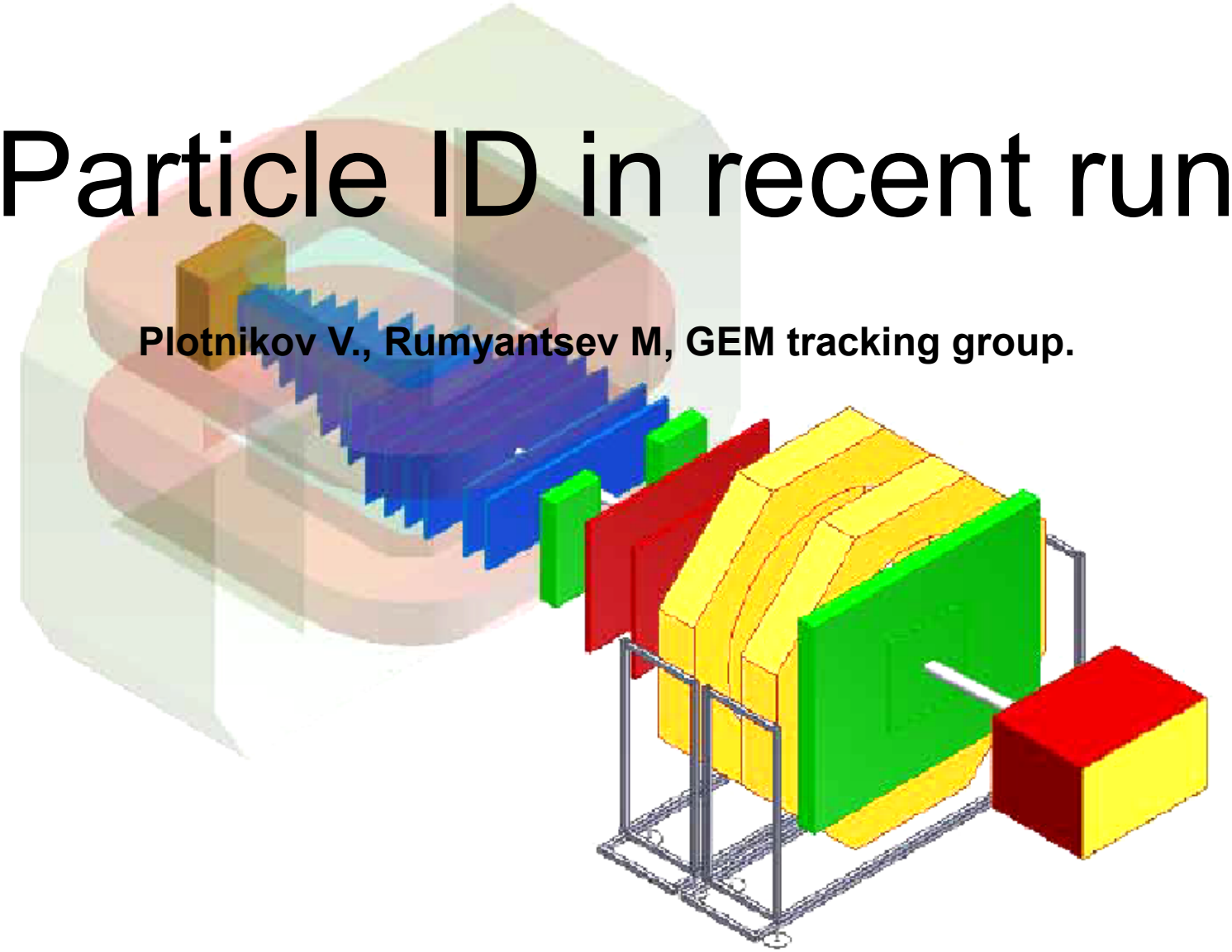
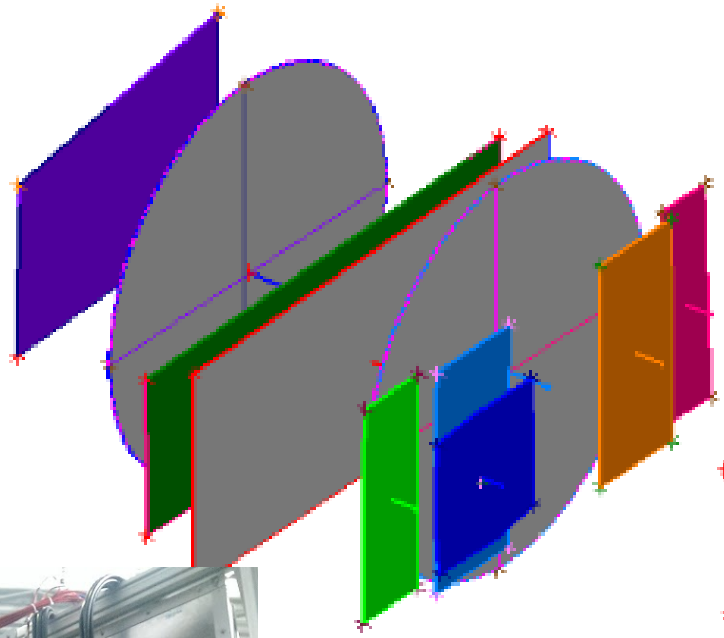
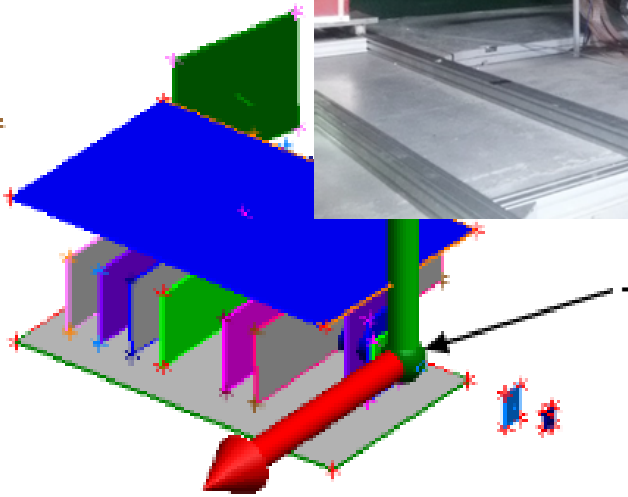
Particle ID in recent run

