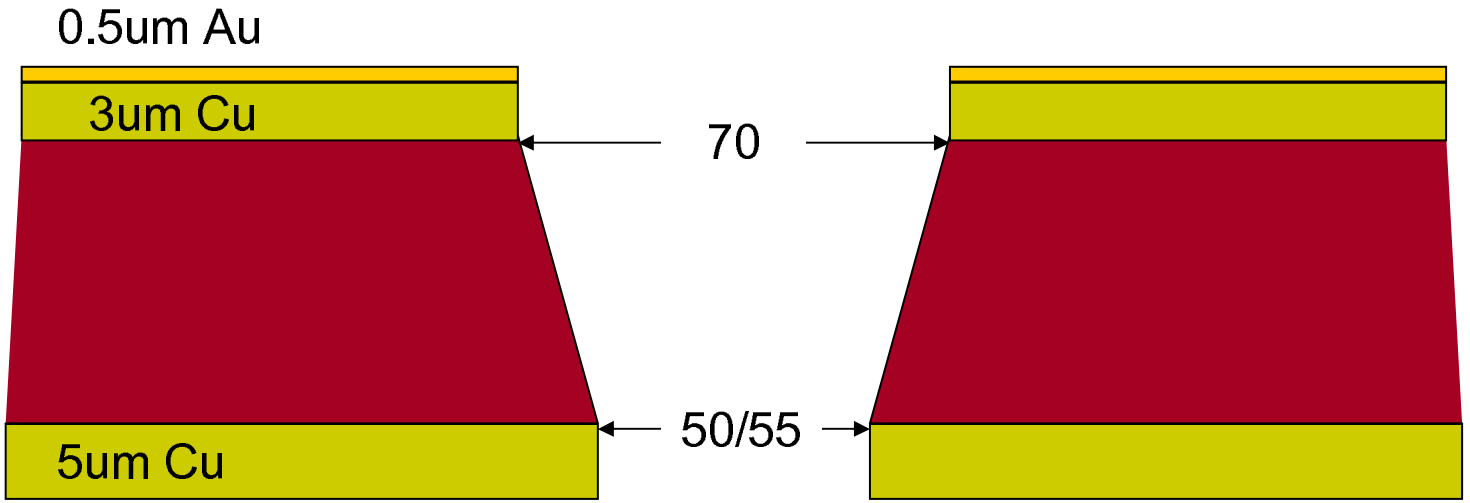
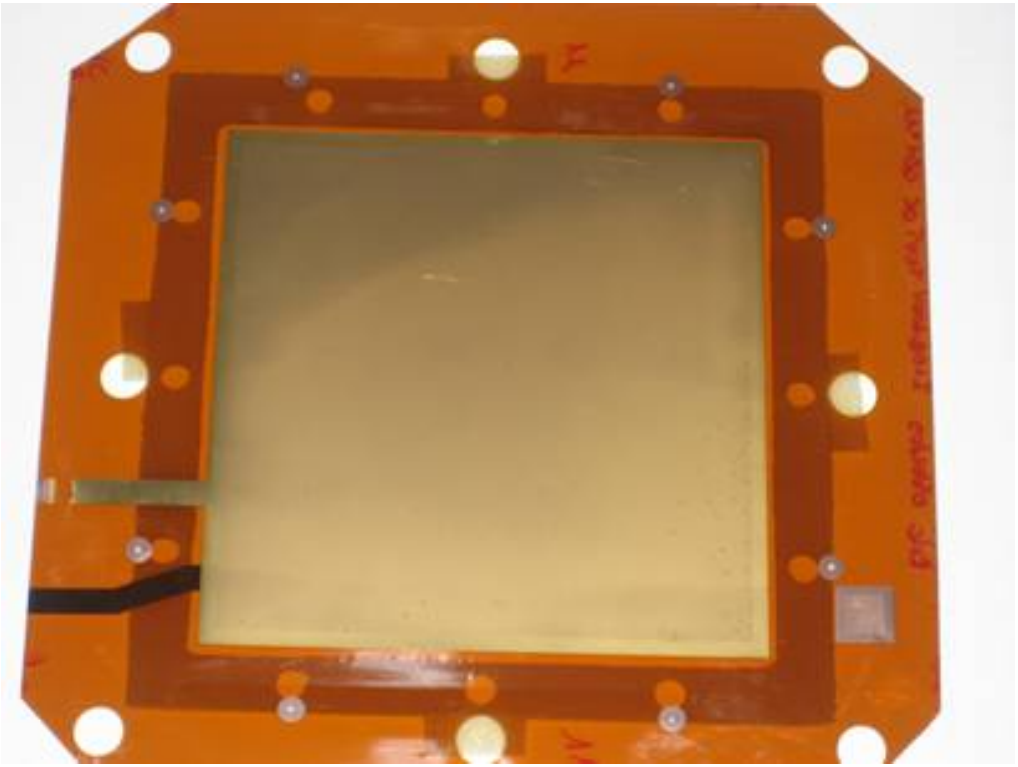
STD GEM



