TPC INPUT TO IDR

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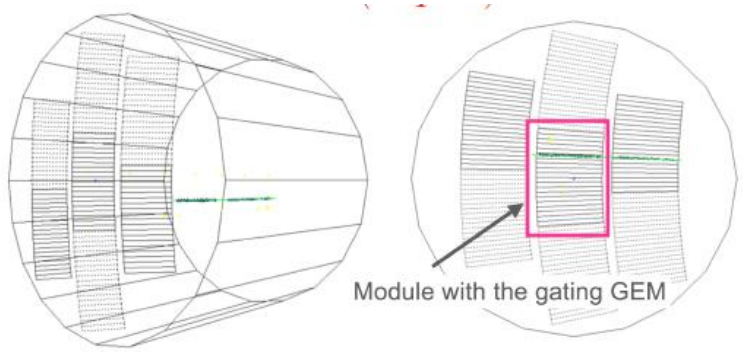
To be updated (was prepared for Arlington)

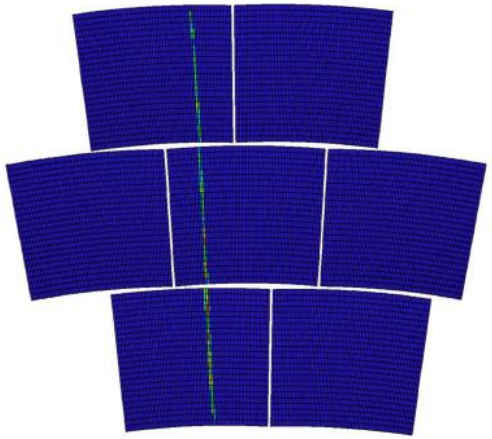
TPC technical developments

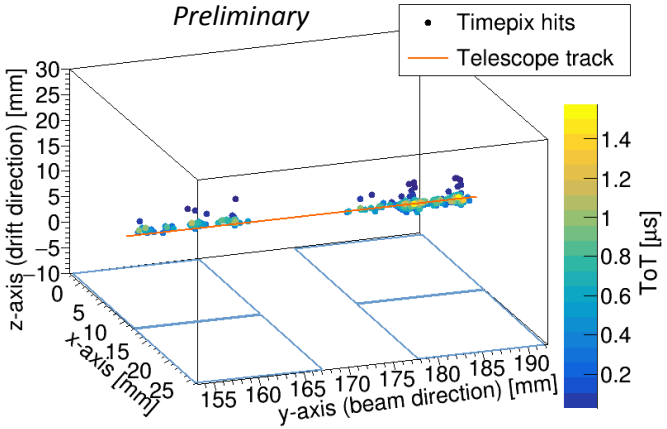
R&D studies since 2002 and beam tests since 2008 -> 3 technologies:

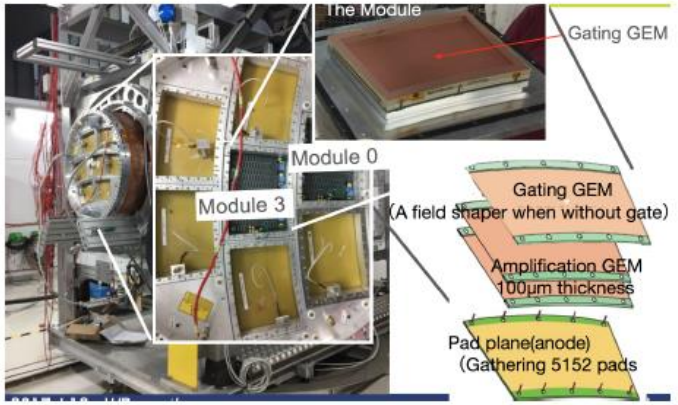
GEM, Micromegas, pixels

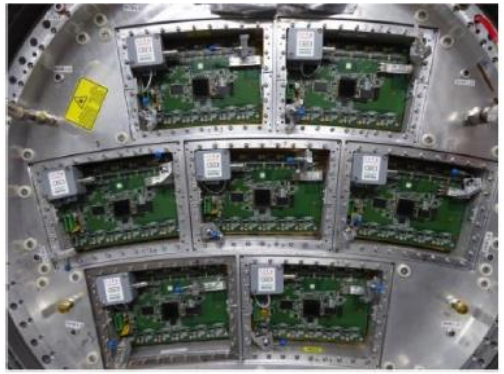
Since the DBD, progress on integration and engineering aspects

