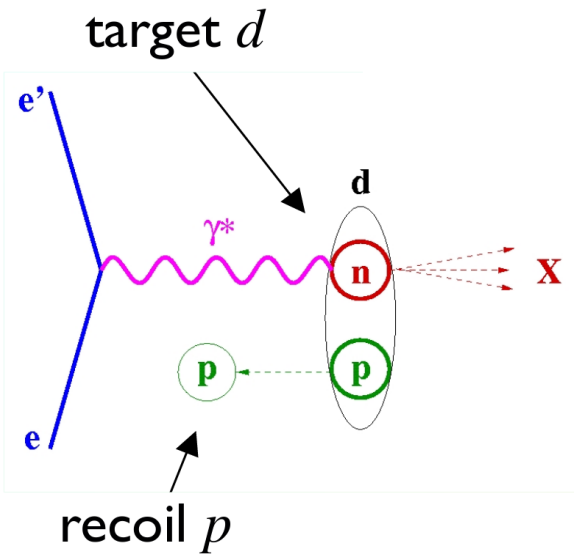
Update on Run Group F

BONuS12
Preparation for readiness review

Gabriel Charles

BONuS12 will study the neutron structure using deep inelastic scattering on a unpolarized deuterium target.

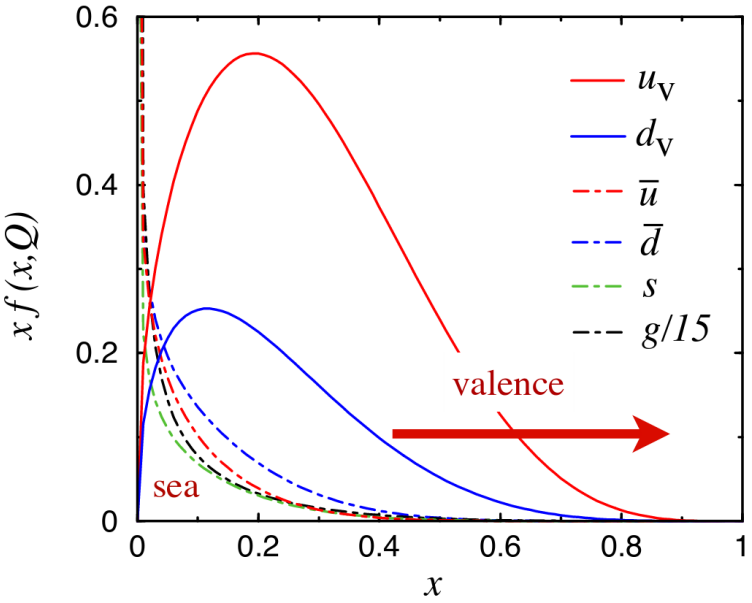


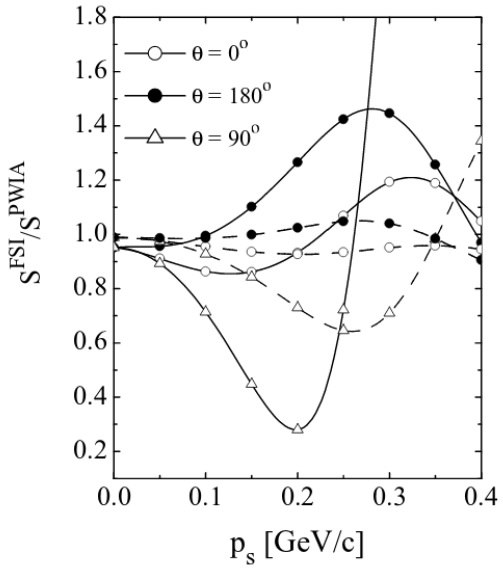
It will increase our knowledge on different topics.

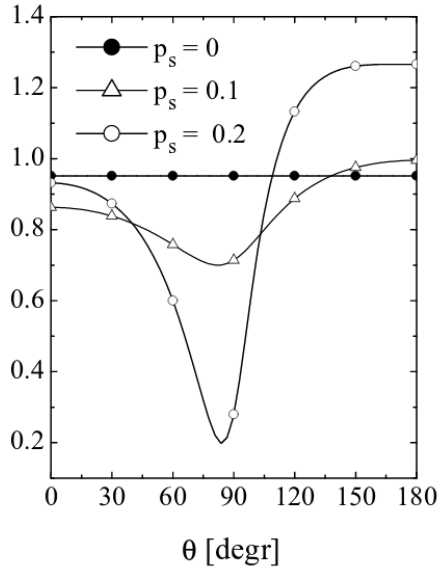
- Measure the neutron structure function
- Predictions for d/u when x→1:
  SU(6) 1 / 2
  Hard gluon exchange: 1 / 5
  Scalar diquark dominance 0

BONuS12 will measure low momentum spectator protons at high angles in coincidence with scattered electrons at high Bjorken *x*.

