

# Proton Drift Chambers PDCs

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- PDCs were first Fair R3B in-kind detector from Petersburg, commissioned in 2007.
- Several experiments were performed:
  - Coulomb dissociation of  $^{27}\text{P}$
  - Coulomb dissociation of  $^{31}\text{Cl}$  and  $^{32}\text{Ar}$
  - Coulomb dissociation of  $^{17}\text{Ne}$
- But since 2015 the PDCs are not working anymore:
  - SAM module and its firmware were not supported any longer.
  - AD16 boards were not available, CMP16 ASIC not produced anymore.
  - Gas system not working.

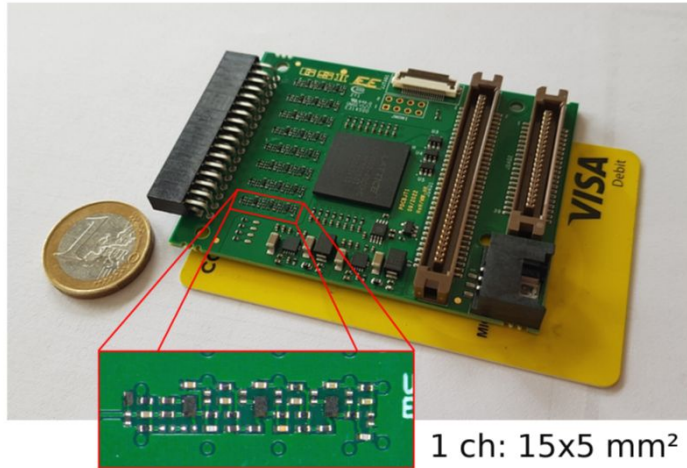
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## New electronics

Michael Wiebusch from EEL designed a 16 channel discrete amplifier-shaper board which replaces the AD16 boards.

The concentrator board is replaced by 2 clockTDC boards.



**Figure 2.** The fully assembled printed circuit board hosting 16 amplifier-shaper circuits and an FPGA for signal discrimination.



### OPEN ACCESS

A custom discrete amplifier-shaper-discriminator circuit for the drift chambers of the R3B experiment at GSI

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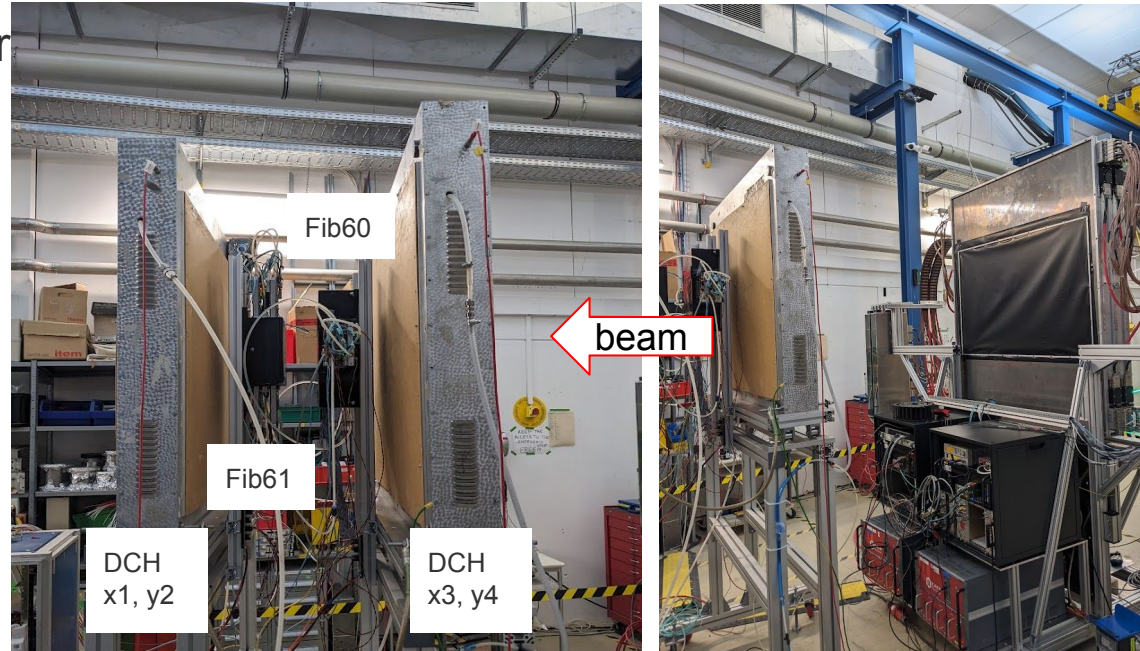
# Setup 2024 behind ToFD

The PDCs were tested against fiber detectors with various beams.