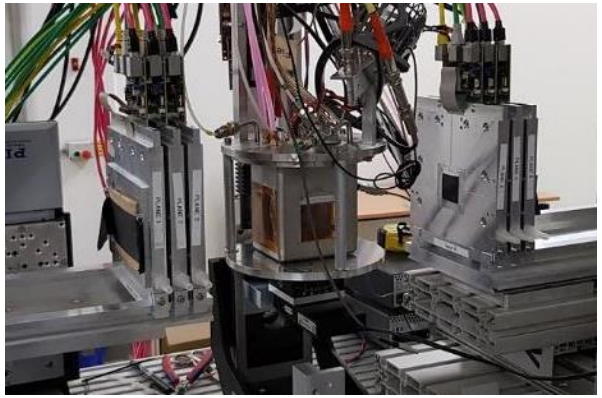










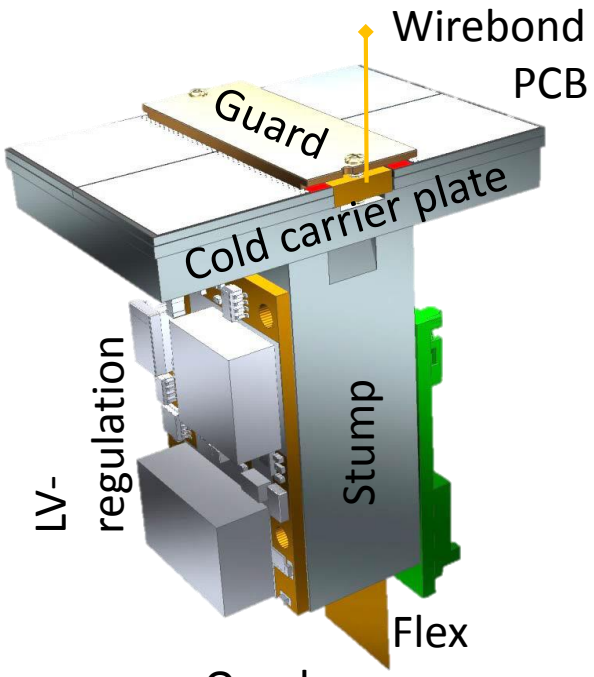


Quad module development (Pixels)

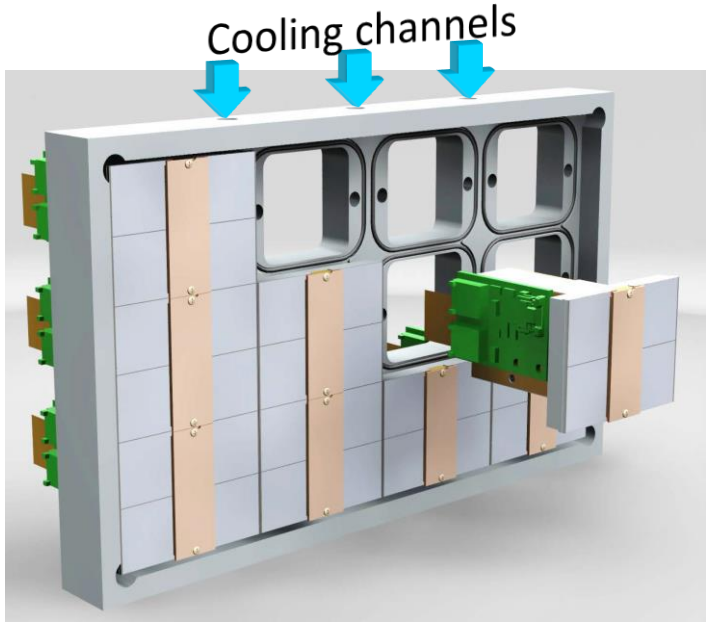
- 4-chip module with all services under the active area (coverage 70%)

- The Quad module is designed for the stringent requirements on chip placement (chip-chip distance < 100 µm and guard height precise at 20 µm level)