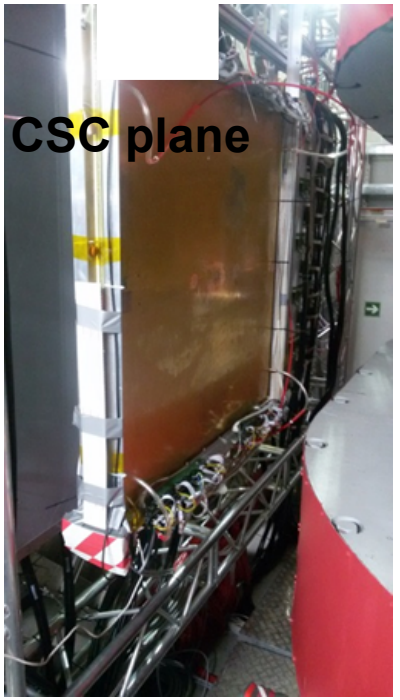
Plotnikov V., Rumyantsev M, GEM tracking group.



Run7 configuration

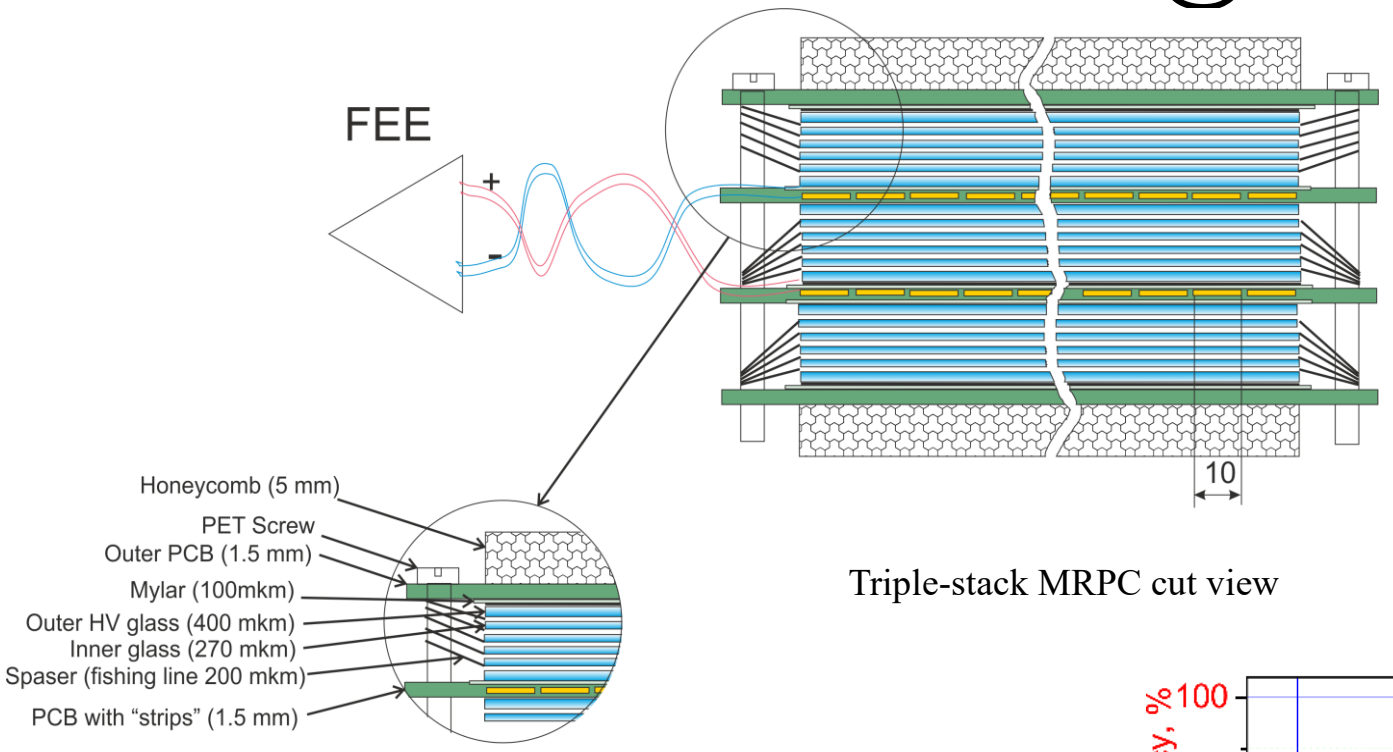




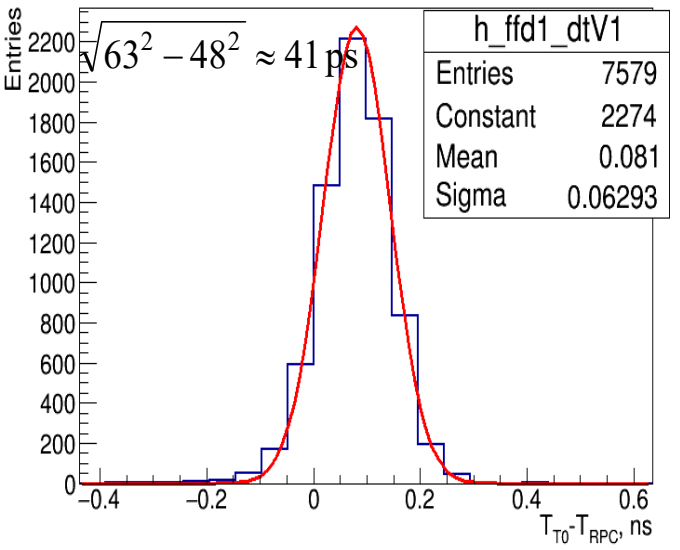


- Tracker in magnetic field — 6 GEM detectors 163 x 45 cm^2 momentum reconstraction
- Tracker outside magnetic field – Catode Strip Chamber (CSC) 100 x 100 cm^2 for good matching extrapolated track and fake track cutting.
- TOF400 – for particle identification.