Barely Off-shell Nucleon Structure @ 12 GeV,





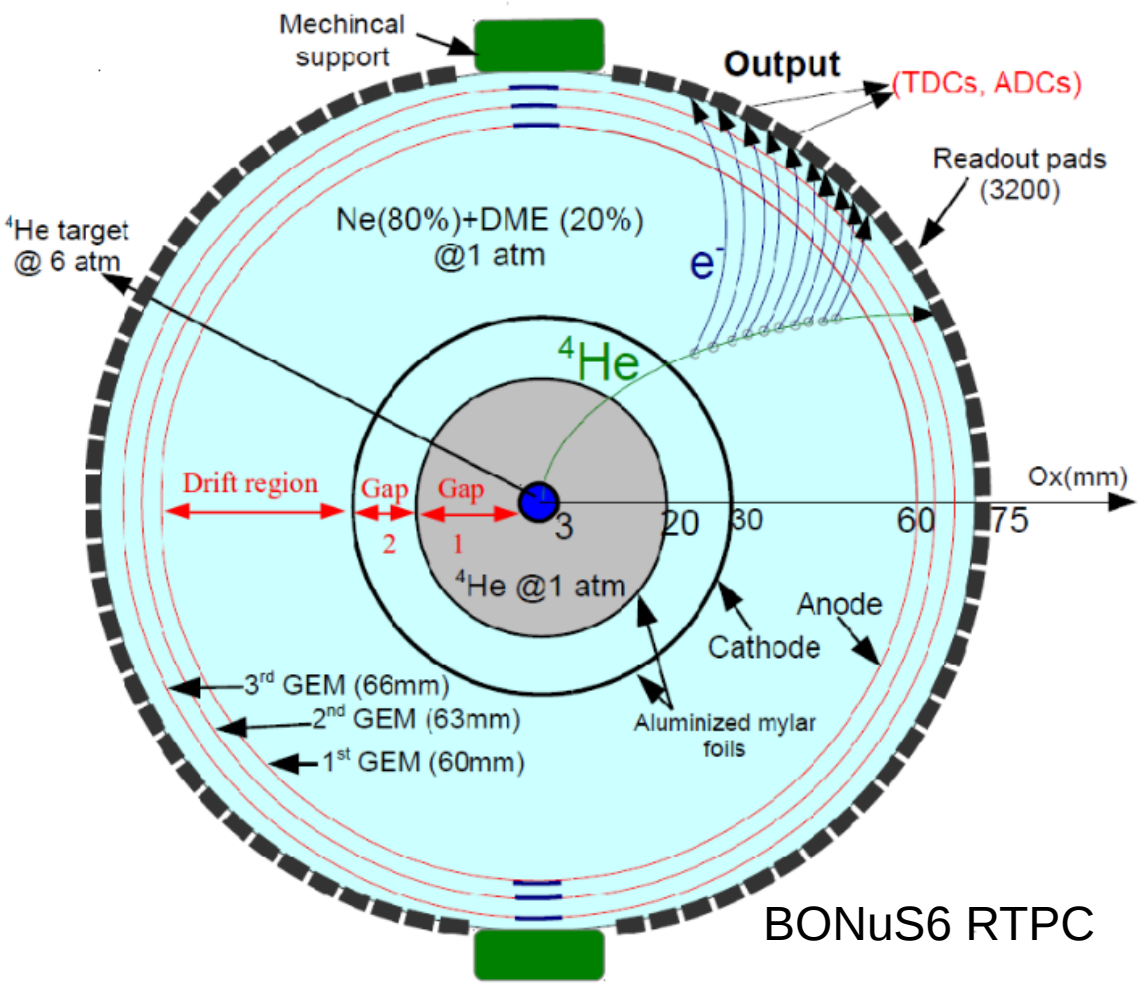


=> A new detector is needed to detect recoil protons below 100 MeV/c
CLAS12 will detect the scattered electrons

BONuS12: third experiment to run (currently scheduled for the beginning of 2019)

Readiness review in Spring 2017

Choice to use a Radial Time Projection Chamber



BONuS6 RTPC

Advantages:

- Energy threshold < 80 MeV/c
- Position resolution depends on pad size and time resolution
- Already used at Jlab: BONuS6, eg6