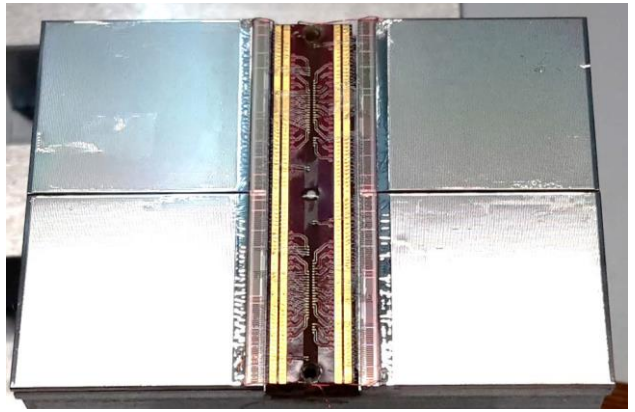
- Can be used as a building block to cover arbitrarily large TPC areas

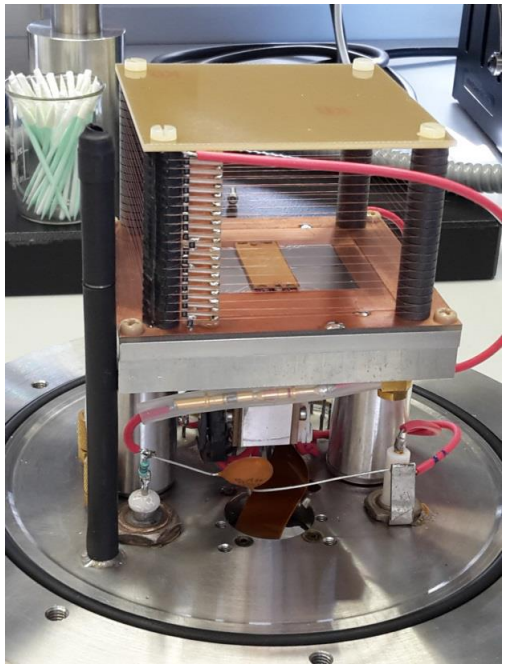


Quad

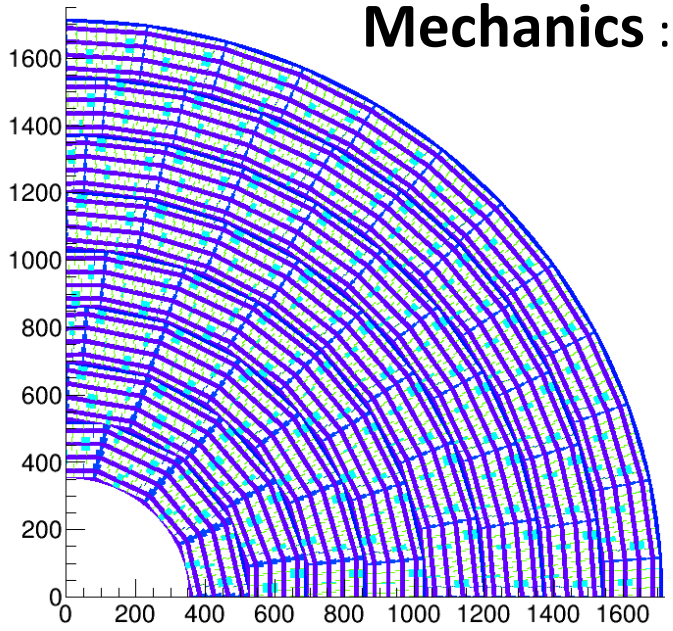


Quad base plate


Quad without guard

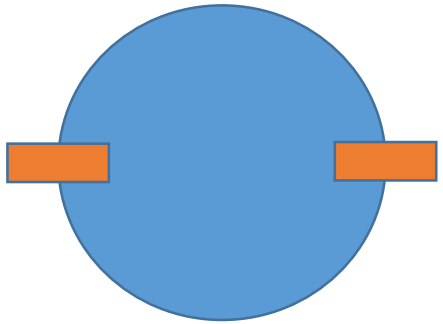

Test Box

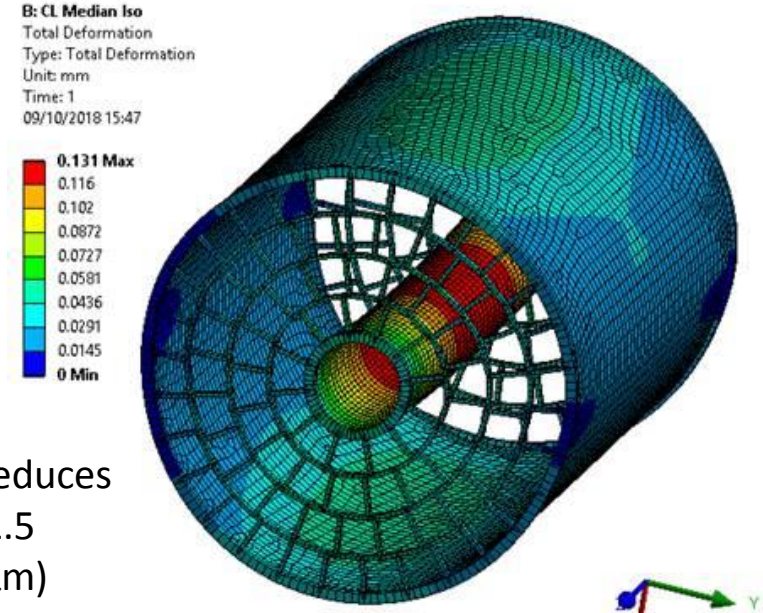
Mechanics : Realistic layout for pixels