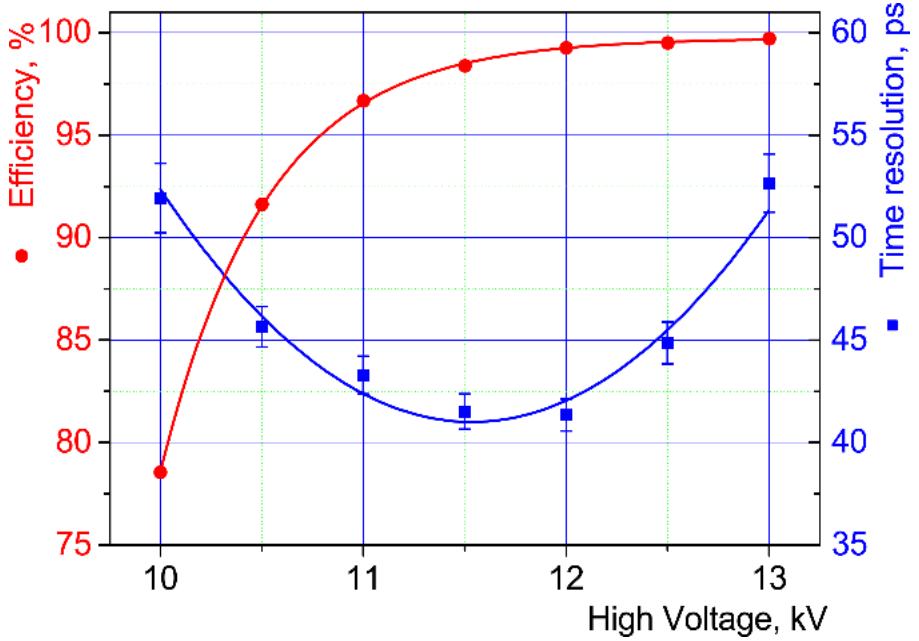
MRPC for the BM@N TOF400



Triple-stack MRPC cut view

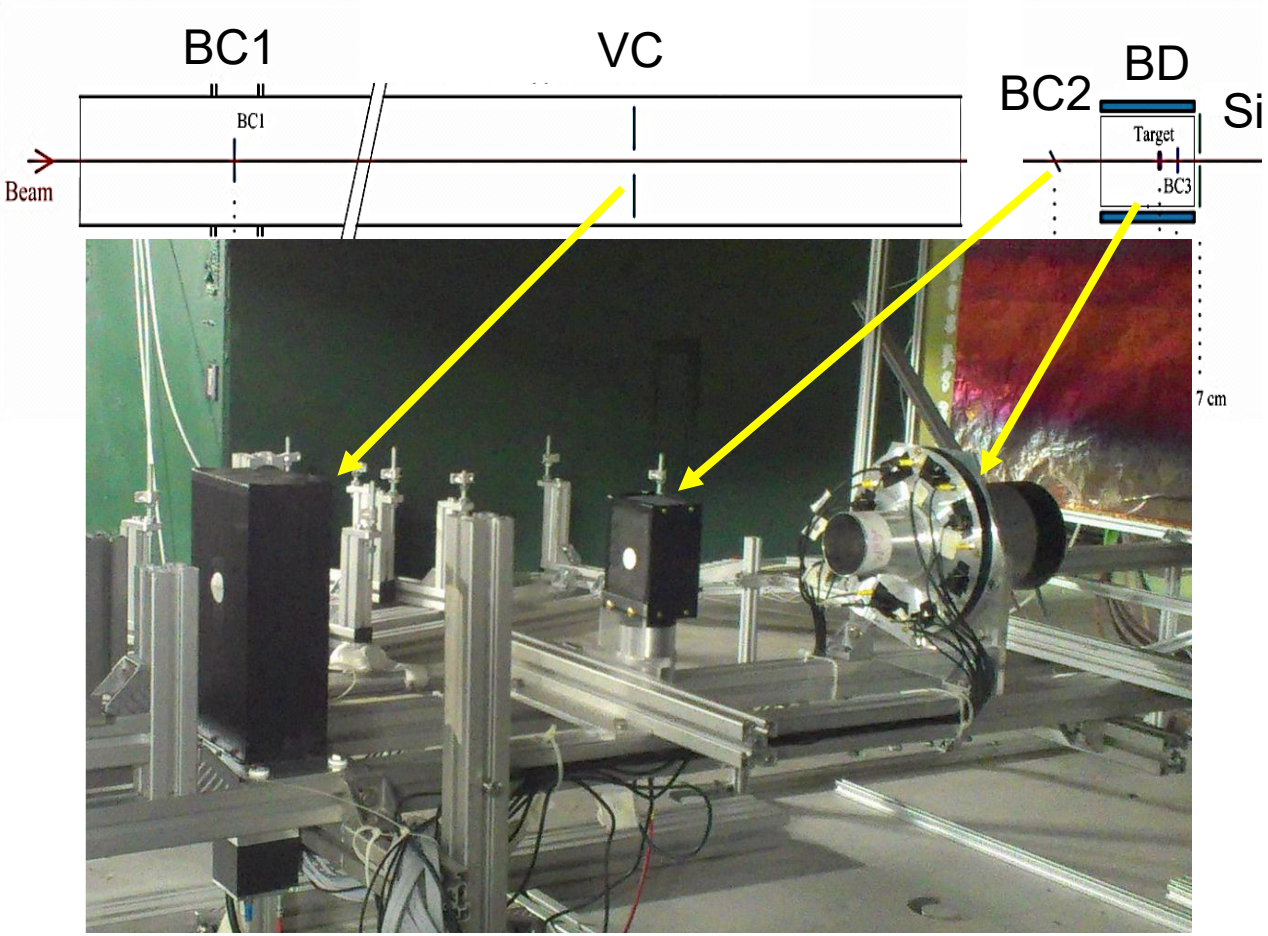


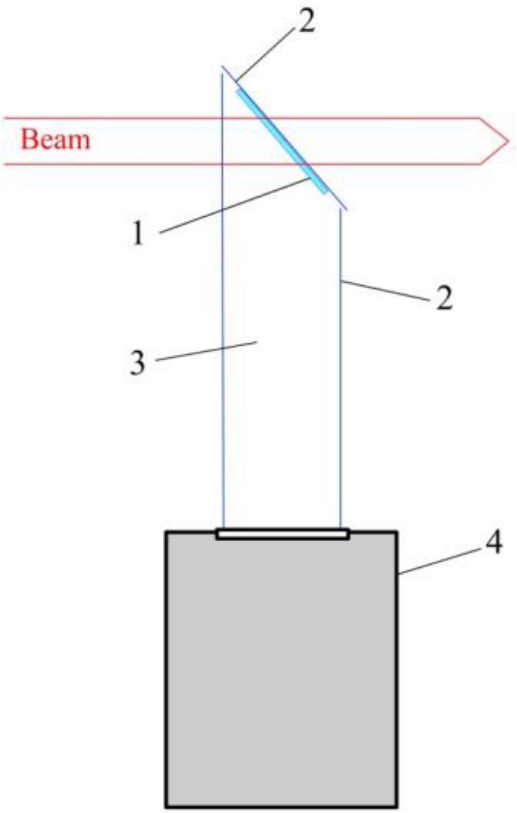
Number of the MRPC	20 pce
Active area	3.6 m^2
Number of readut channels	1920



Efficiency and time resolution of the MRPC versus HV

T0 for the BM@N





Trigger types:
Beam triger: BC1+antiVC+BC2
Interaction Triggers:

- BT+BD>3
- BT+Si>3
- BT+BD>3+Si>3

Scintillator: BC-400B with size of 14×10×0.8 mm
PMT: MCP-PMT PP0365G
Rise time: 200 ps
Time resolution: 30 ps (C beam)

Idendification chain

