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First beam test results for the STT-ASIC readout

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Beam time

When: 22/04/16 - 01/05/2016

Where: COSY-TOF area

What: Testing of three prototype detectors

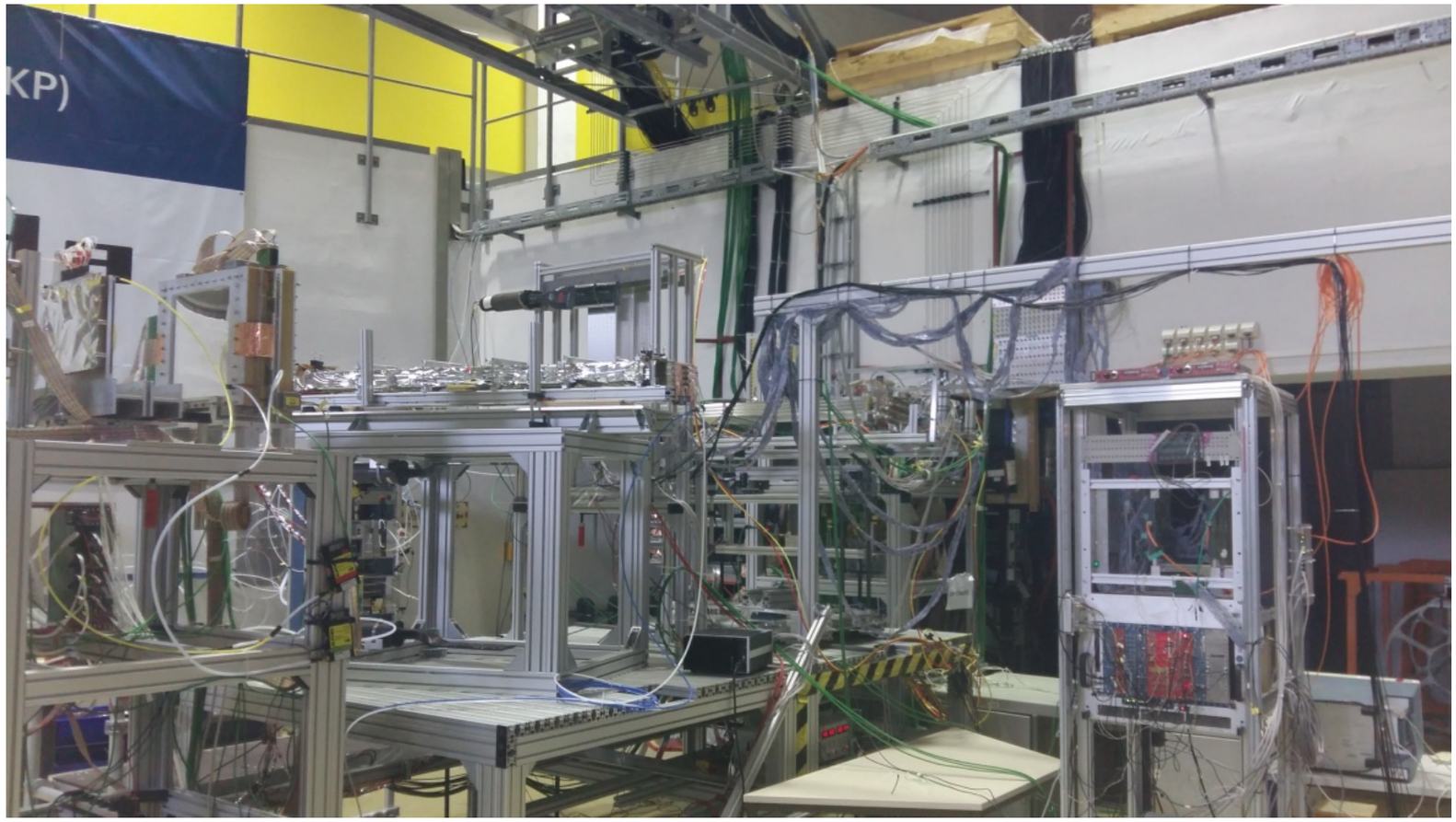
(STT-ASIC readout, STT-ADC readout, FT-ASIC readout)

Beam specifications

Particles: Protons

Momentum: 0.55, 0.75, 1.0, 2.95 GeV/c

Size: 2x3cm



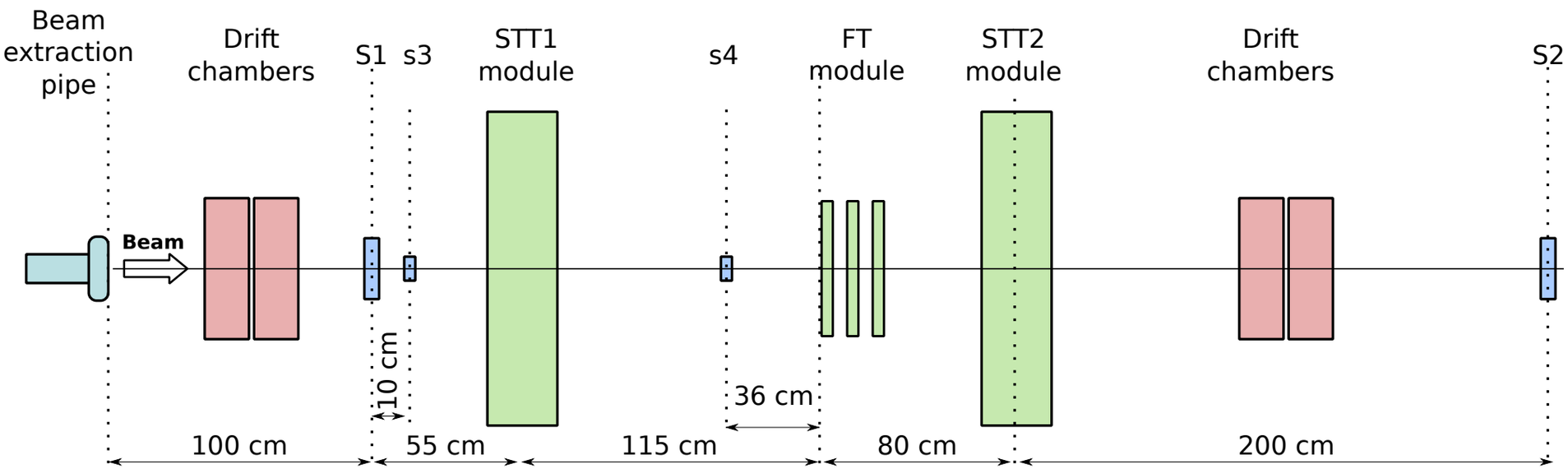
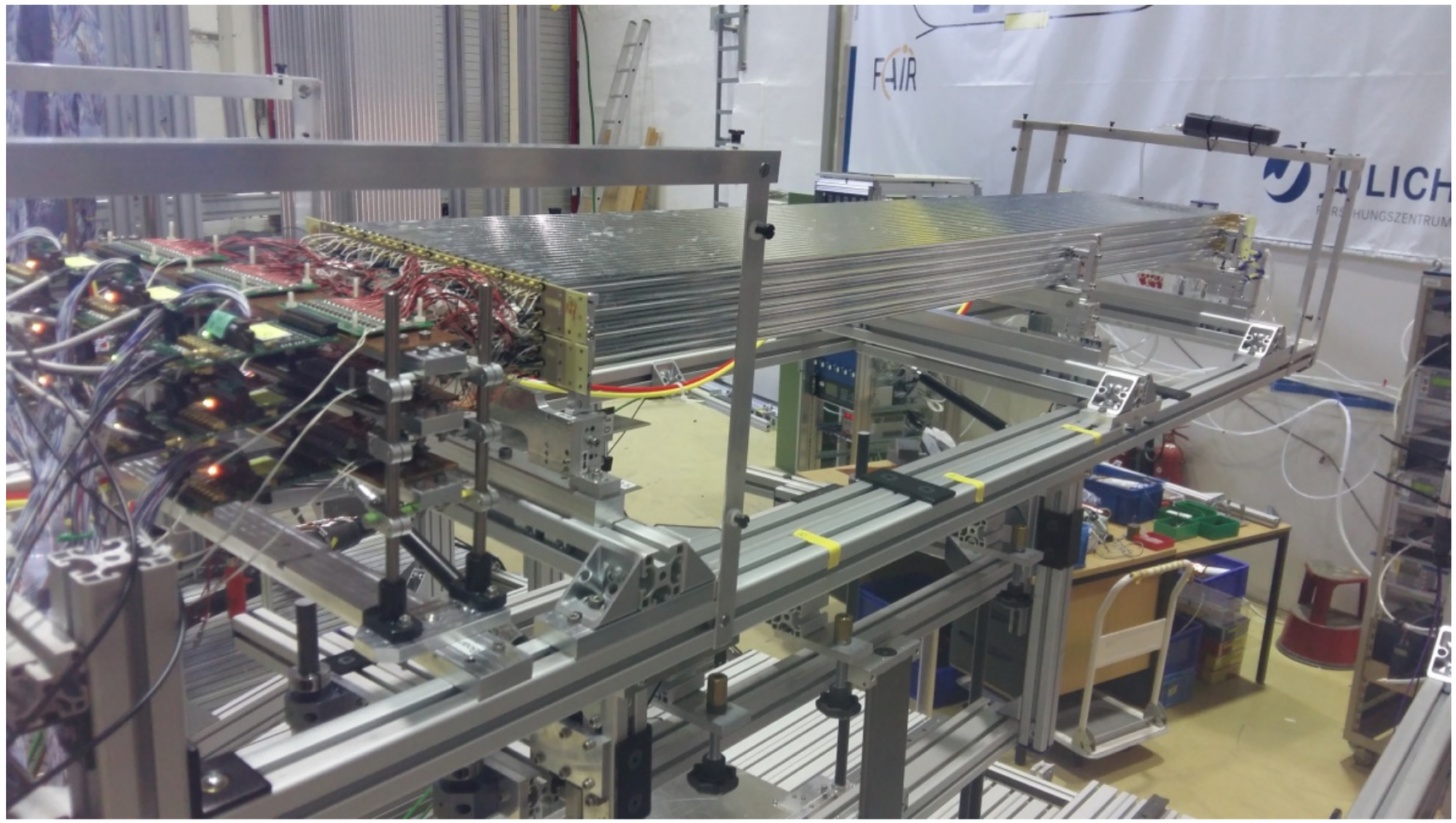