NEW GEM

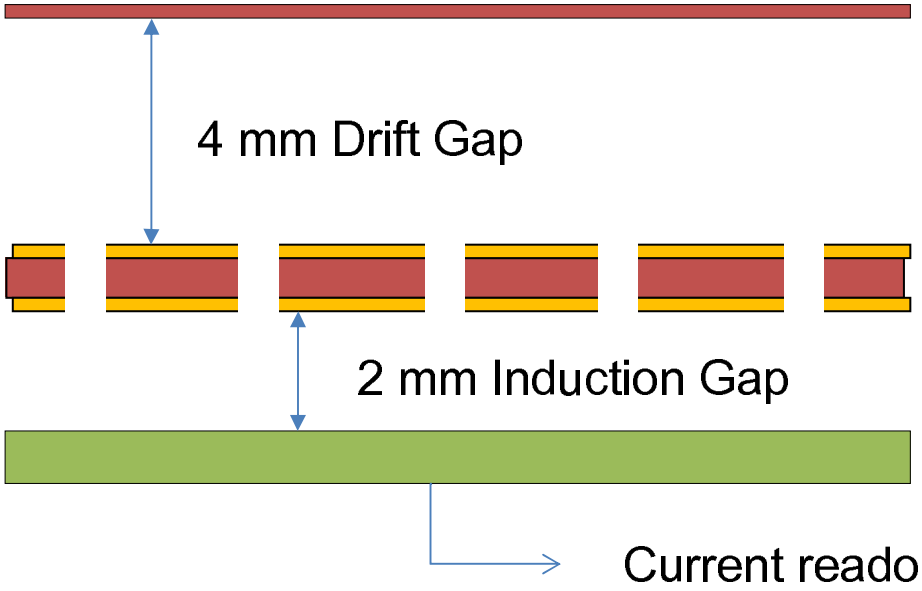


10x10cm^2 NEW GEM with gold on the top mounted on FR4 frame



Sample of 4 foils (tested good by Rui)

- 3 foils: discharge voltage in N_2 650 V
- 1 foils: discharge at 500V (damaged?)