- GEM tracks from tracking groop (STS are not includet)
- GEM track are extrapolated to the CSC plane and matched against the CSC hits.
- Successfule matched tracks are refitted with CSC hits
- GEM+CSC tracks are axtrapolated to the TOF400 planes and matched against the TOF400 hits.
- GEM+CSC tracks are extrapolated to the z=0 (target) point for length calculating.
- Use track information (Length and P/q) and TOF information calculate a mass of the particle.

Data set

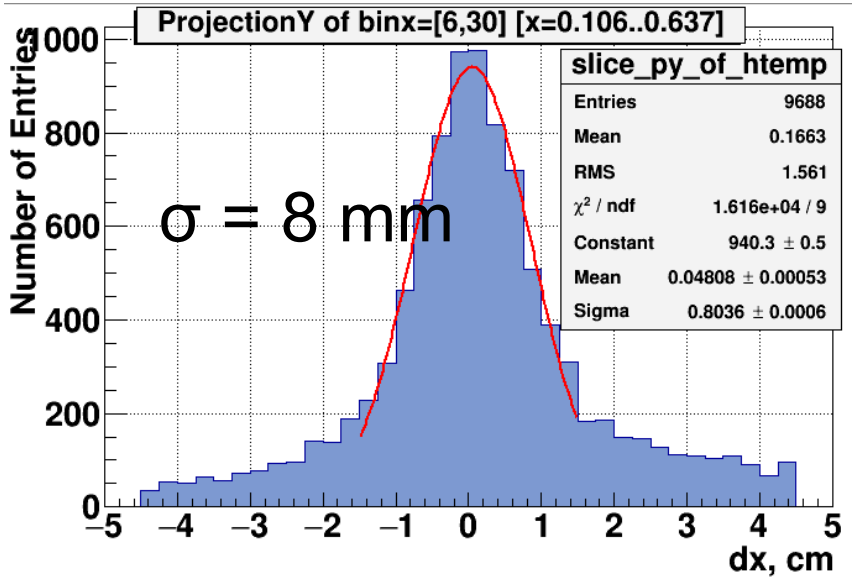
Ar beam T=3,2 GeV/nucl. Spill ~ 2s during ~11 s.
Magnetic field B_y=0,6 T