Figure made by Pawel Strzempek (JU Krakow)

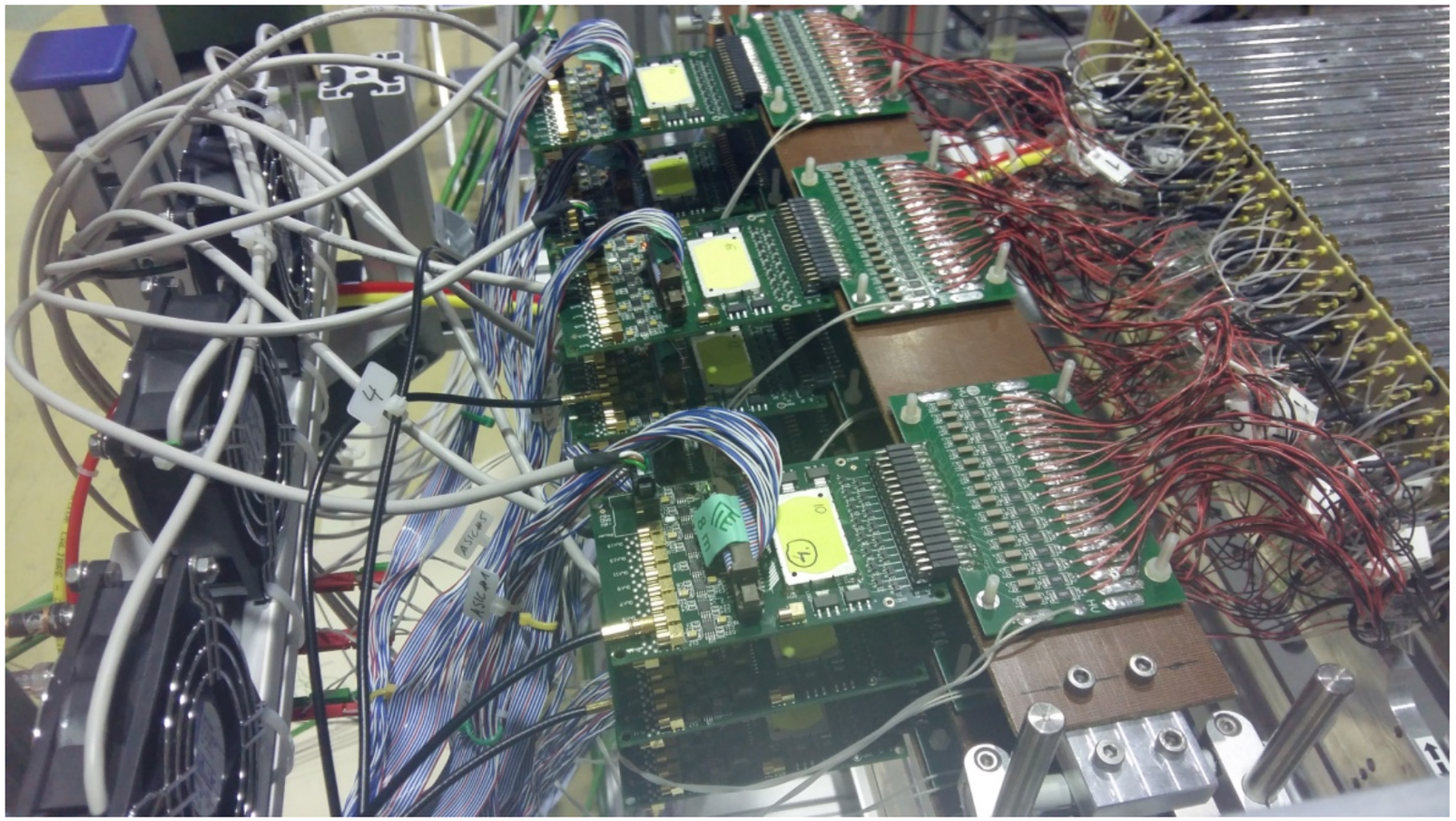


STT-ASIC readout

144 channels

6 layers x 24 tubes

Inclination, move right/left, turn (thanks to Artur Cebulla)