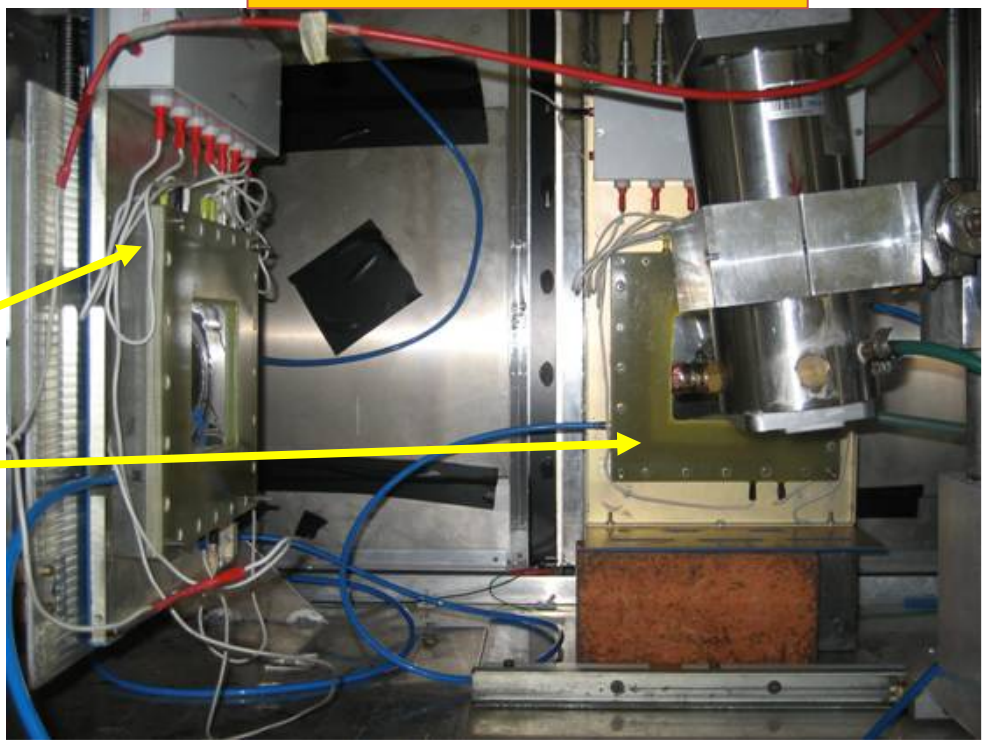
Single-GEM
chamber layout

GAS: Ar/CO_2 70/30

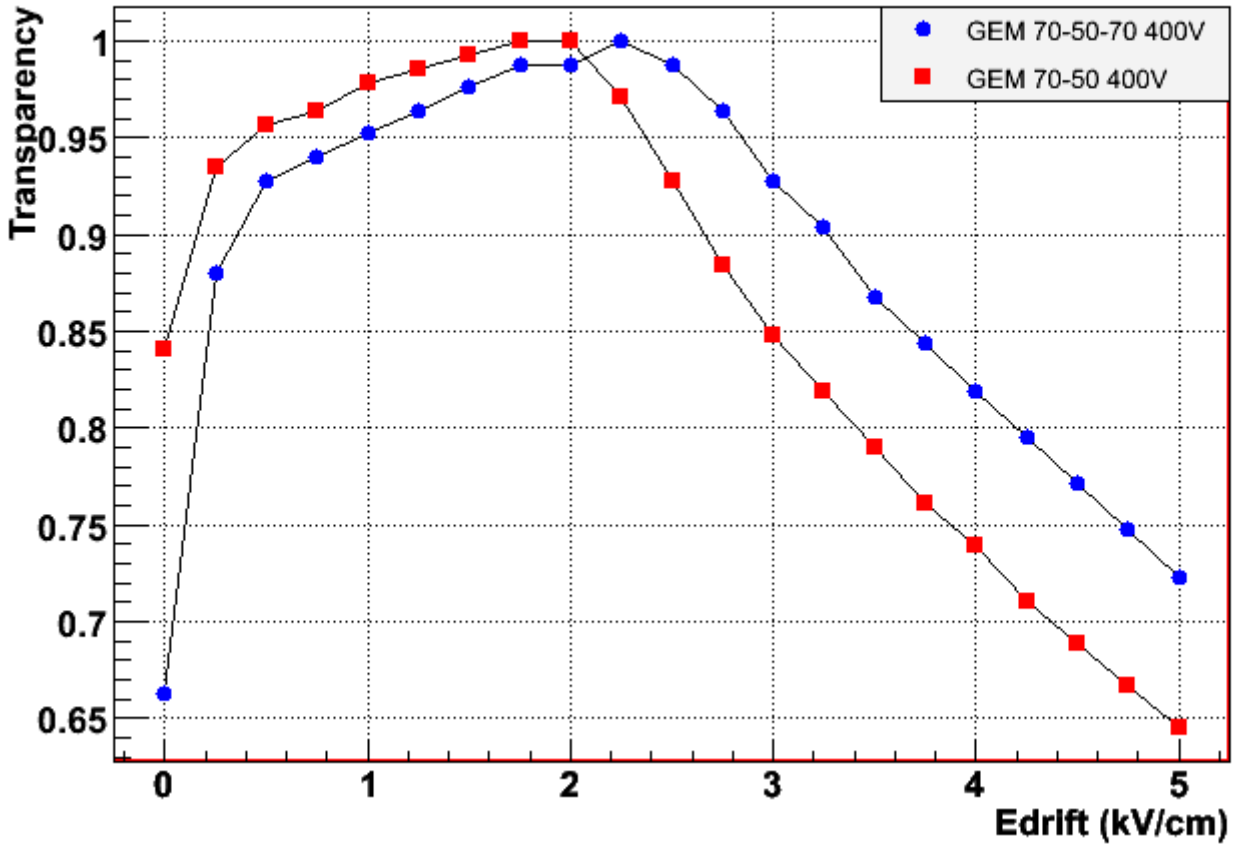
Single-GEM detectors redout
in current mode

2 identical chambers have