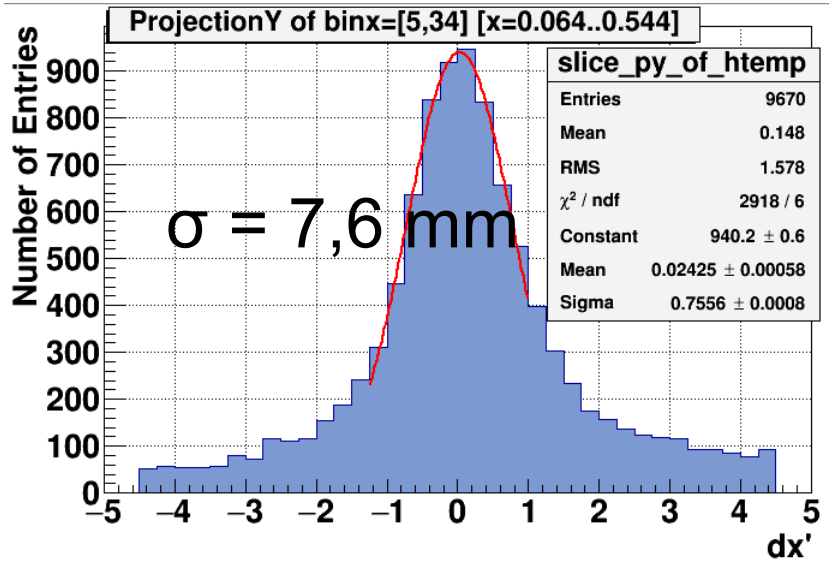
Target	Runs
C (2 mm)	4611-4628
Pb(2,5 mm)	4630-4647
Al (3,3 mm)	4649-4665
Cu(1,67 mm)	4669-4685
Sn (2,57 mm)	4687-4704

Data taking for 14 hours. Total number of triggers = 15 365 890.

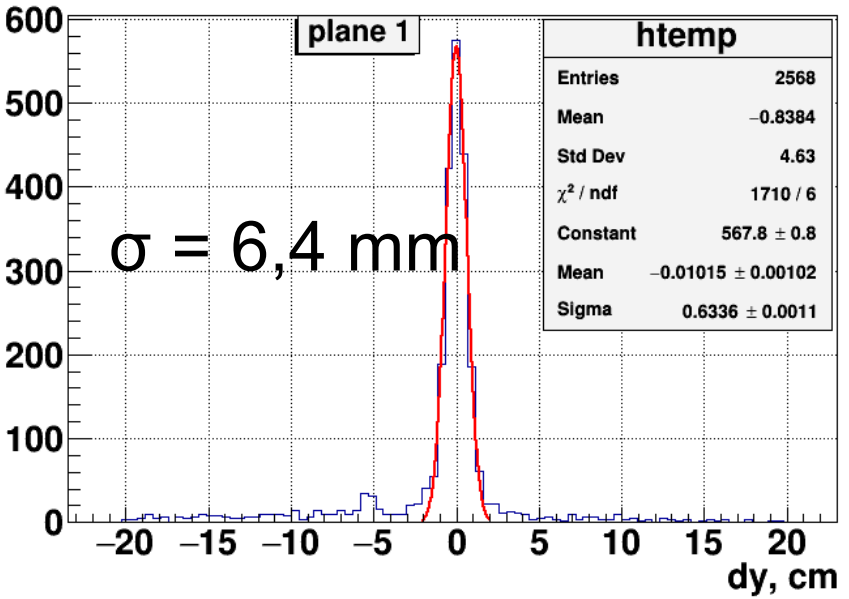
Track matching

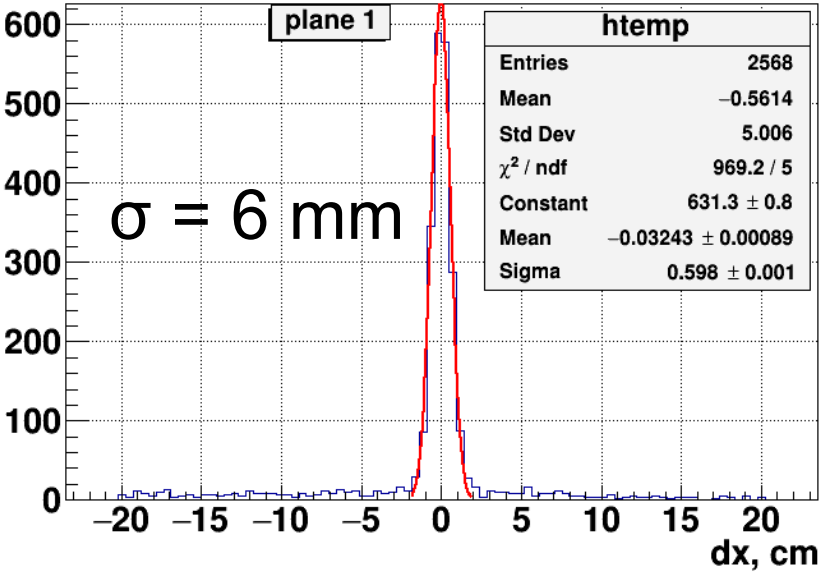
Residuals for GEM track extrapolated to CSC chamber