Detector readout

FEE

1 ASIC —> 8 channels

1 FEE —> 2 ASIC —> 16 channels

1 TDC —> 3 FEE —> 6 ASIC —>48 channels

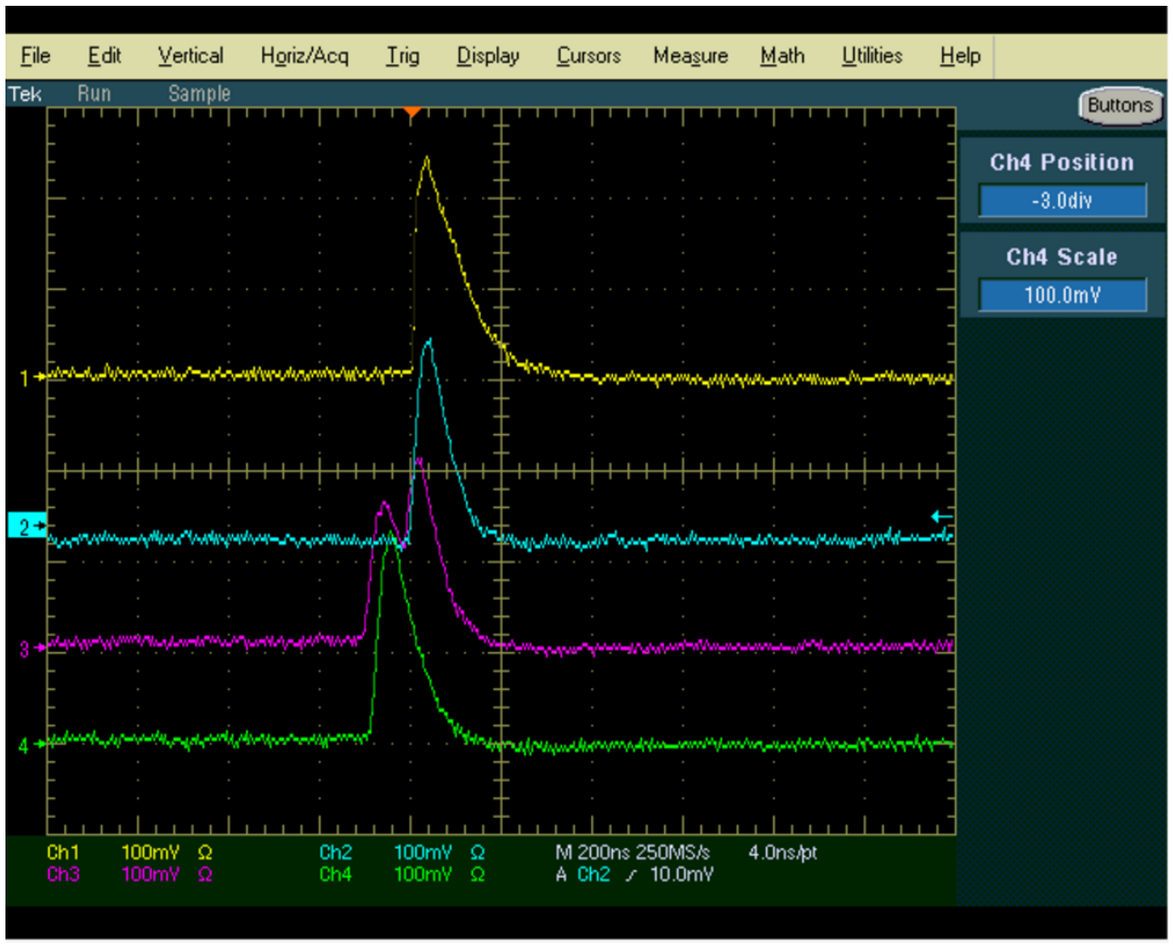
1 TRB —> 4 TDC —> 192 channels

Settings

3 different voltages (1750V, 1800V, 1850V)
Different thresholds
Several combinations of peaking time, amplification etc + different positions at the same time

Very low noise levels ~ 5mV

Threshold was set even to 10 mV

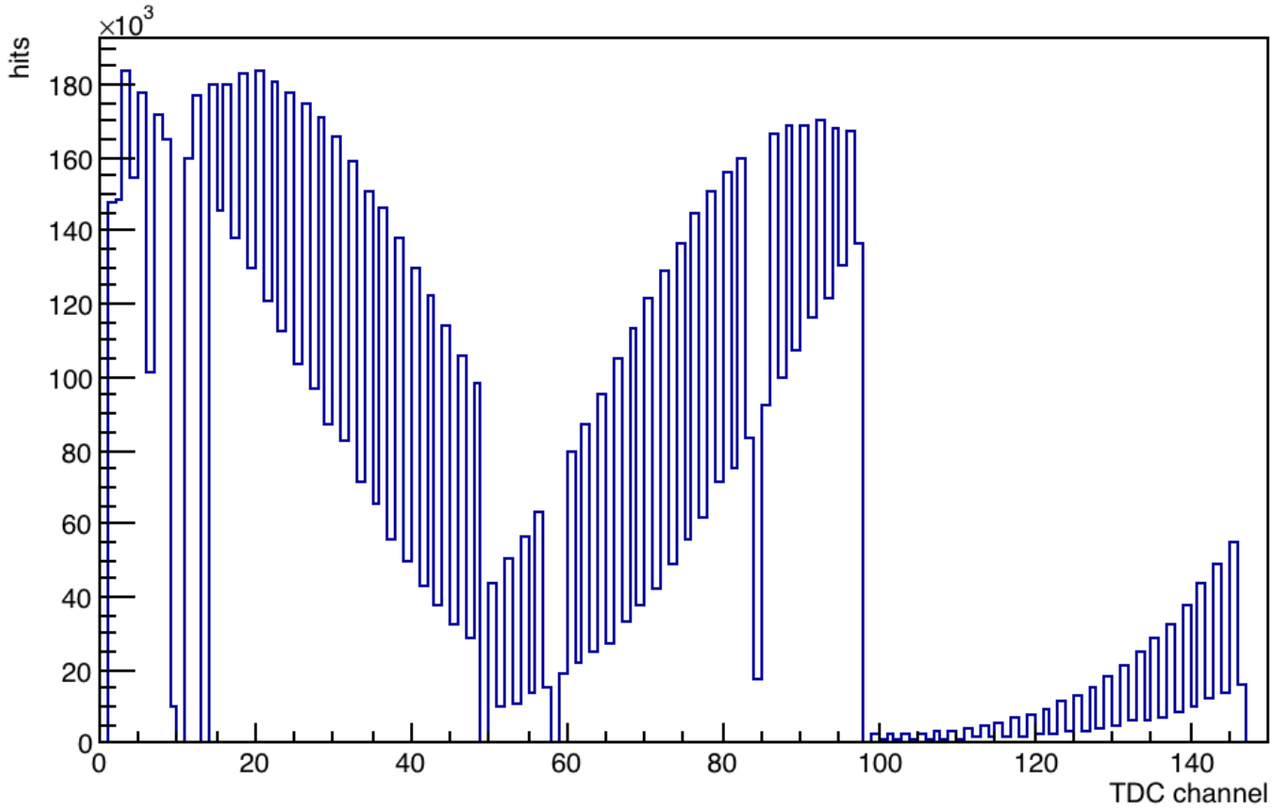


Preliminary results

Settings of the data analysed so far:

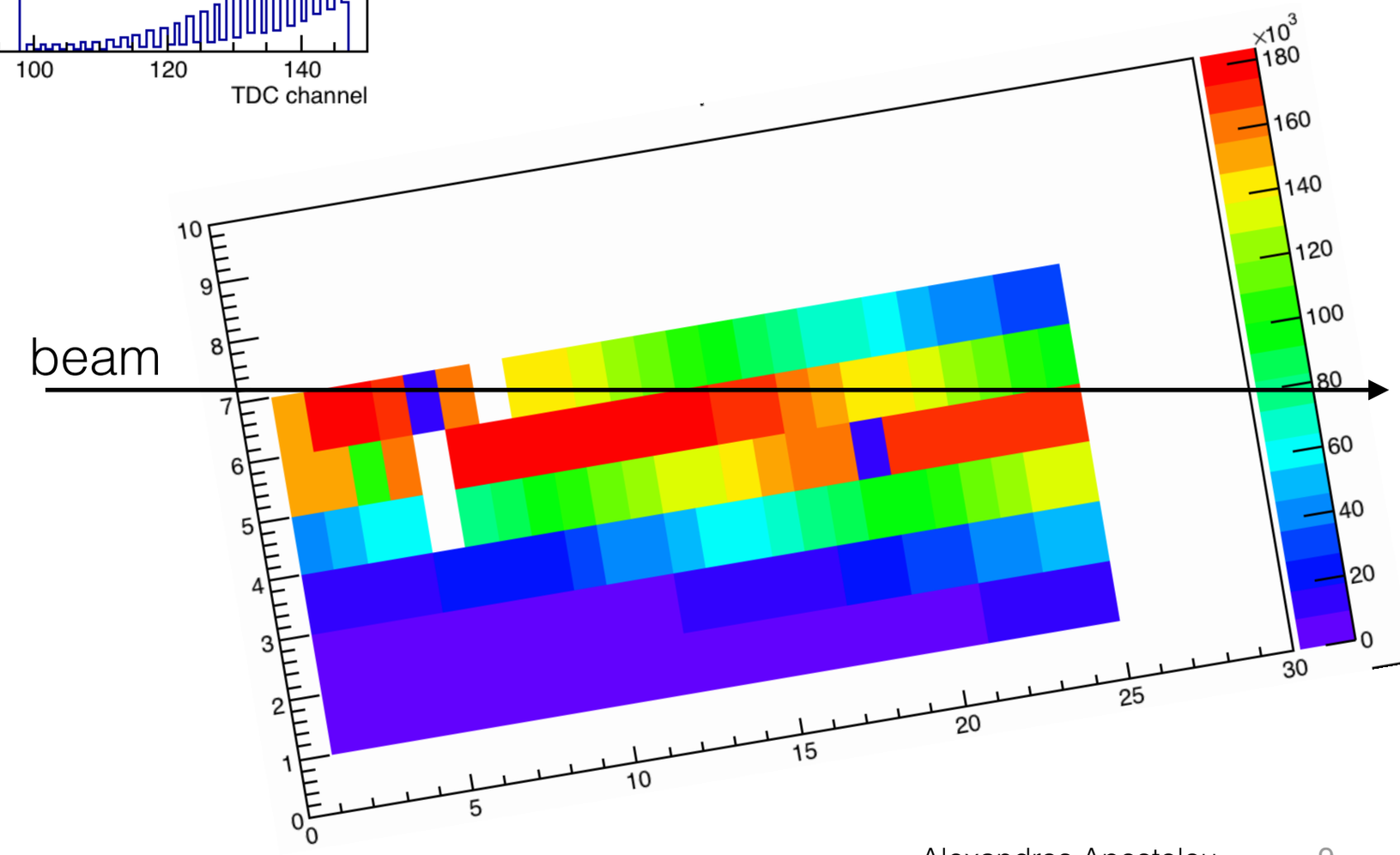
Voltage: 1800V
Threshold : 10mV
Gain : 1
Peaking time : 20 ns

Remarks:
r(t) calculation : first iteration
Error for the isochrone: 150μm
TOT/dx : no truncation