been tested with X-rays:
- 1 with single-mask foil
- 1 with standard foil

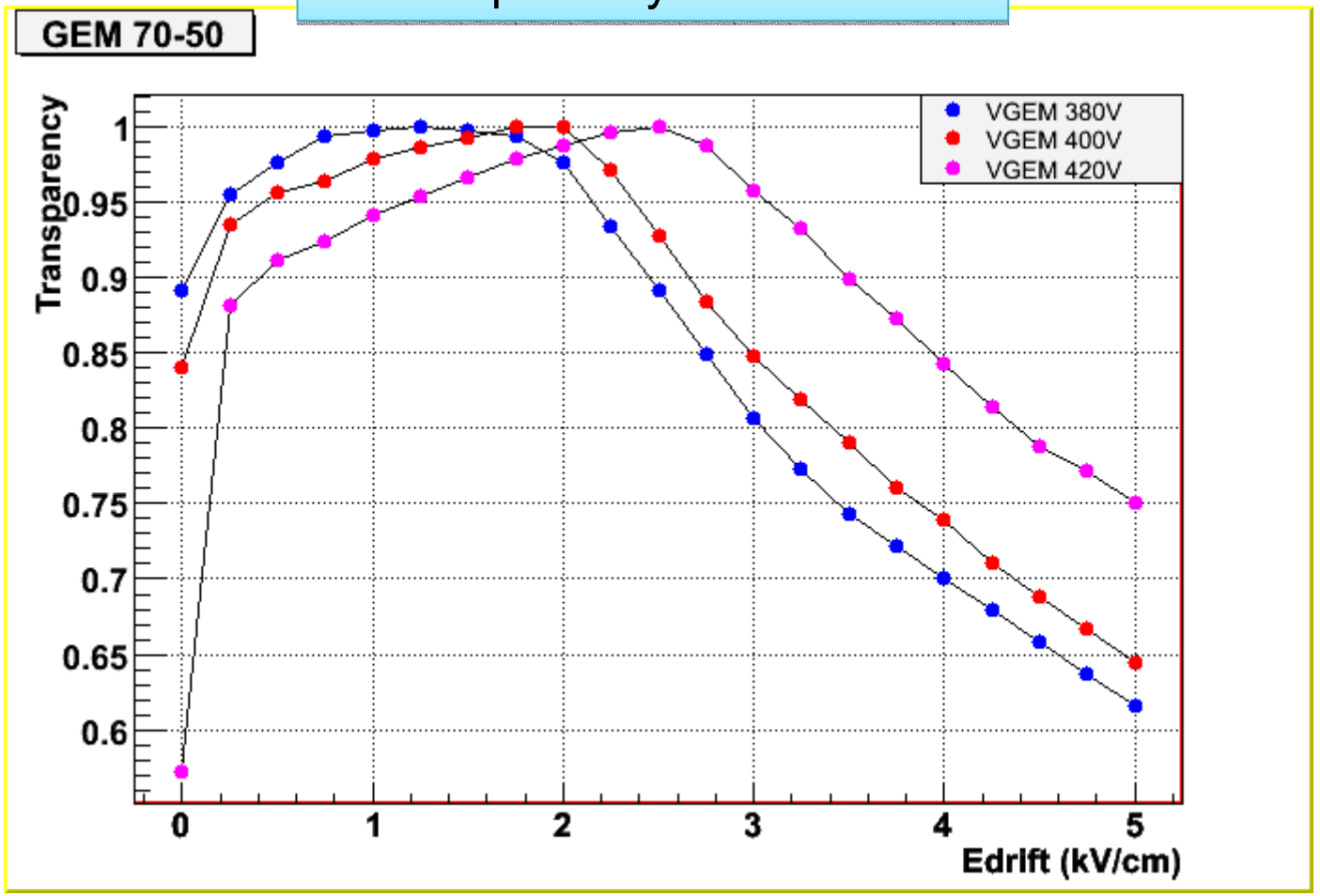
Flushed on the same gas line
and irradiated with front and
side openings of the gun