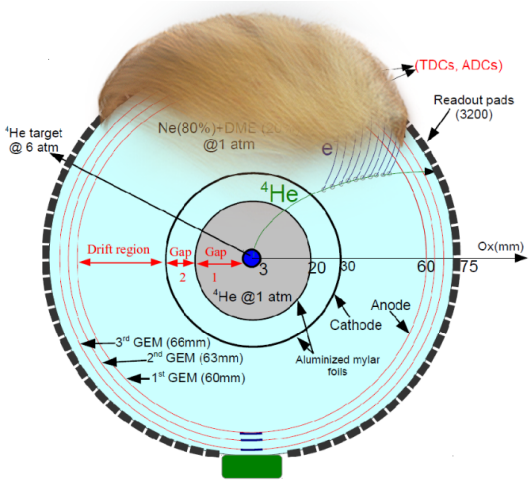
Larger angular coverage

New electronics

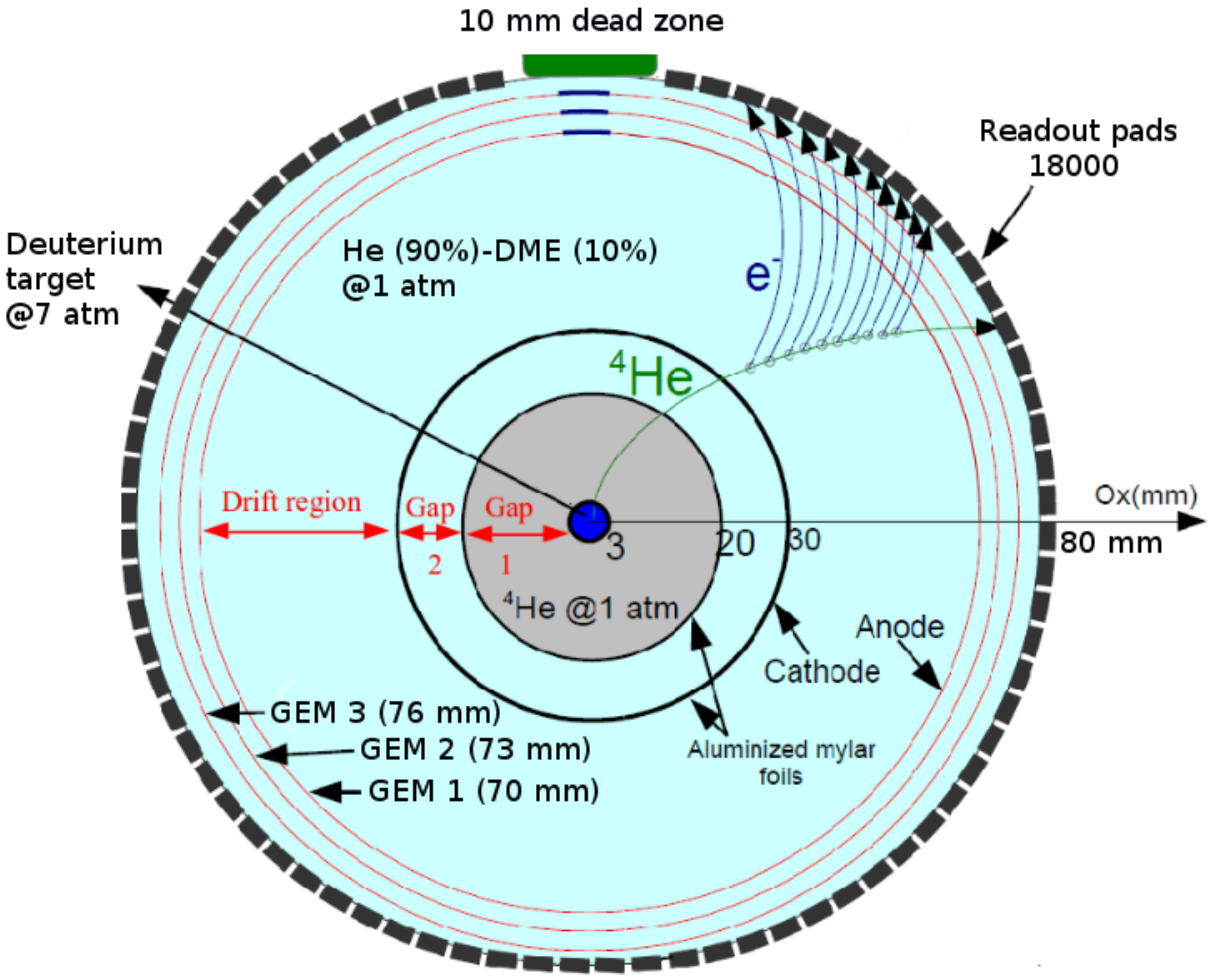
New tracking algorithm

Gas properties and homogeneity stability

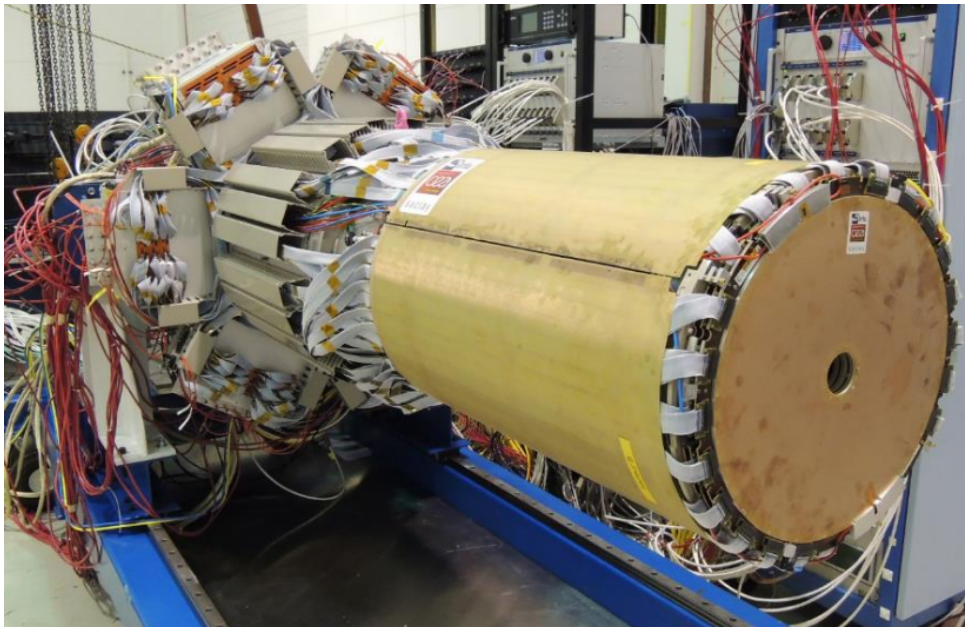
Better tracking



Different design, using different size GEM foils, and tape them at the top, larger radius, longer target and detector (400 mm long)



Working with Saclay to use the DREAM electronics
- it's already there, we are trying to use the same cables => minimum work needed to change the detectors
- ALTRO is not available anymore and we have only 3200 channels
- it's fast enough