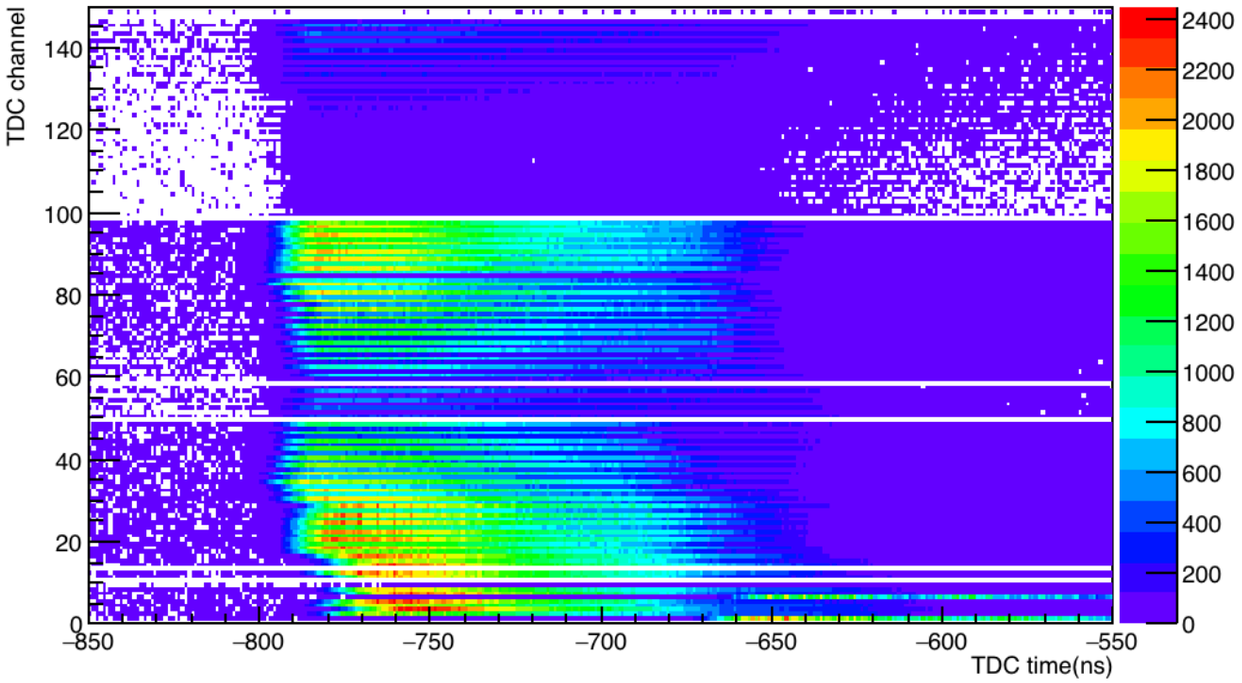


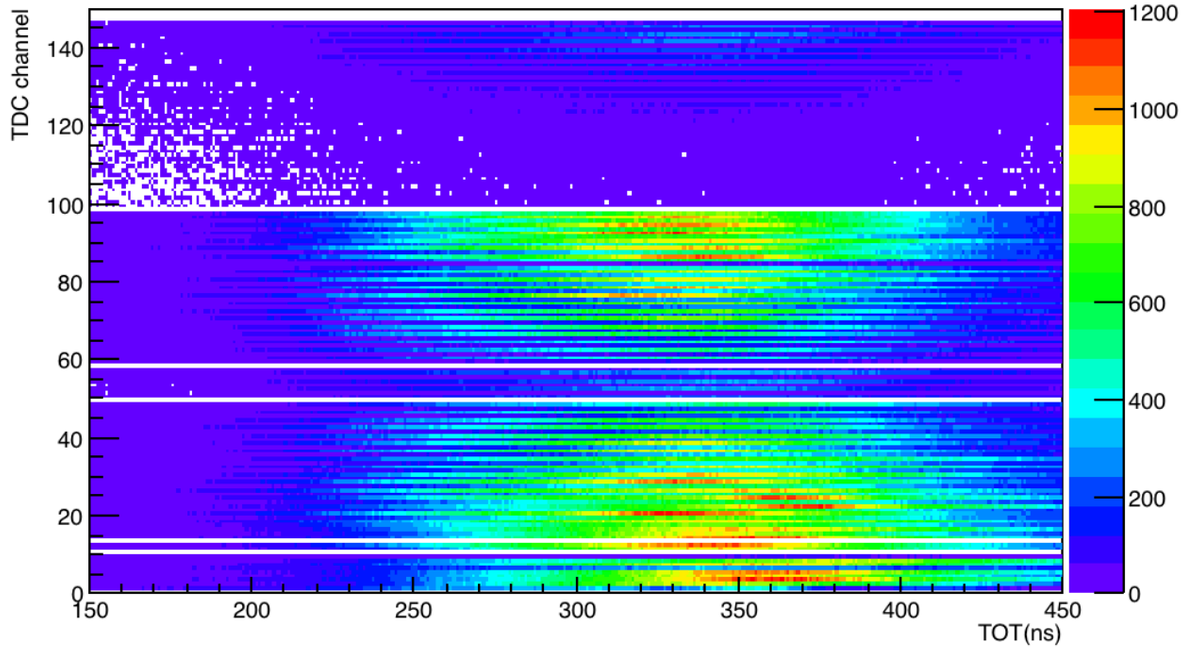
0.55GeV/c

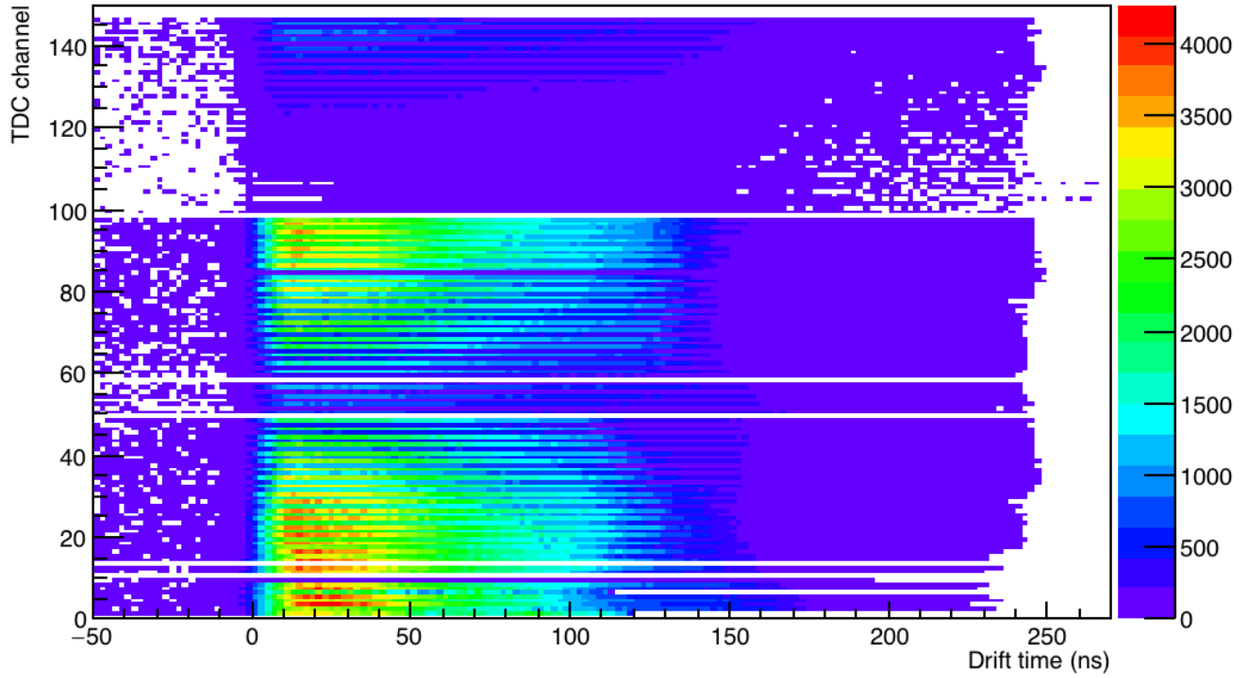
beam



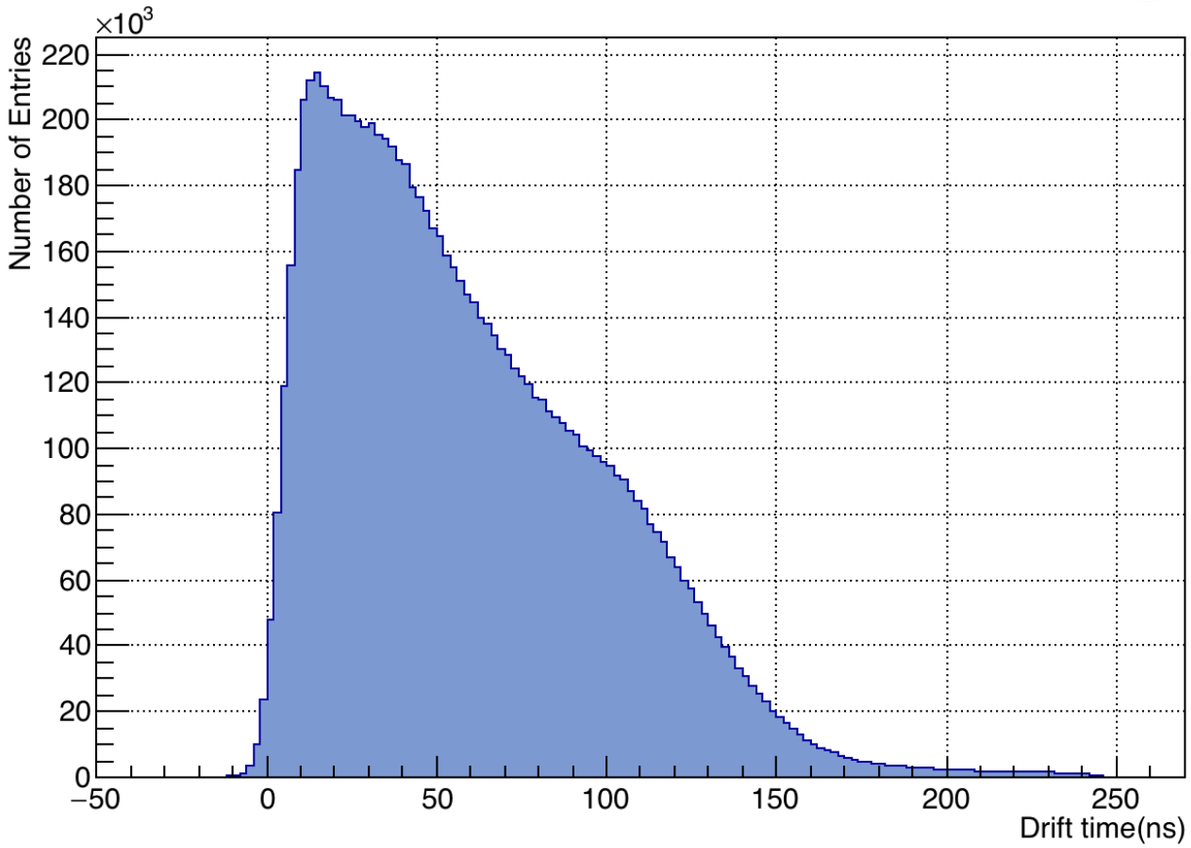
0.55GeV/c

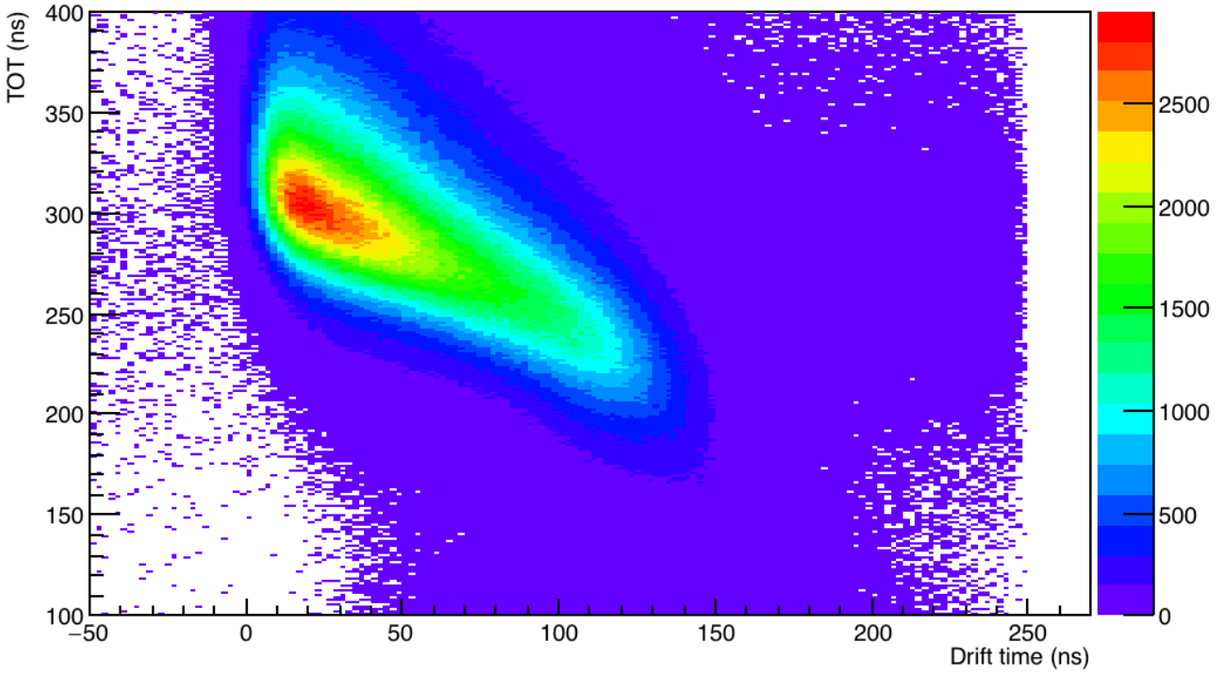


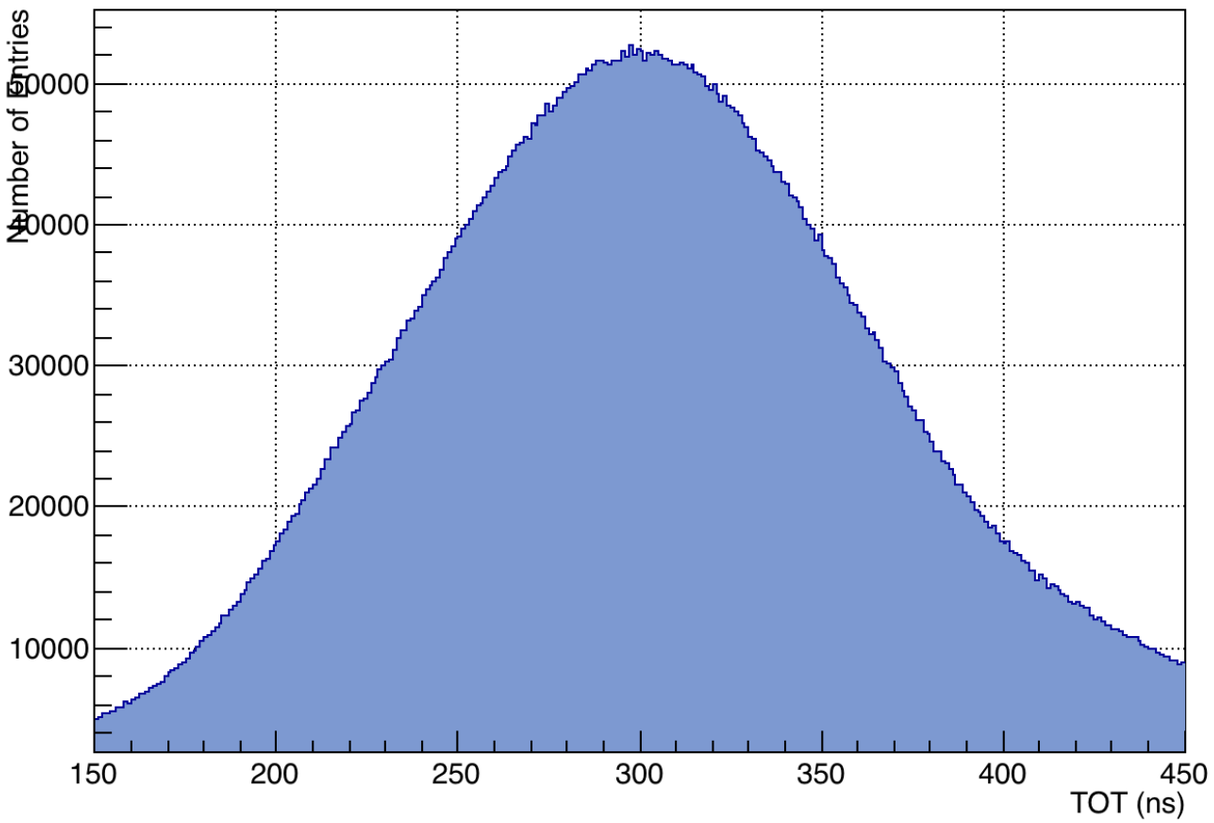




0.55GeV/c