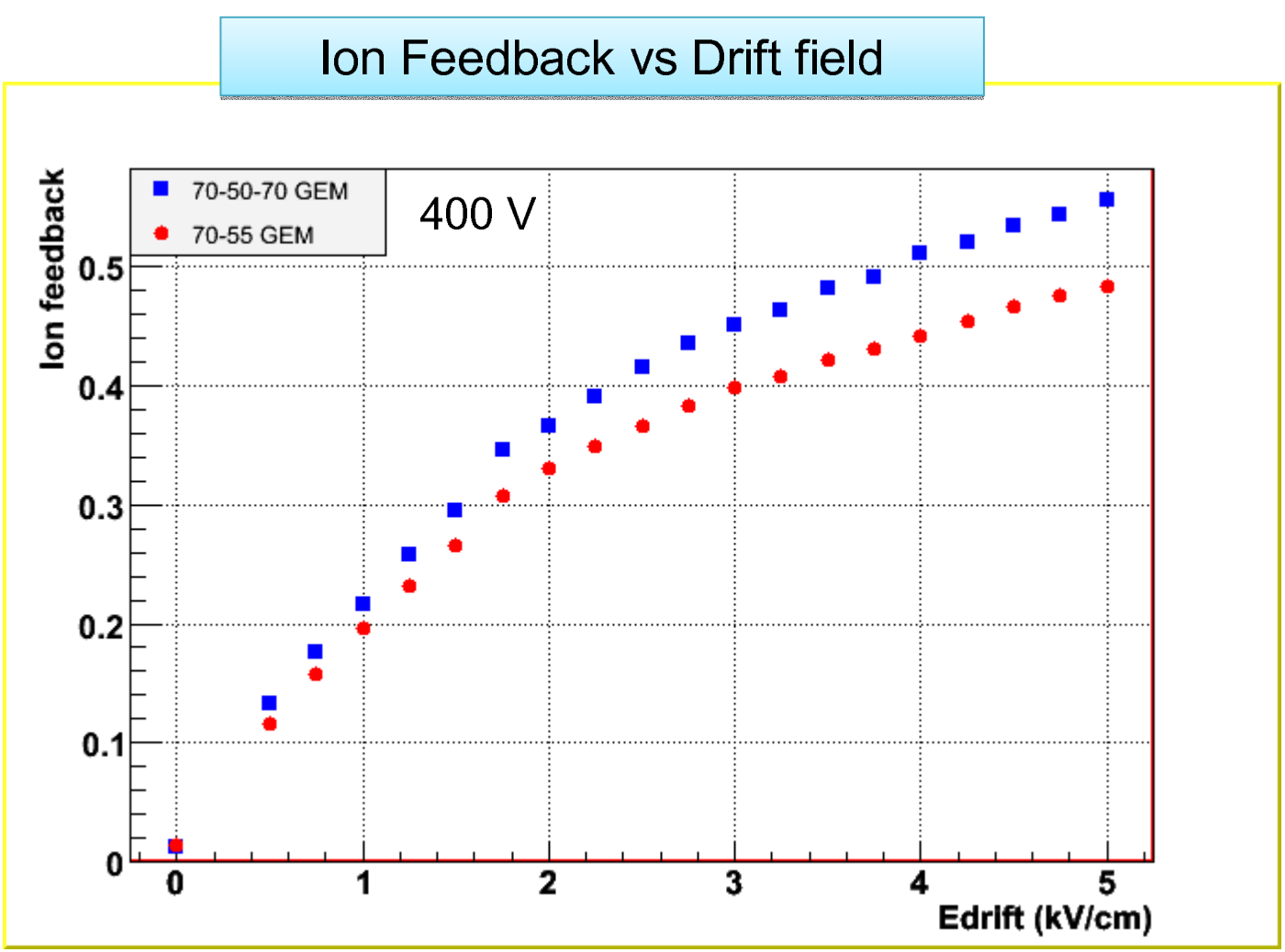
Transparency vs Drift field



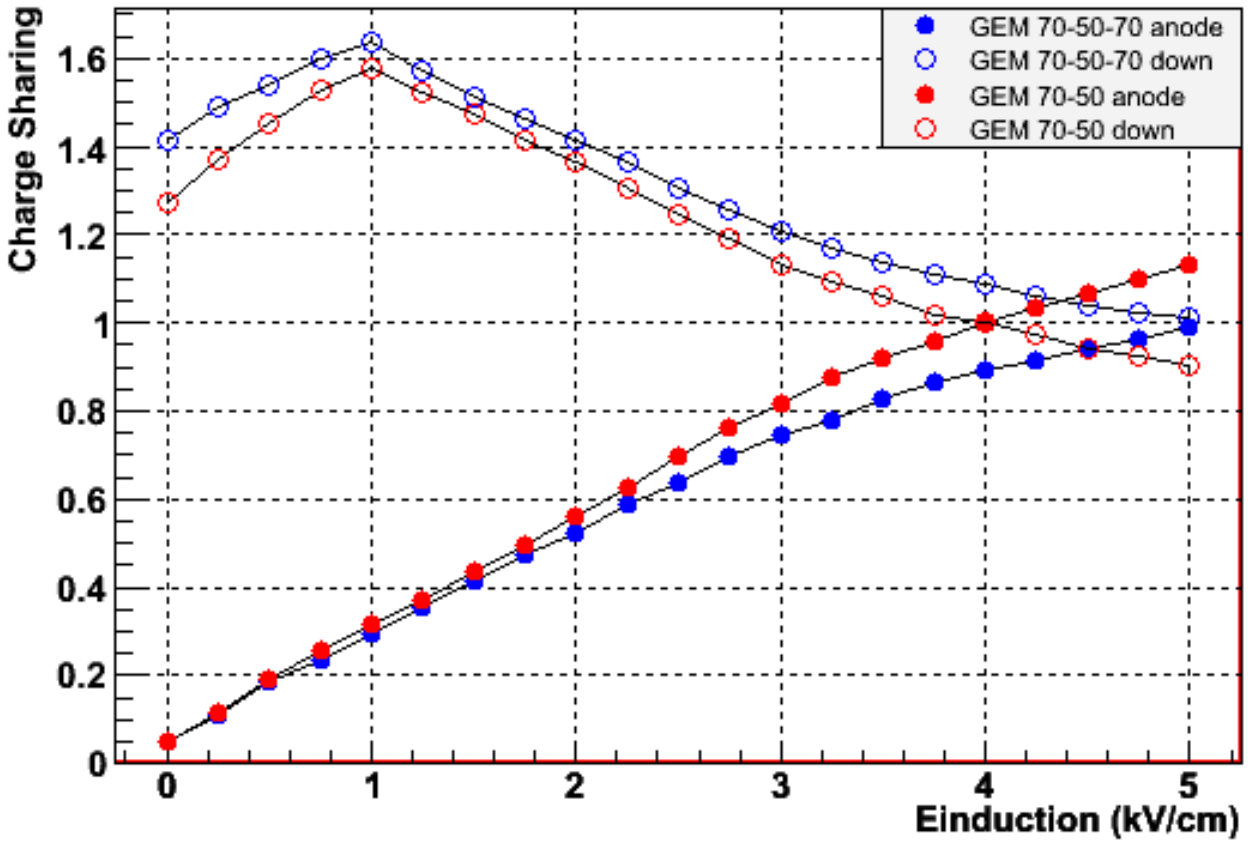
Transparency vs Drift field



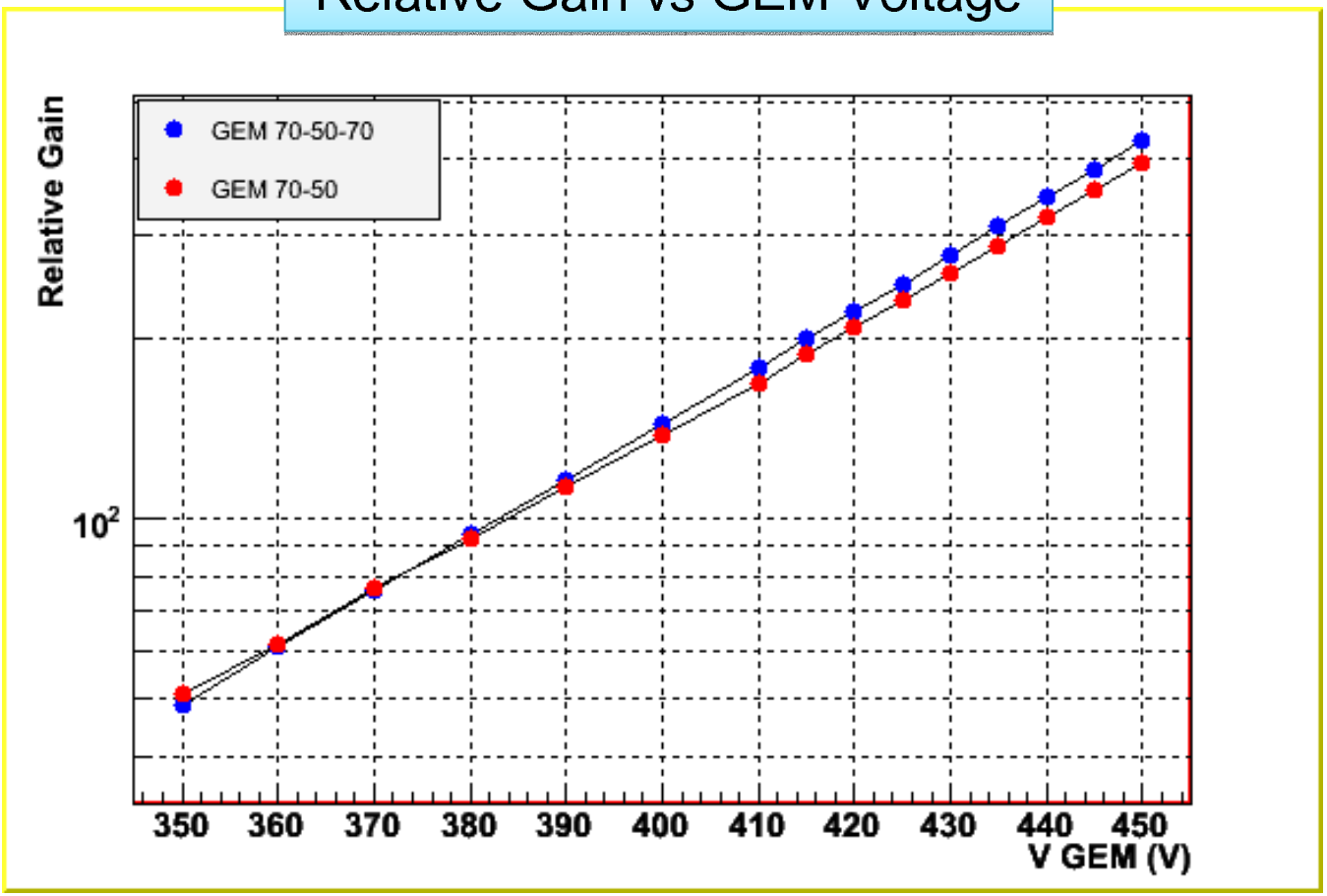
Ion Feedback vs Drift field



Charge Sharing vs Induction field



Relative Gain vs GEM Voltage

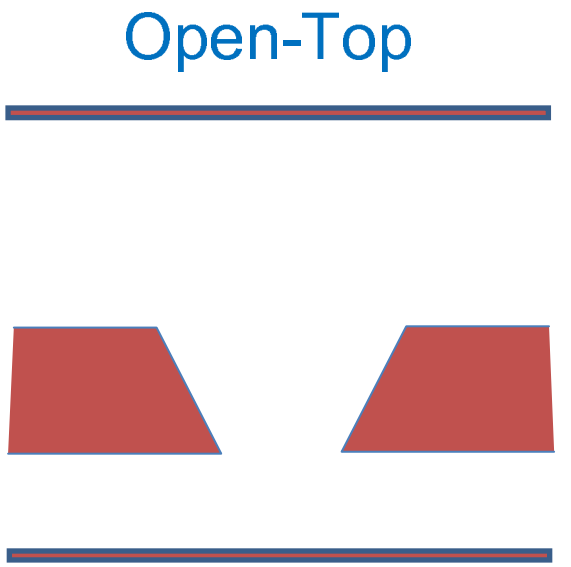


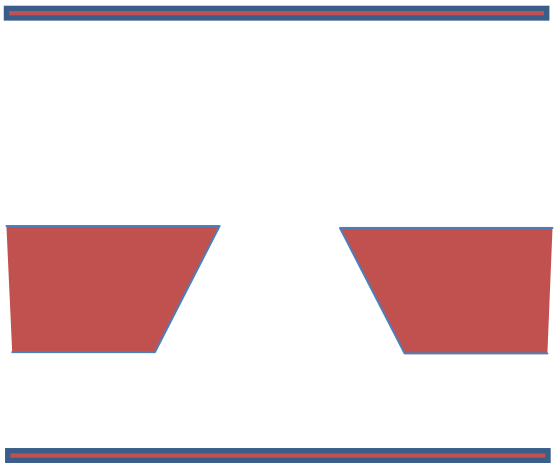
Edrift = 1.5 kV/cm
Eind = 5 kV/cm