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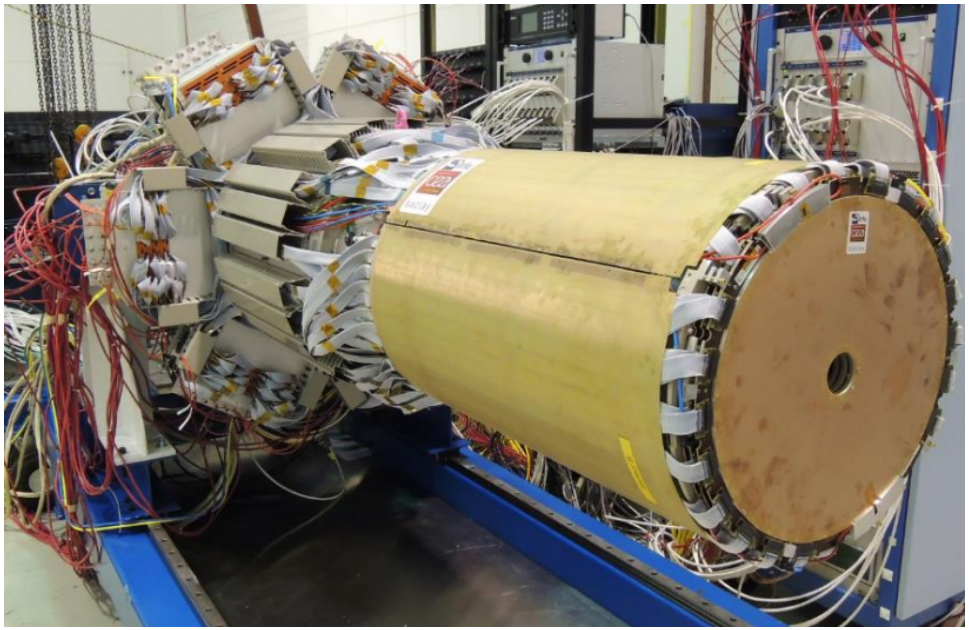
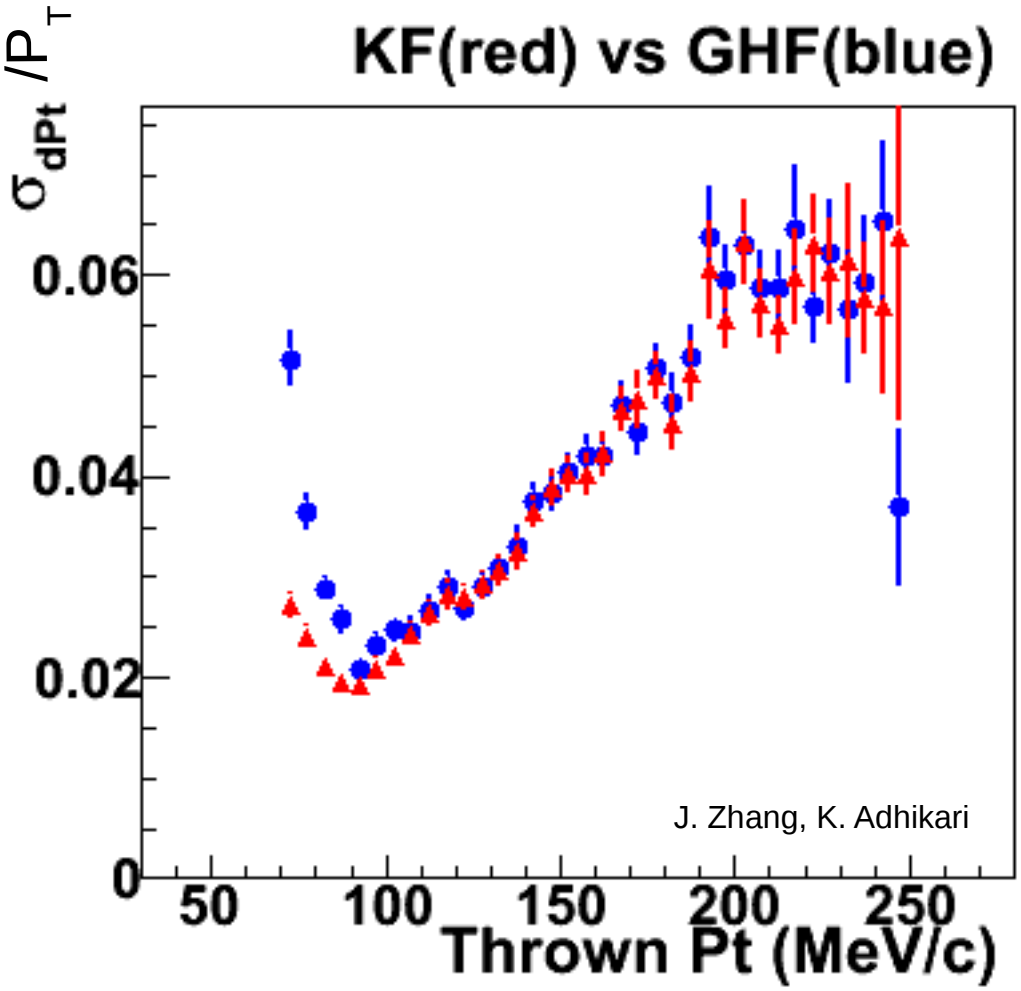
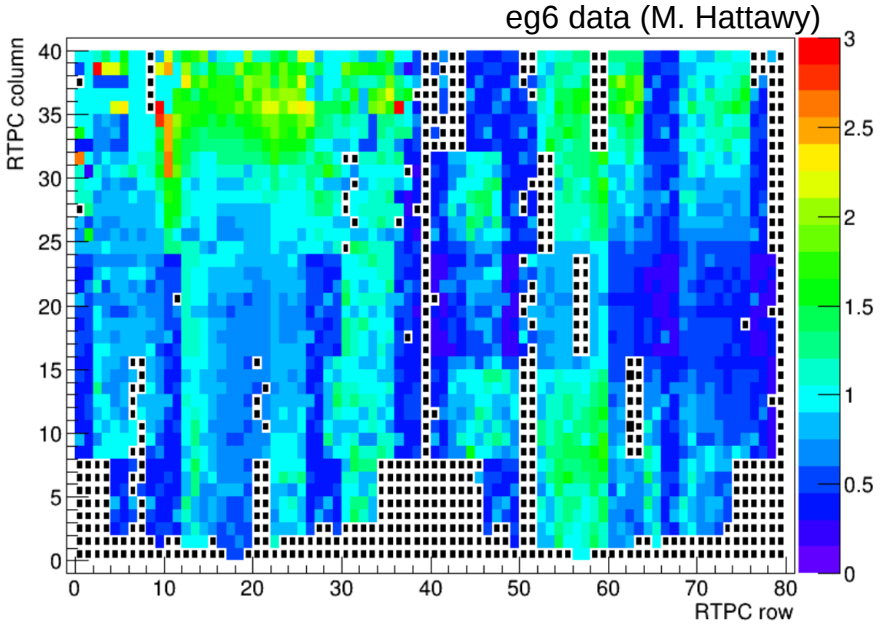


Work to be done:
- the firmware needs to be adapted
- a protection circuit needs to be added