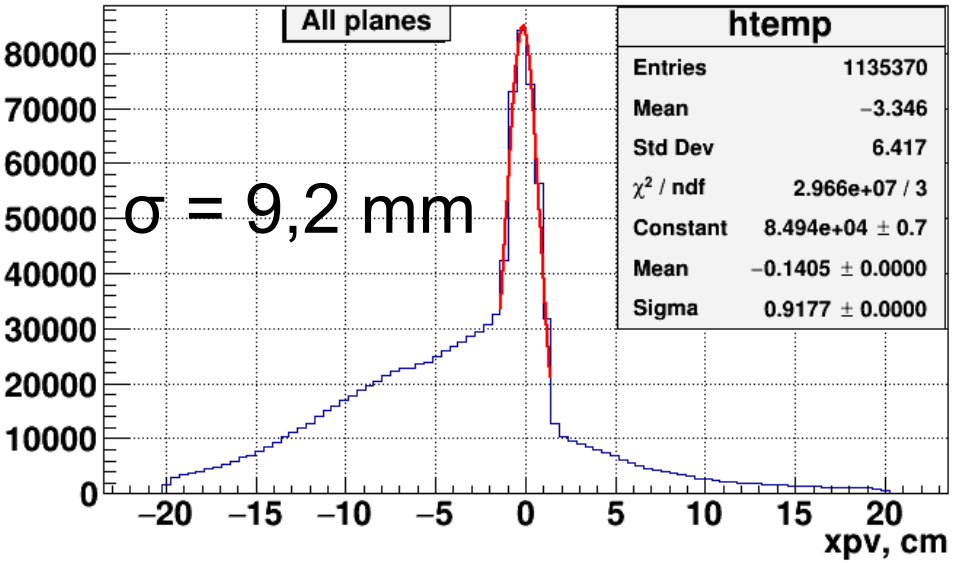
Residuals for refited GEM+CSC track extrapolated to TOF400

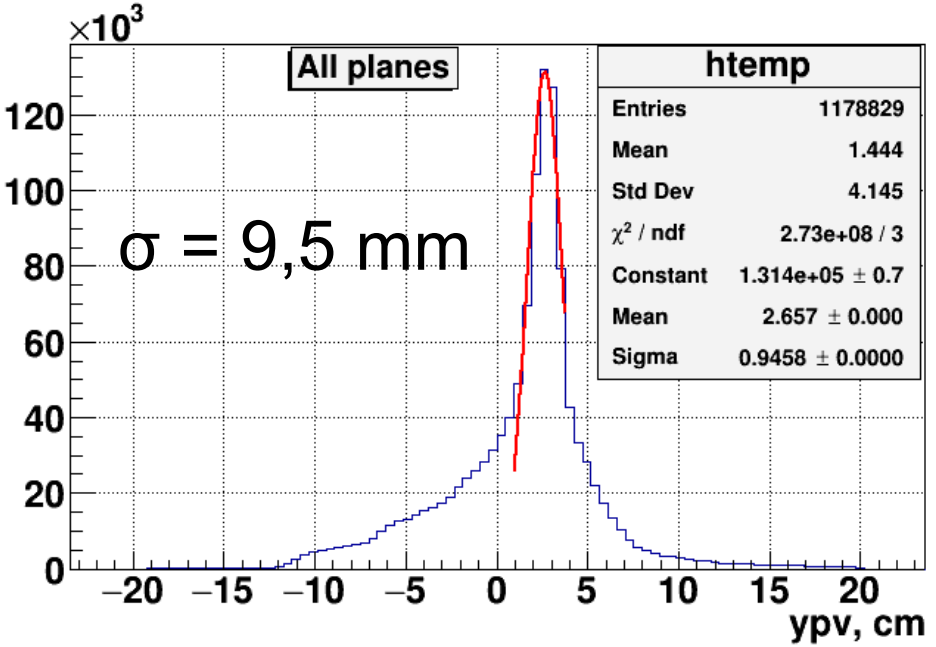




Cat for primary vertex (Target)