Pixels : realistic tiling with quad modules

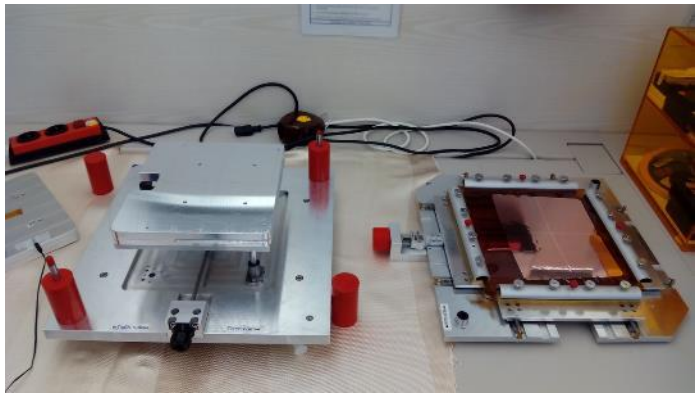
New studies on supporting TPC and deformations



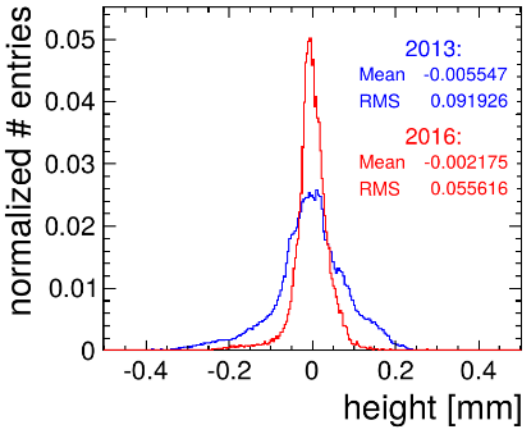


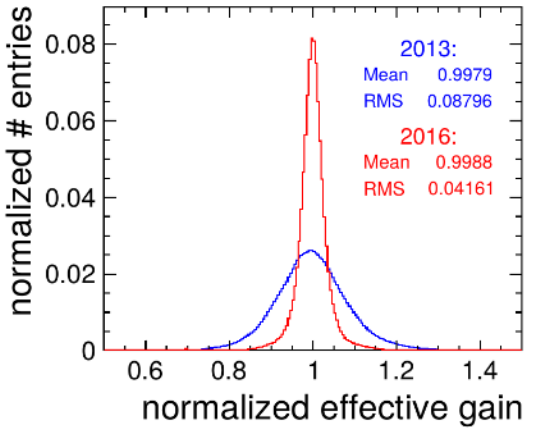
Support by 4 horizontal ‘ribbons’ reduces static deformations by a factor of 2.5 (maximal scalar deformation 130 µm)