- test bench being setup at ODU, first tests this or next month

BONuS6 and eg6 used global helix fit. We will use a Kalman Filter.
It can handle energy losses which are not negligible for us.

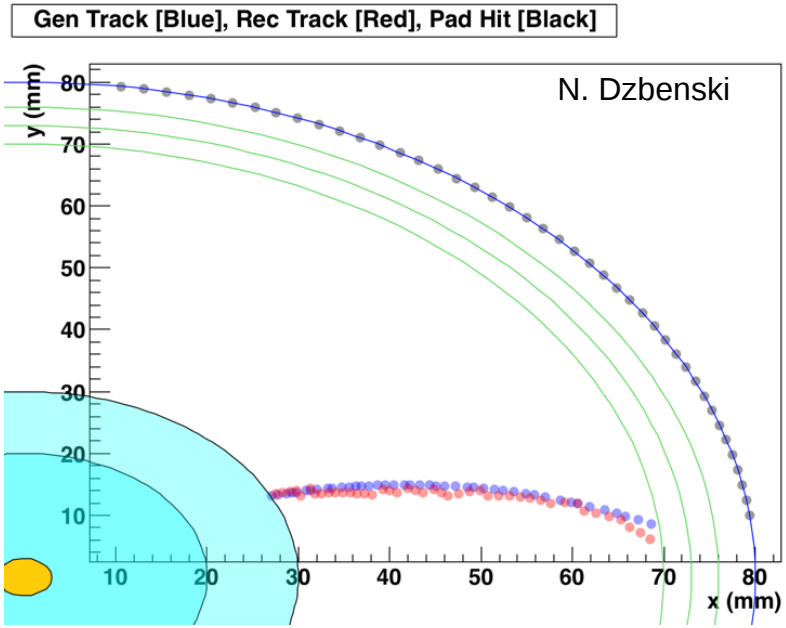


Gain for previous runs.