- All the previous measurements have been obtained with an “Open-Top” hole configuration

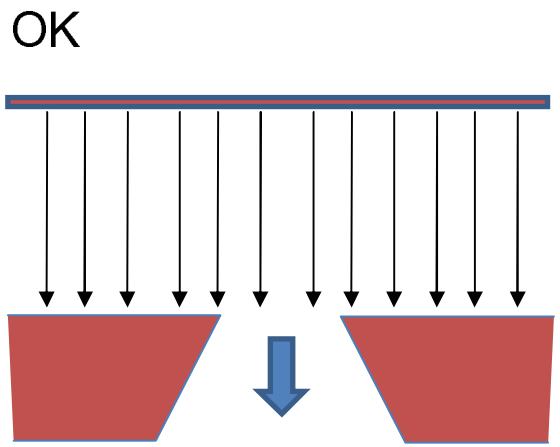
- No discharge in Ar/CO_2 up to 500 V even under very high irradiation

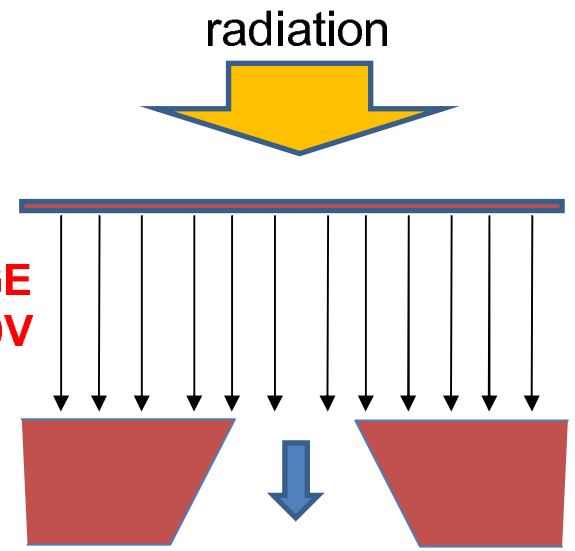
- What about the “Open-Bottom” hole configuration? Weird behaviour: discharge as soon as intense electron currents draw on the narrow hole side