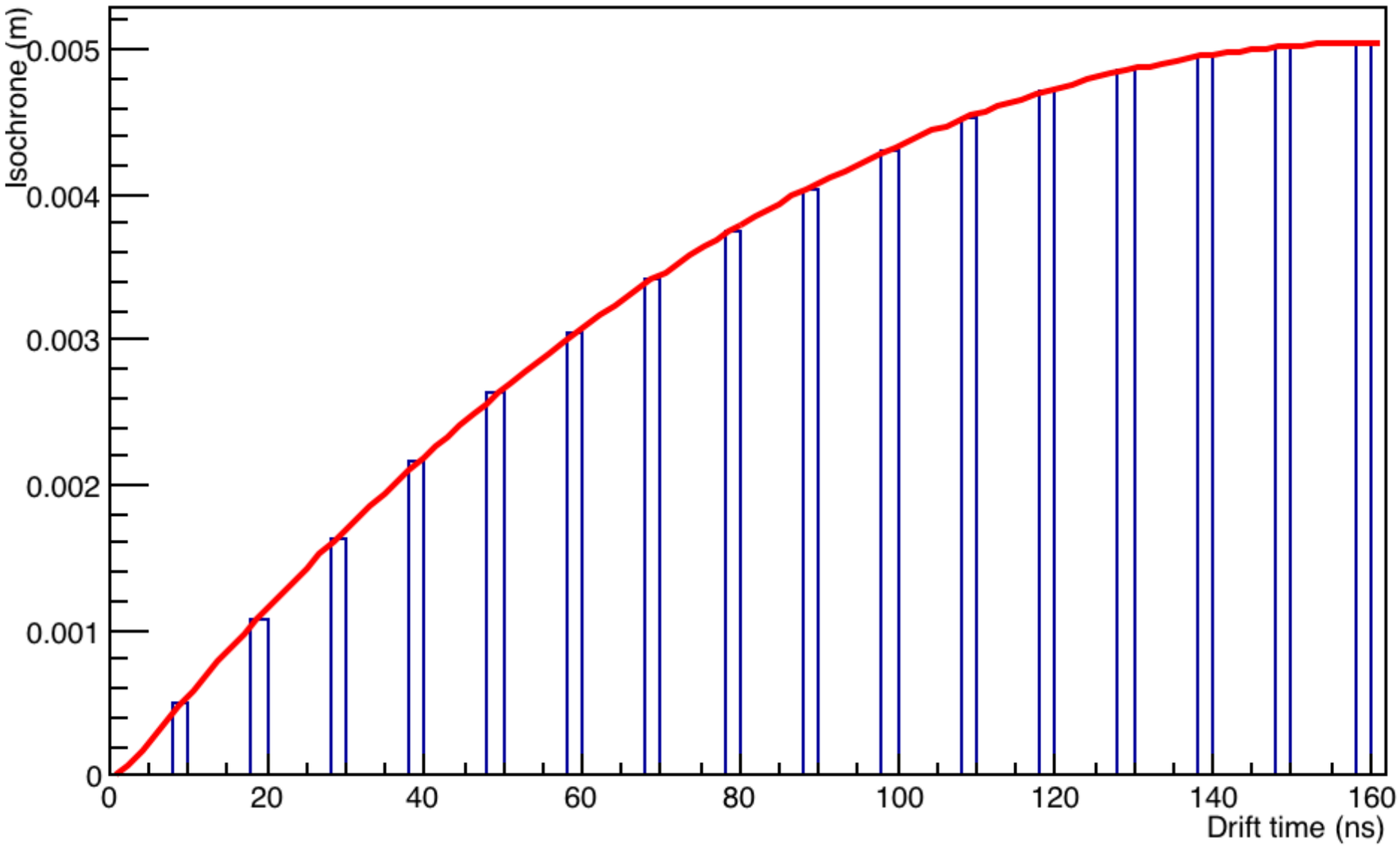




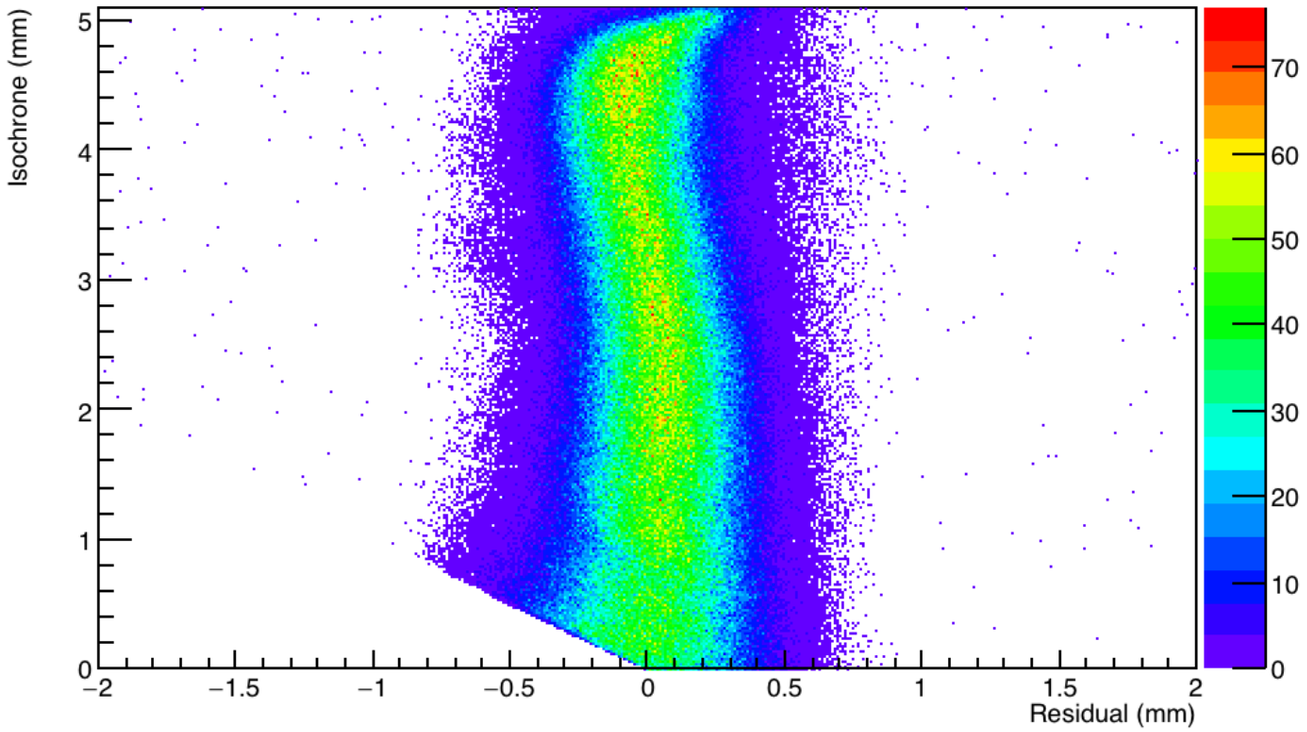


r(t) calculation

0.55GeV/c

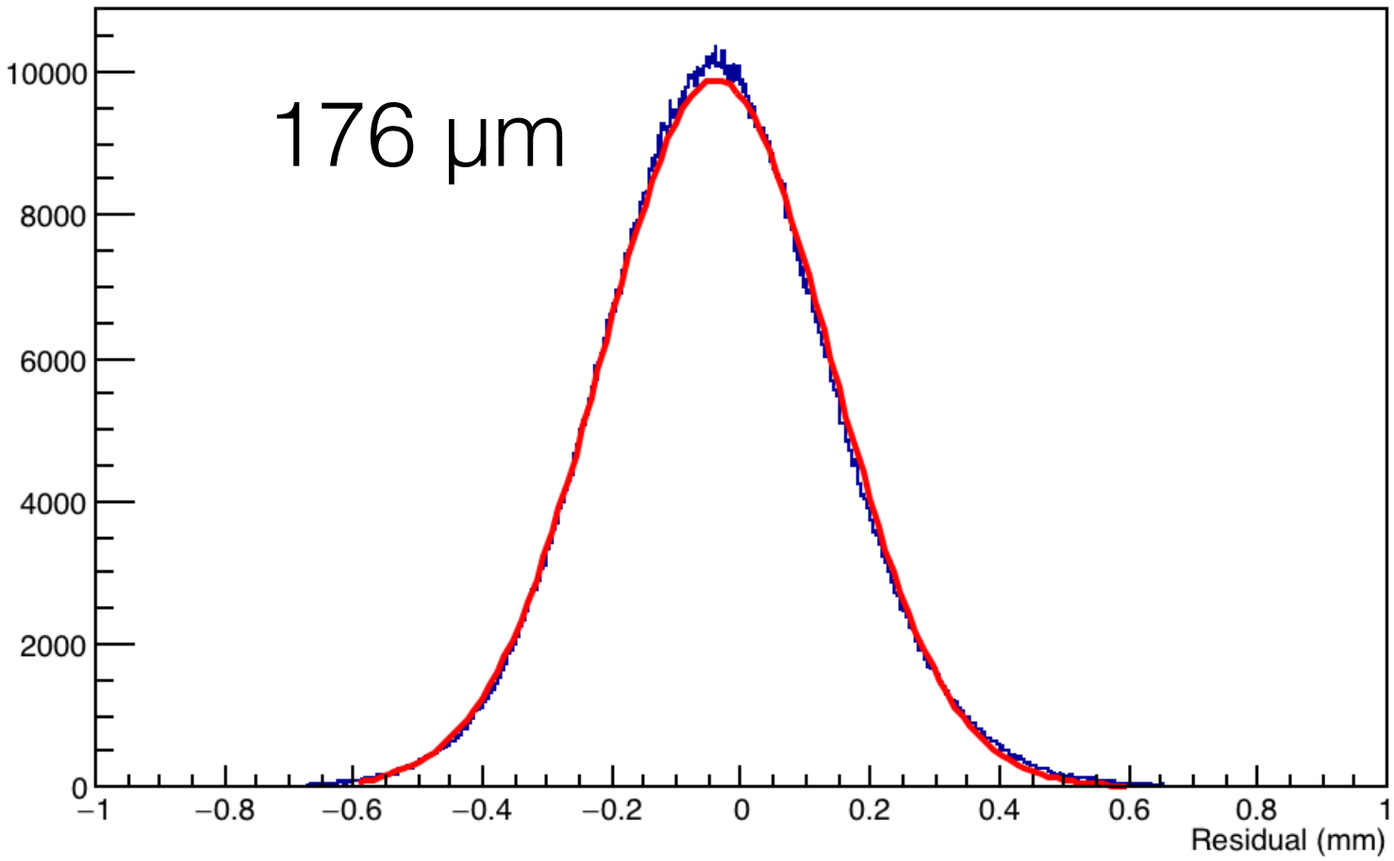


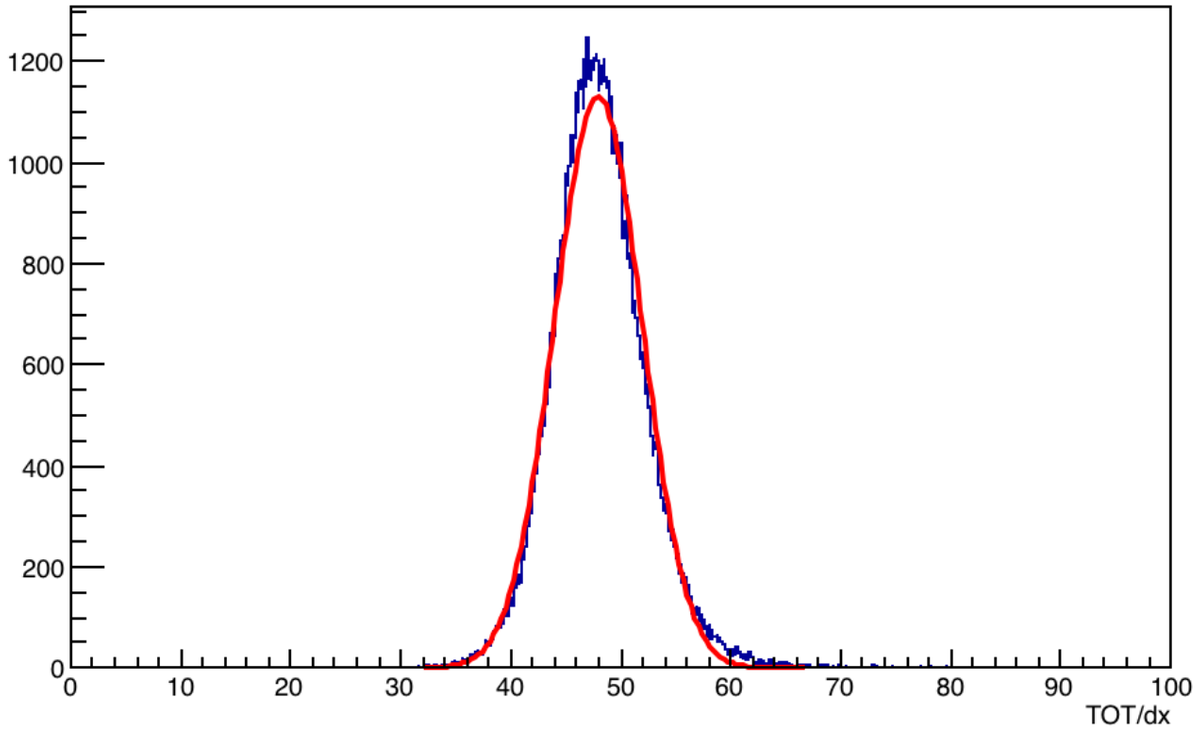
First iteration, need a lot more!!!!



0.55GeV/c

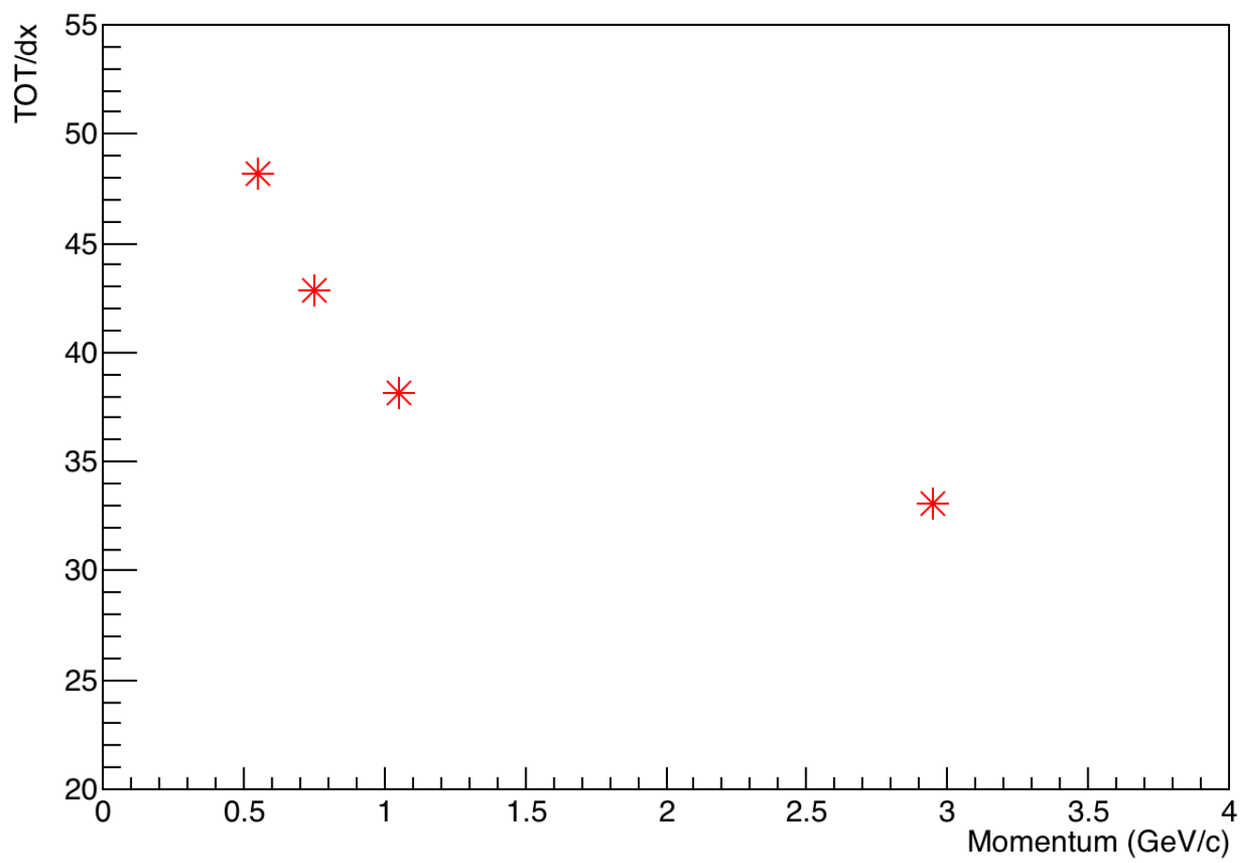
0.75 GeV —> 189μm
1 GeV —> 191μm
2.95 GeV —> 197 μm





0.55GeV/c

0.55GeV: TOT/dx—> 48.19
0.75GeV: TOT/dx—> 42.83
1.00GeV: TOT/dx—> 38.17
2.95GeV: TOT/dx—> 33.09



Summary and outlook

Almost 400 data files —> 600 GB
Large variety of different settings, voltages, positions
Very good quality (1st FEE has some problems)

Improve r(t) by applying multiple iterations
Correct the error in the isochrones
Apply truncation method to TOT/dx
Closer look per channel

******Still a lot of corrections and improvements******

Backup

$$r(t_i) = \frac{\sum_{i=1}^{i_t} N_i}{N_{tot}} \cdot (R_{tube} - R_{wire}) + R_{\text{aval}}$$