Why is it important? Add uncertainty to the energy collected eventually
Even if a calibration with magnetic field is necessary,
we need to make sure that the calibration without B is as good as possible

We are looking at all the aspects that could be the cause of this:
- gas composition (Magboltz-Garfield)
- gas density
- GEM gain
- electric field homogeneity: cathode foil, resistive end plates

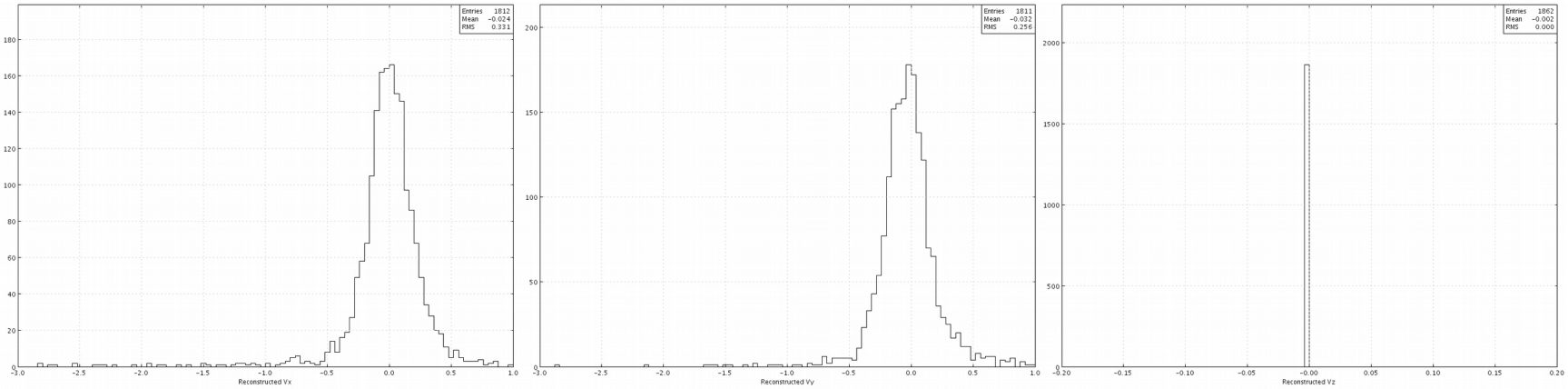


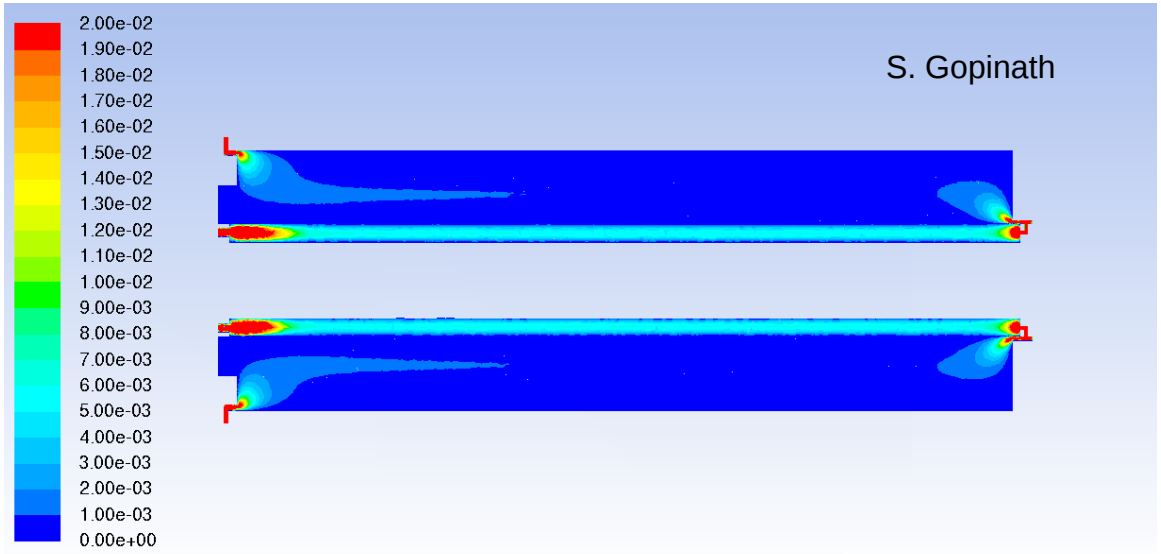
With Gemc, Magboltz and Garfield answer the questions:

- What is the effect of small gas composition modification?
- What is the drift time?
- What is the Lorentz angle?
- What is the best gas mixture?