GEM module flatness

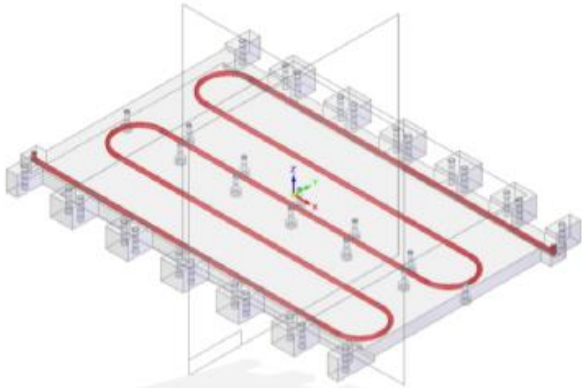


Improved stretching of the GEM foil improves gain uniformity

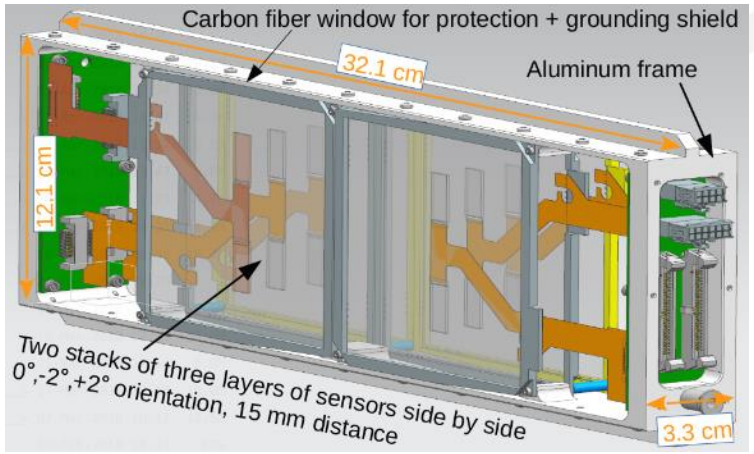


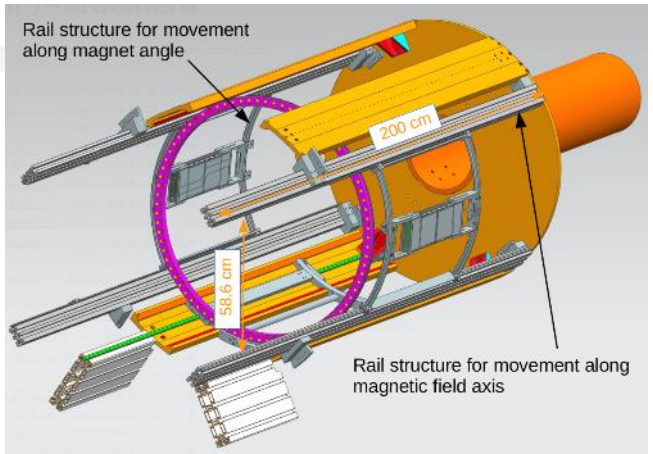


Development of a **cooling plate** in 3D printing (Saclay)
Also effort at Kindai U.

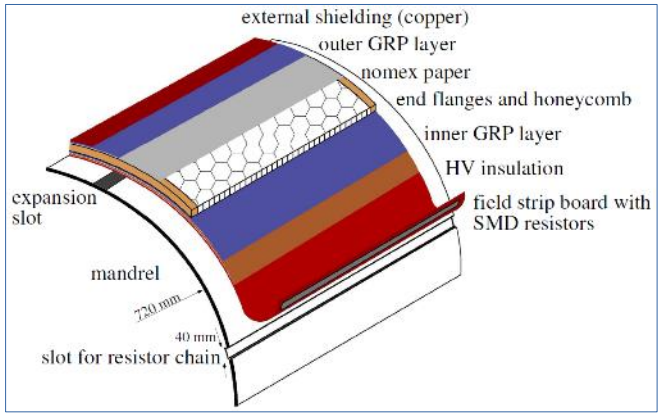


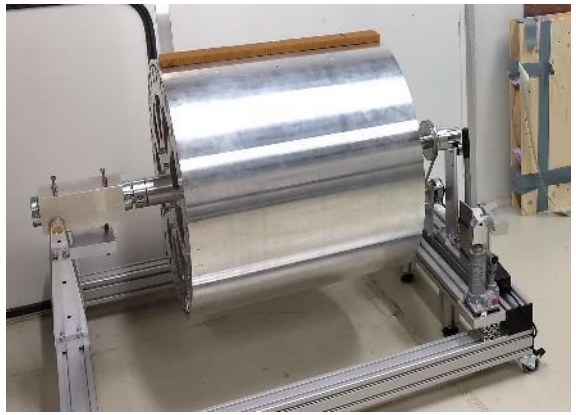
LYCORIS : a silicon telescope for the test beam facility at DESY