All targets are made in the form of a cylinder with a diameter of 3 cm

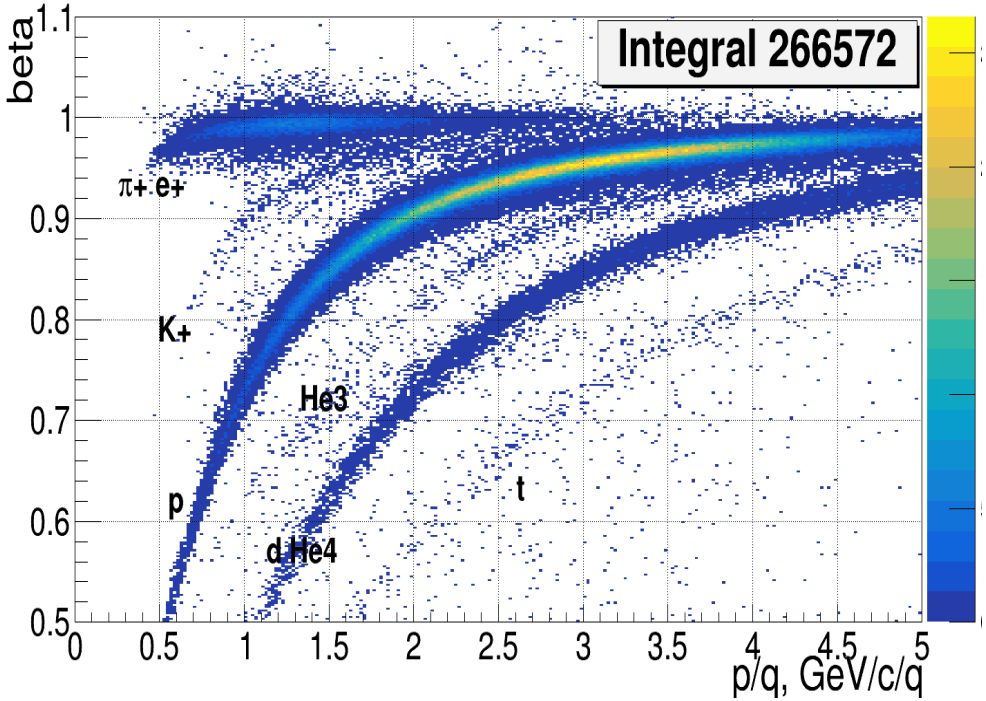


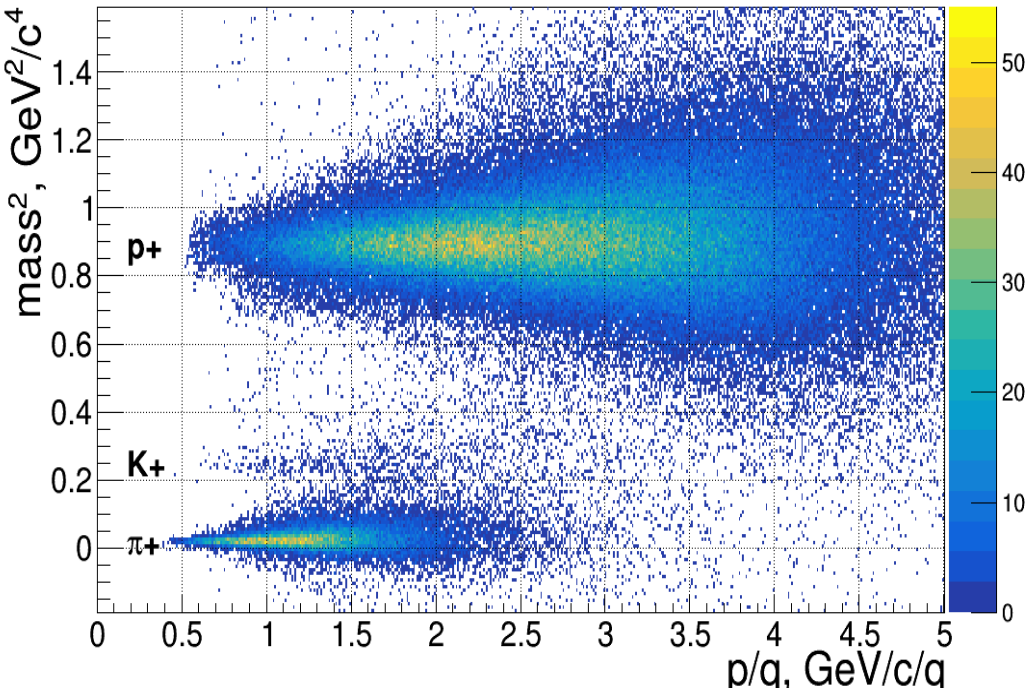


Cat for primary vertex is |X| > 2 cm and |Y-2,6| > 2cm

Only primary particles going from the target are reconstructed!