For a complete test, we are implementing the RTPC in Coatjava, providing comments for the tutorials on the way.

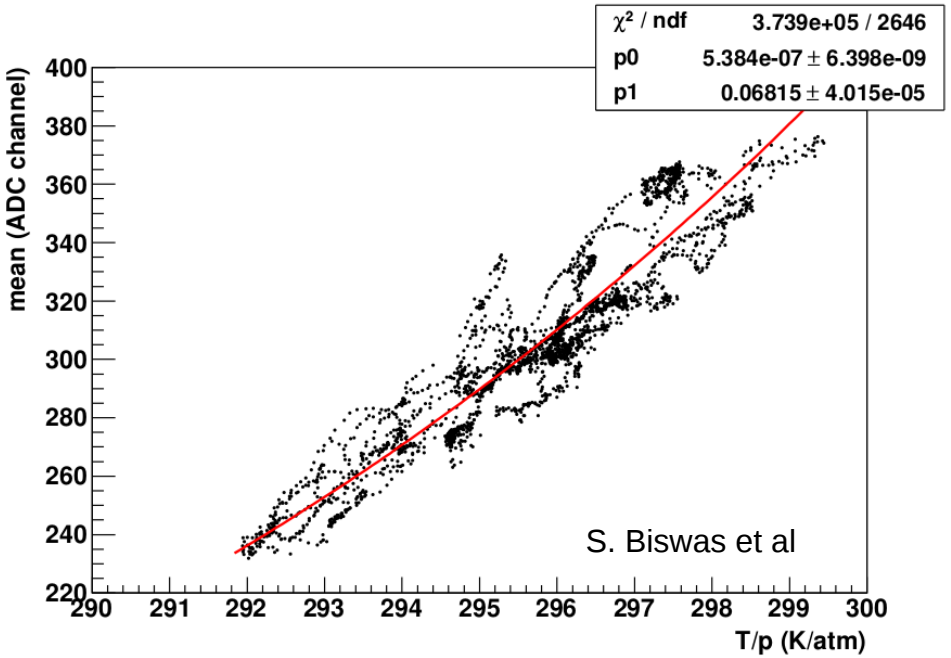
D. Payette



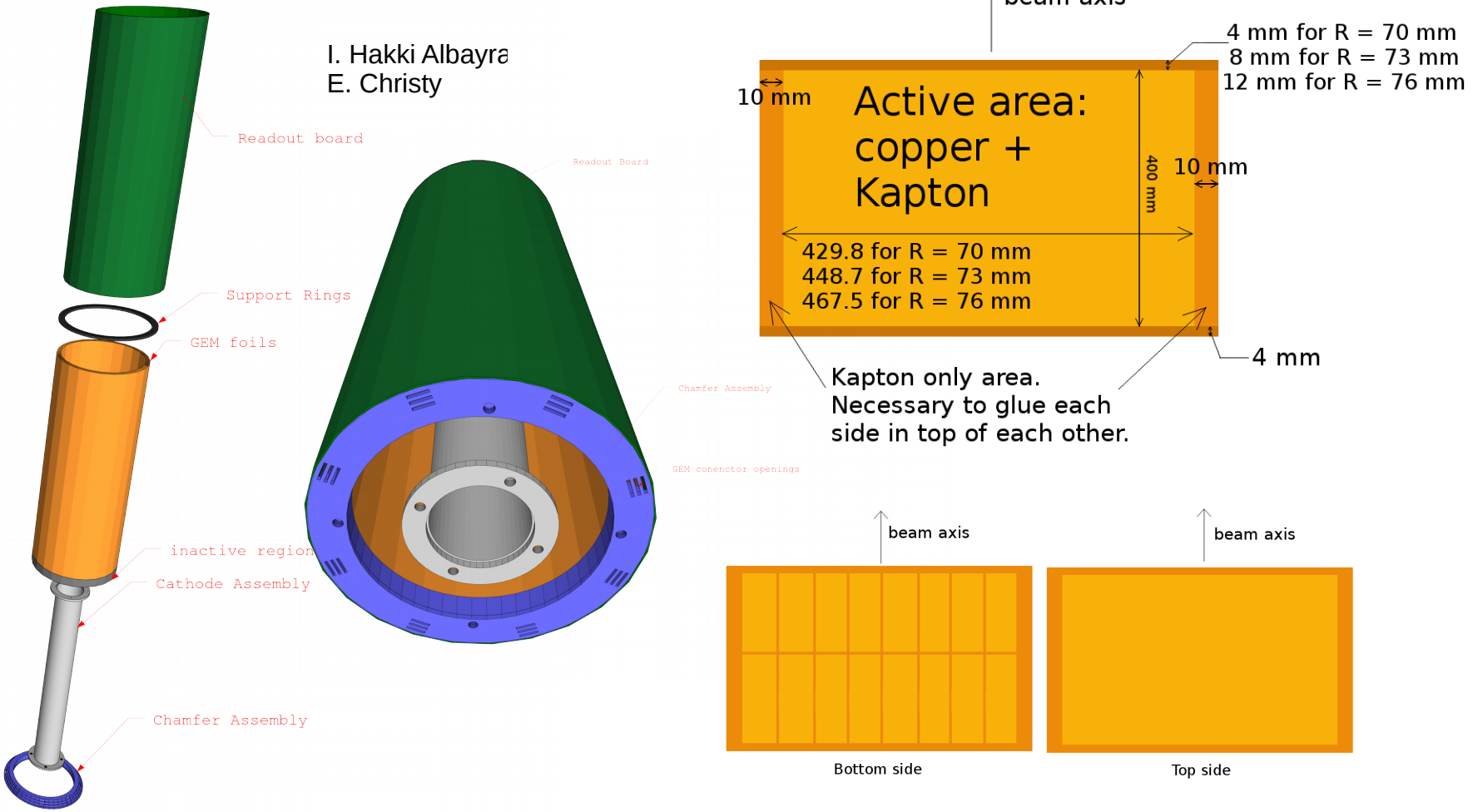


Gas flow simulation of the chamber => adding more inlets and outlets to ensure a more homogeneous distribution of the gas in the chamber

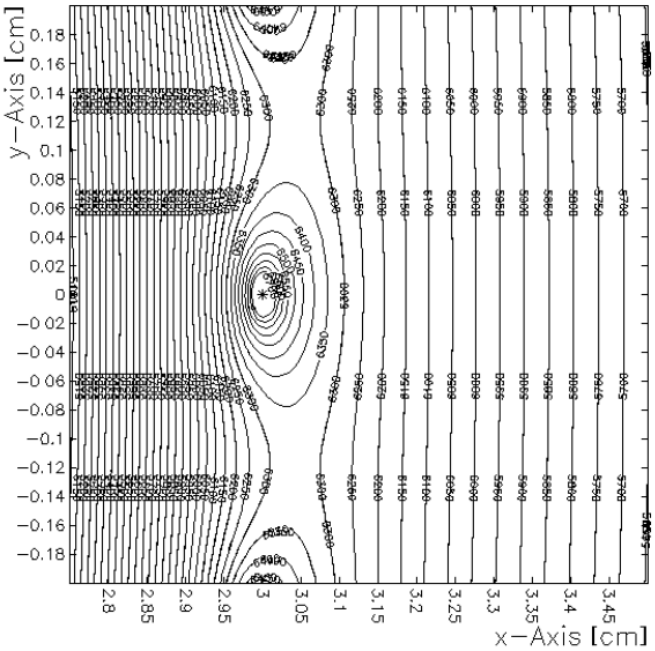
Different solutions are under investigation to keep the working conditions stable: blow air at fixed temperature and pressure around the detector, calibrate the gain before, blowing gas at fixed temperature and pressure in the detector...



GEM gain: stronger constraints on the position of the GEM foils. As the detector is longer, a spacer will be added at the center. The GEM foils are segmented on one side.



A. Nadesshani