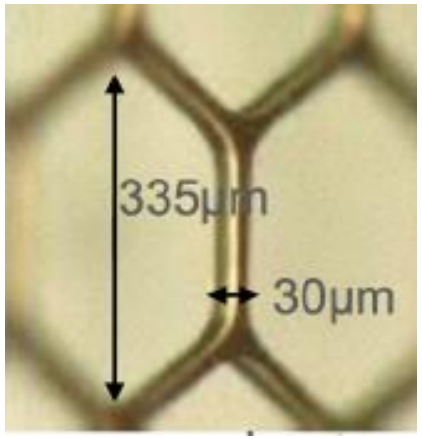
New field cage in progress (mandrel ready)

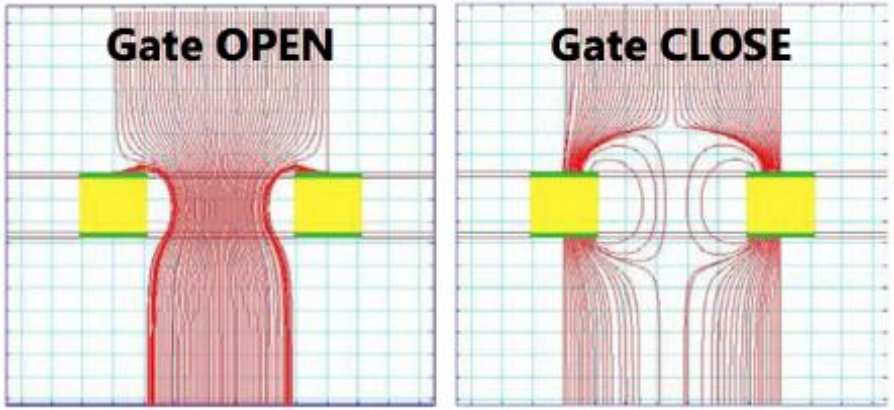


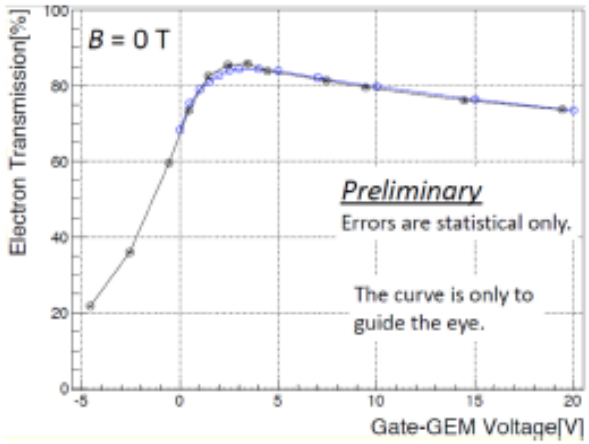


Recent achievements

- Gating scheme with Large Aperture GEMs proven to work, with 86% electron transparency (small setups and beam test)