Fib60: 256 fibers with 500  $\mu\text{m}$

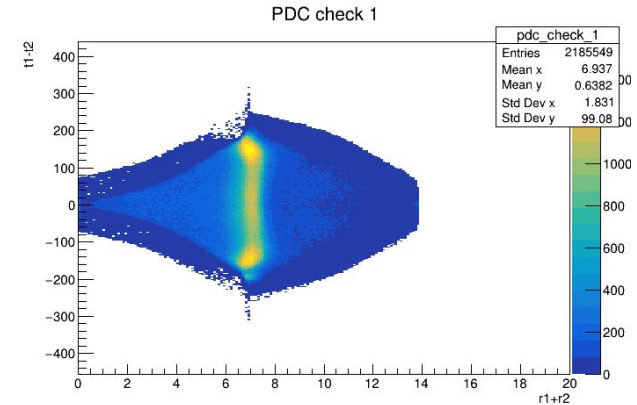
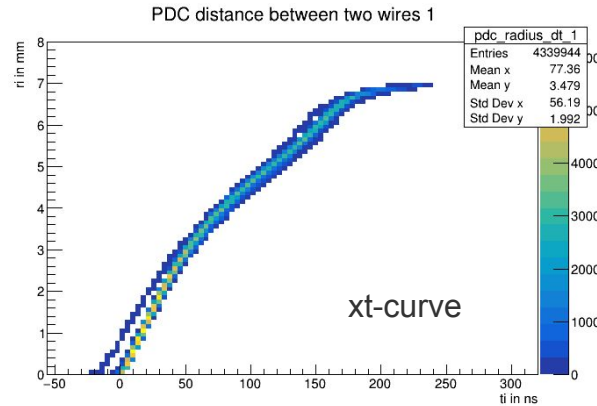
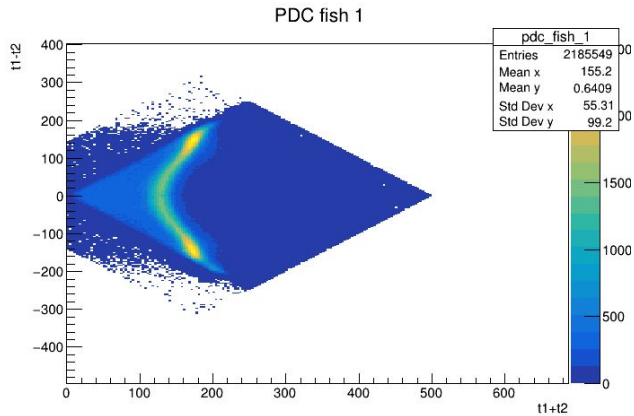
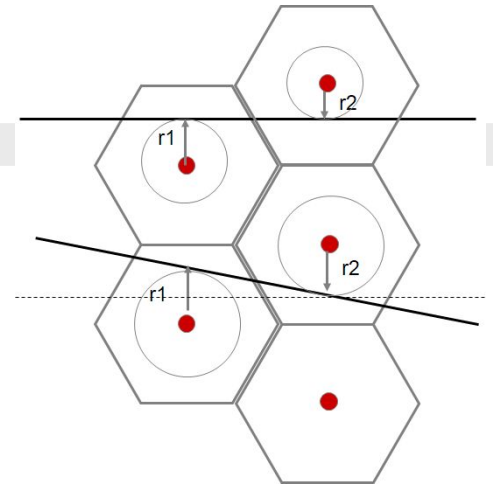
Fib61: 1280 fibers with 200  $\mu\text{m}$

Size 12.8 cm wide, 20 cm long



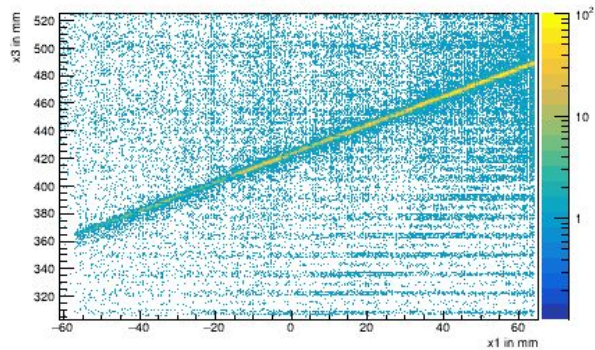
# Analysis of the data

The analysis and calibration code is available in R3BRoot.