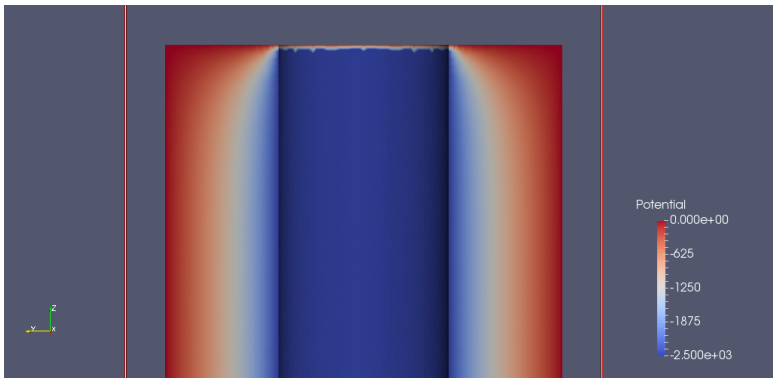


Replace the cathode foil by wires

Cathode foil could have unknown wrinkles

Studies on going to understand the effect on the drift time and Lorentz angle

Cover end plates with a resistive paint to have a homogeneous electric field



Electric field is distorted at the edges if nothing is done

BONuS12 will provide new data at high Bjorken x to determine the neutron structure function and d/u ratio

A new RTPC is being built with a great team of motivated people as we are

Several points are being investigated to improve the previous RTPC: larger angular coverage, new electronics, gain stability, better tracking

Gemc and Coatjava are being updated with the help of Veronique, Gagik, Nathan

A test bench will be operational next month at ODU to test the DREAM electronics