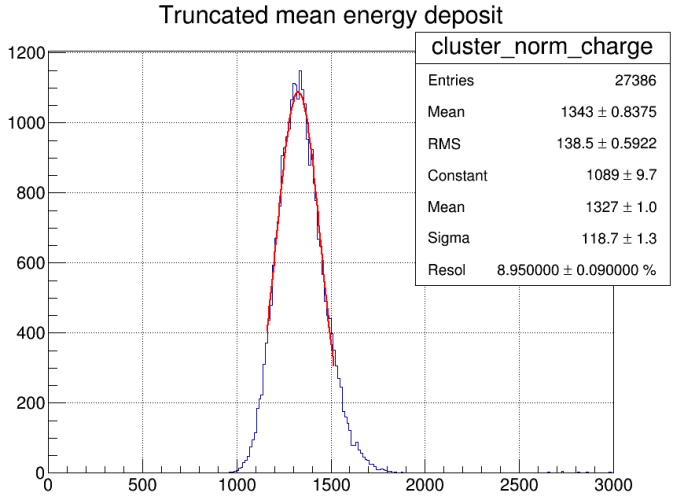




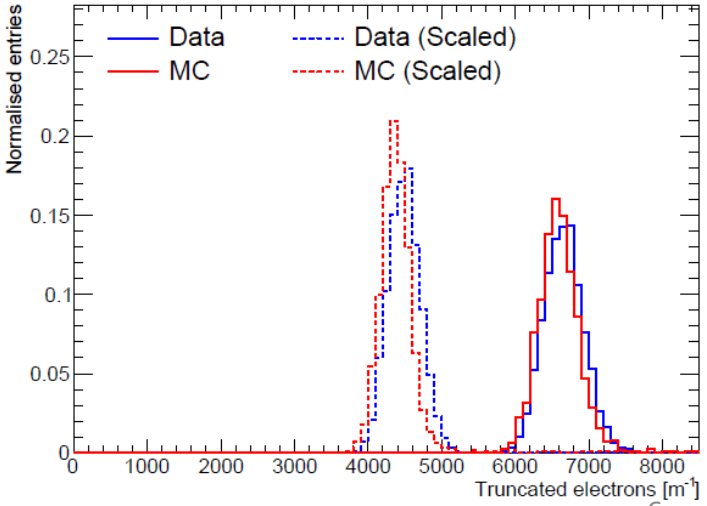
- dE/dx resolution better than ~5% for GEM, Micromegas, pixels, based on beam tests, and in agreement with expectations

dE/dx resolution:
4.5% with GEMs,
5.0% with Micromegas with resistive foil

(preliminary)



Electron dE/dx resolution with Pixels :
3.9 % (MC)
4.1% (DATA)
Scaled to a 1m track



Beam tests in progress

- Pixels (Bonn/Nikhef, October 2018)

2.5 GeV electrons at the ELSA Facility in Bonn. 30 million tracks recorded, to be analyzed

- Micromegas at DESY (November 2018) : test new scheme (mesh at ground and encapsulated resistive anode.

Advantages : better shielding, less distortions, better voltage flexibility)

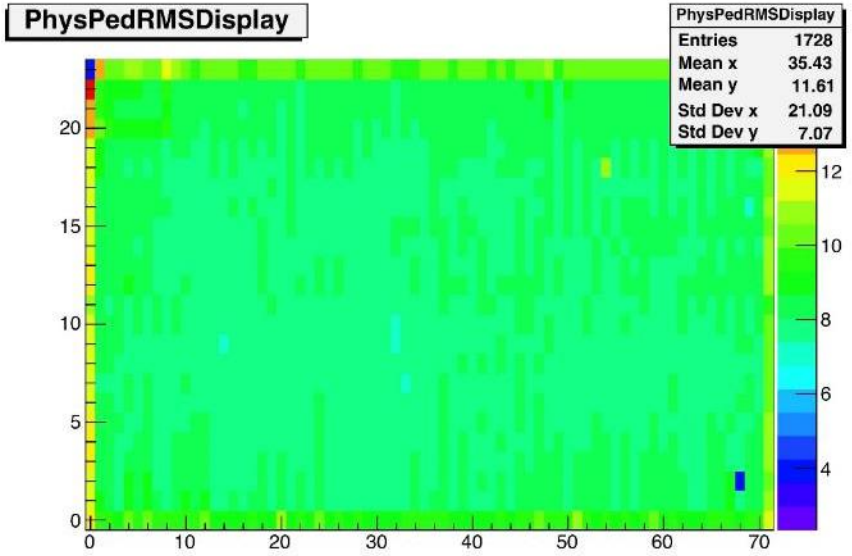
Status of the new modules : 4 manufactured, 3 delivered in Saclay and tested for connections and HV (two excellent, one with small current that should vanish when flushed with dry gas).

New mechanics : only a few disconnected pads (in blue on the display)

Other items :

Test 2PCO2 cooling with 1 loop

Use LP2 endplate



LCTPC News : SALTRO electronics in (slow but continued) progress,

3 testbeam analysis meetings organized in 2018

Collaboration meeting at DESY January 9-11, 2019.

Start discussions on mode of technology choice.