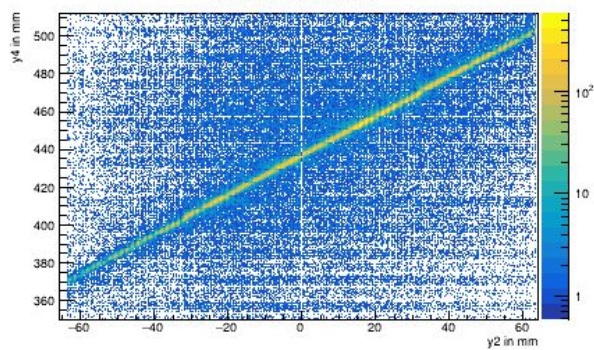


# Deuteron beam during s118

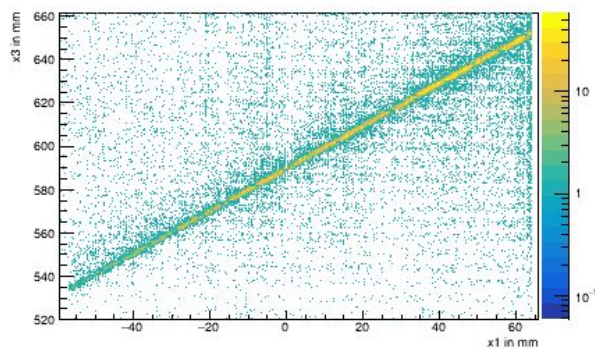
PDC x1 vs Fib61 x



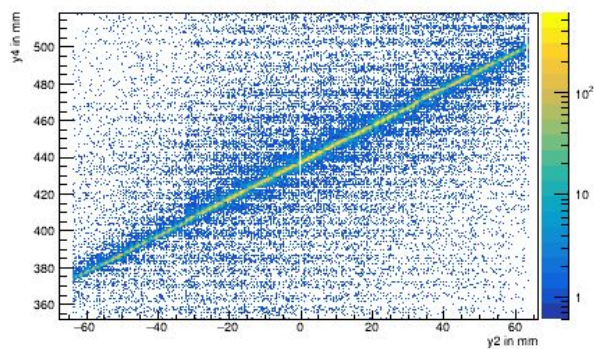
PDC y2 vs Fib60 y



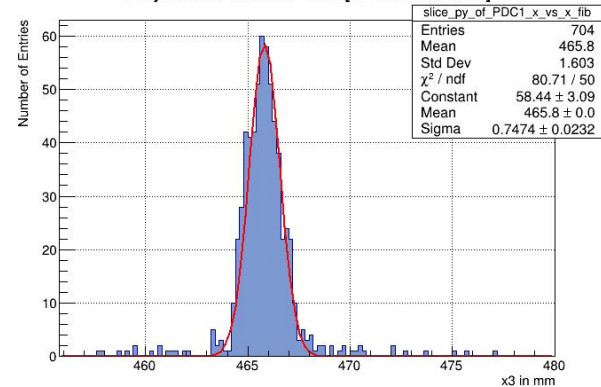
PDC x3 vs Fib61 x



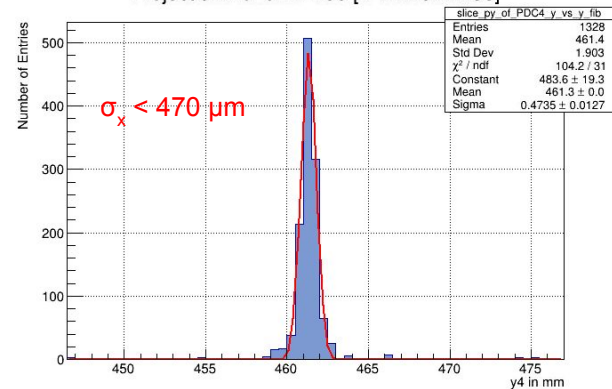
PDC y4 vs Fib60 y



ProjectionY of binx=565 [x=41.00..41.25]