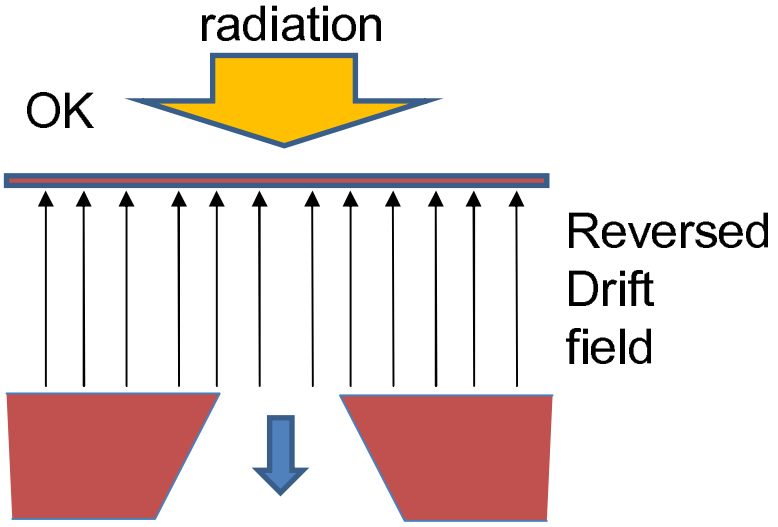


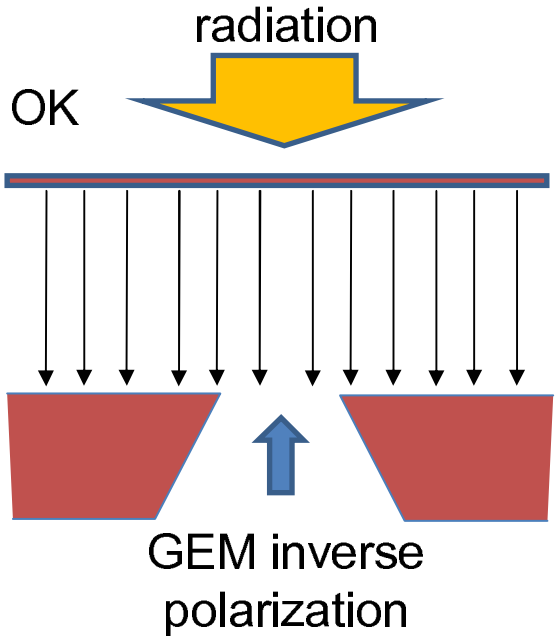


Open-Bottom configuration

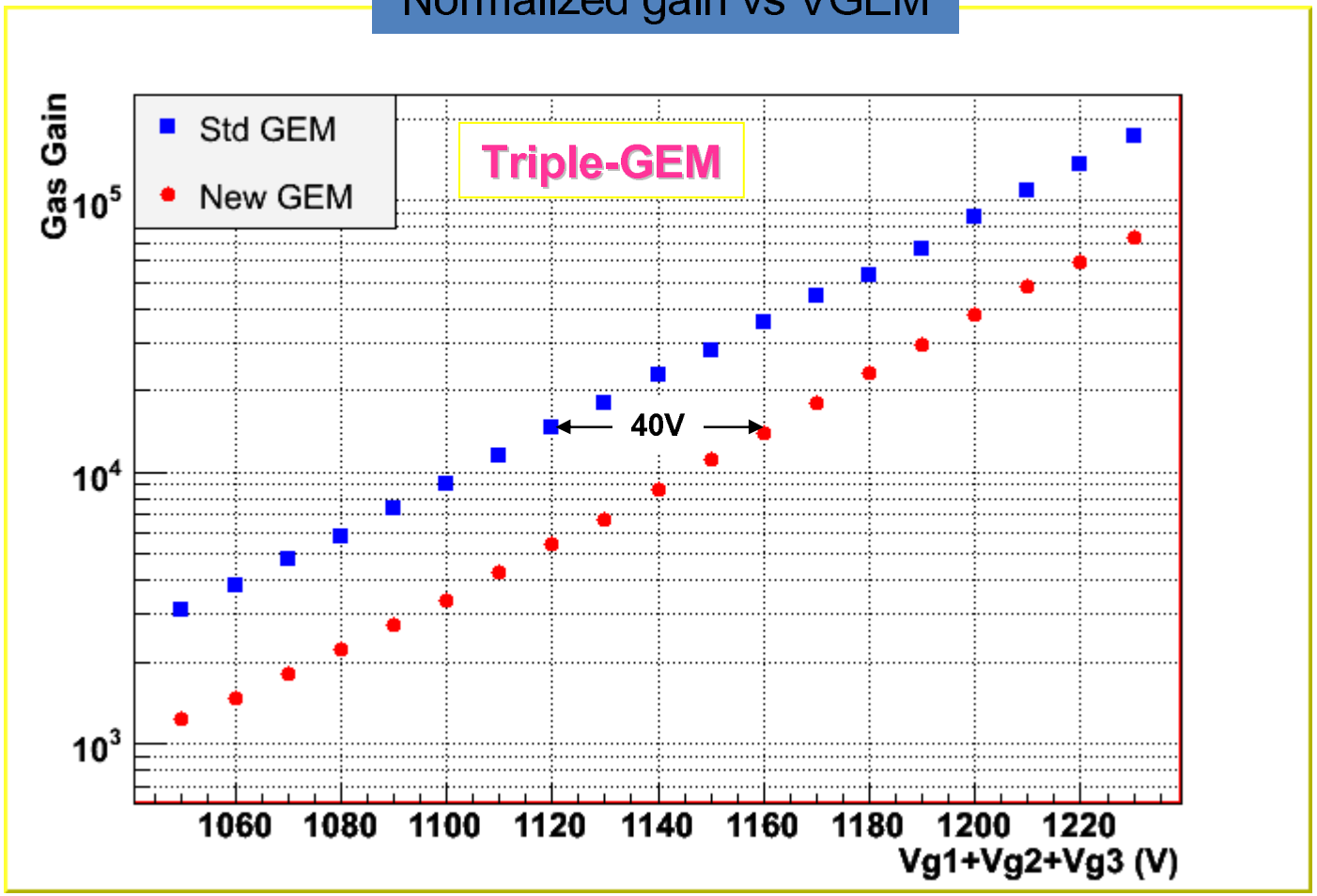








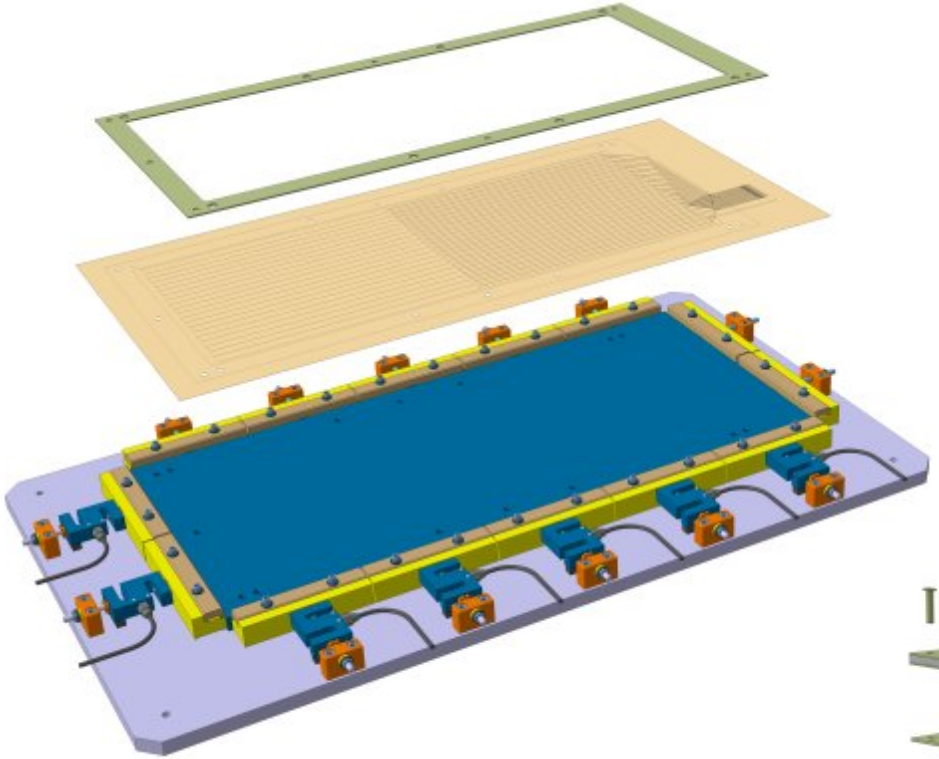
Normalized gain vs VGEM



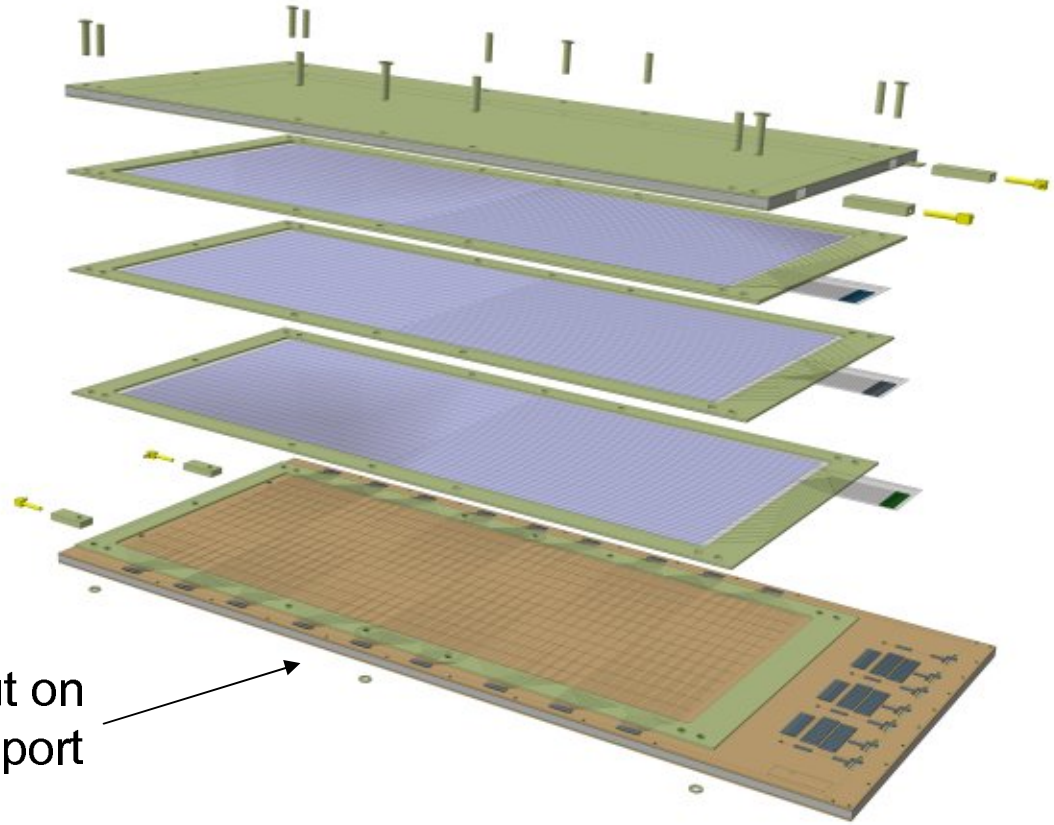
Data normalized to previous Absolute gain measurements with Ar/CO_2 70/30

Fields: Ed=1.5 – Et1=2.5 – Et2=3.0 – Ei=5.0

70x30 cm^2 Triple-GEM planar detector with Single-mask foils



Dedicated stretching tool (already machined and assembled)



1.5x2.5 cm^2 Pad readout on FR4 support

Conclusions

- We tested a sample of single-mask GEM with a conical hole 70/50
- A single-GEM chamber has been assembled and irradiated with X-rays. An identical chamber with standard foil (70-50-70) has been placed on the same gas line and used as a reference
- The currents shows no large difference between the two types of foils: in particular the gain is very similar
- All the results have been obtained with the Open-Top configuration of the foil (70-50). The Open-Bottom configuration (50-70) has discharges as soon as the electrons reach the GEM
- We plan to build a 70x30 cm^2 Triple-GEM with single-mask foils
- A newer and upgraded release of single-mask foil is already produced, with almost cylindrical hole (70/65). We are ready to test it