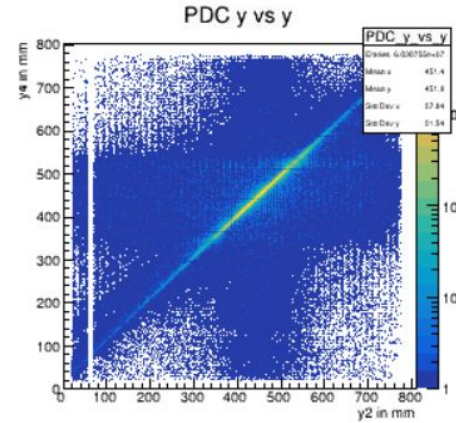
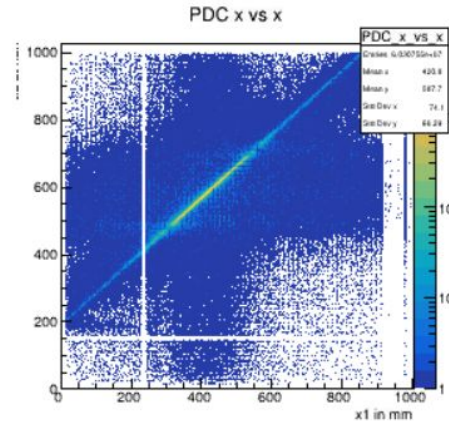
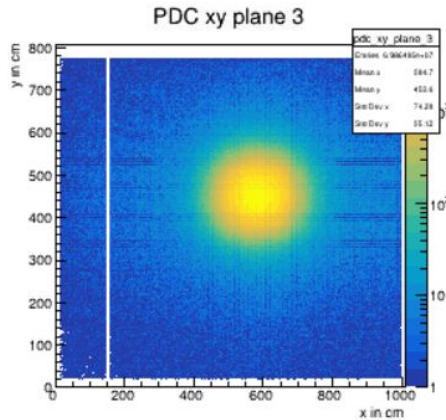
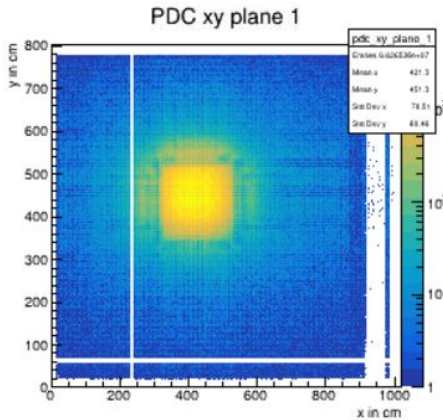


ProjectionY of binx=498 [x=24.25..24.50]



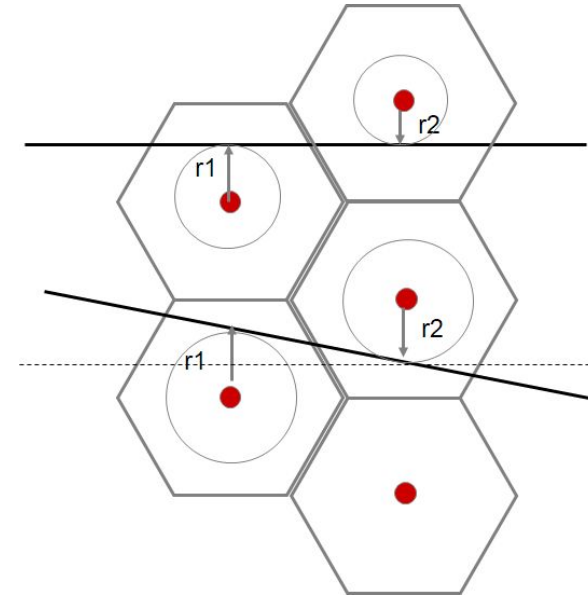
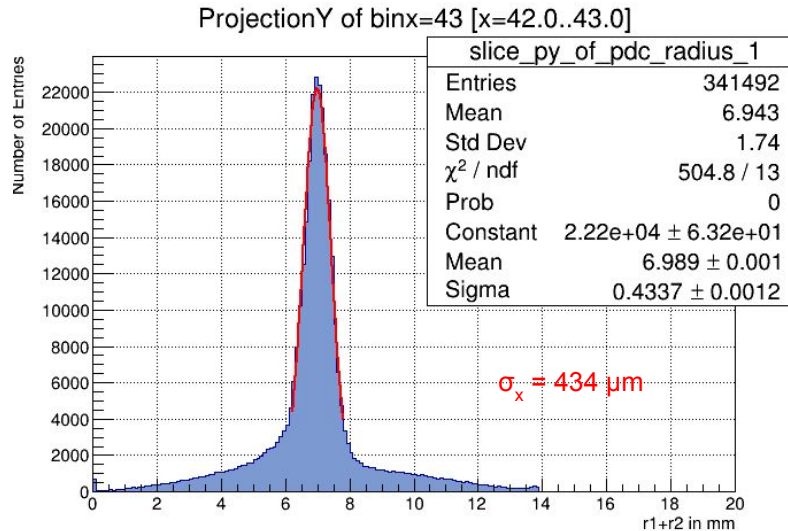
# Carbon beam during s118

Carbon beam of 400 AMeV had too much angular straggling and was partly stopped in the housing of the fiber detectors.



# Comparison to the previous performance

In 2007, the performance was never tested against other detectors, but a resolution of  $\sigma_x = 400 \mu\text{m}$  was determined from the sum of  $r1 + r2$ .





- The gas mixing unit was repaired.
- The old electronics was replaced. We have tested the new electronics with cosmics,  $^{55}\text{Fe}$  source and various beams.
- The position resolution was measured with the help of fiber detectors to be:  $\sigma_x < 470 \mu\text{m}$ .
- The efficiency was measured to be 98% for deuterons.

The proton drift chambers are working again and ready for future experiments.