Preliminary result of identification



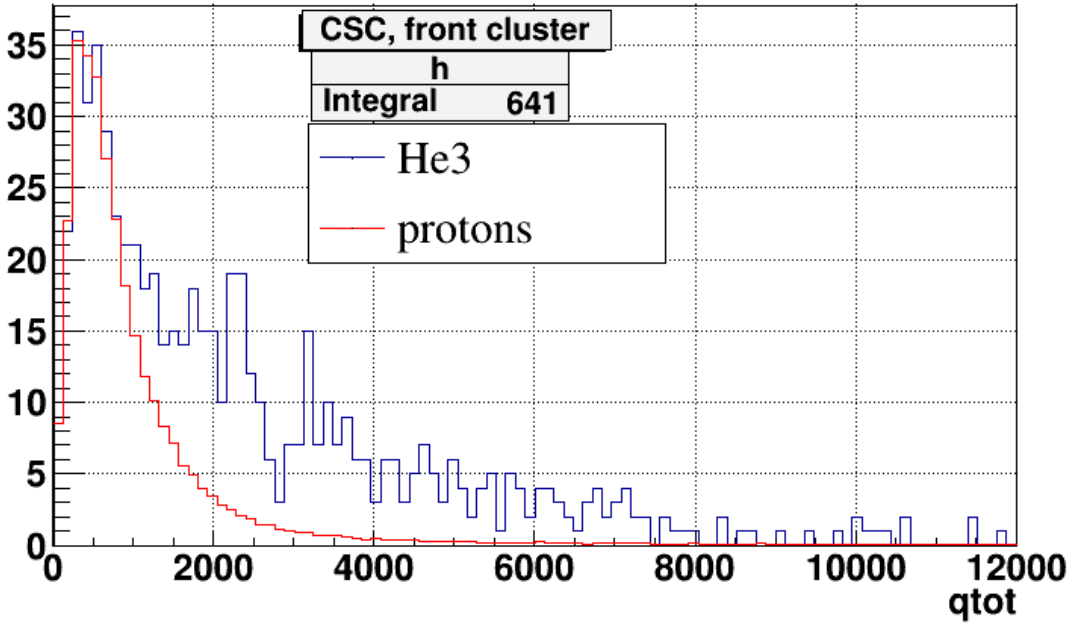


Proton Mass² = 0,894 + 0,081 GeV²/c⁴ (need to be 0,880 GeV²/c⁴)

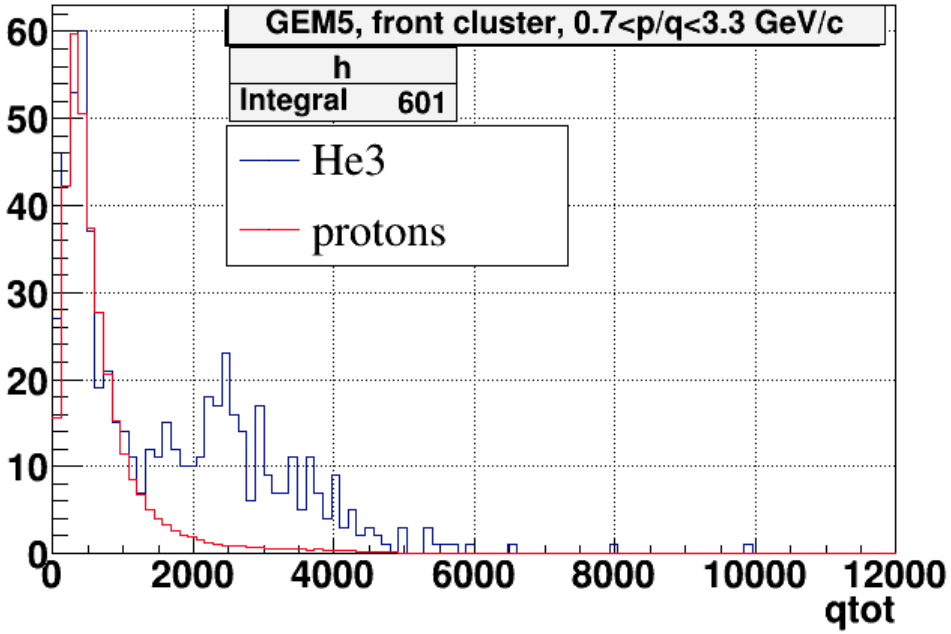
pion Mass² = 0,021 + 0,016 GeV²/c⁴ (need to be 0,019 GeV²/c⁴)

Number of K+ ~ 900

Possibility of separation of He4 and d



Amplitude of clasters in CSC detector
for He3 (blue line) and proton (red line)

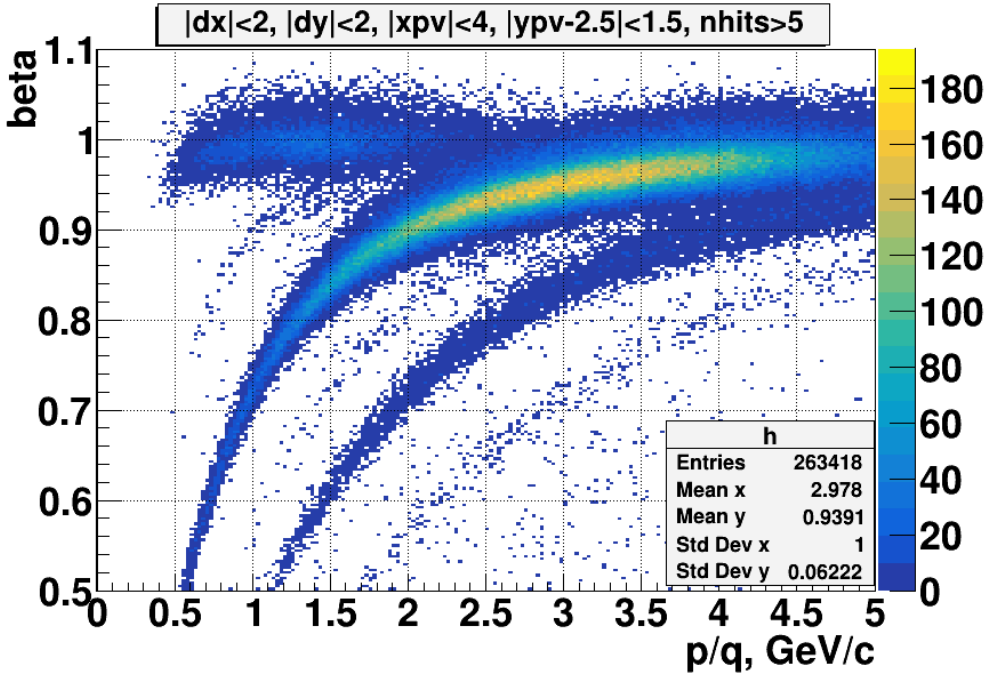


Amplitude of clasters in GEM detector
for He3 (blue line) and proton (red line)

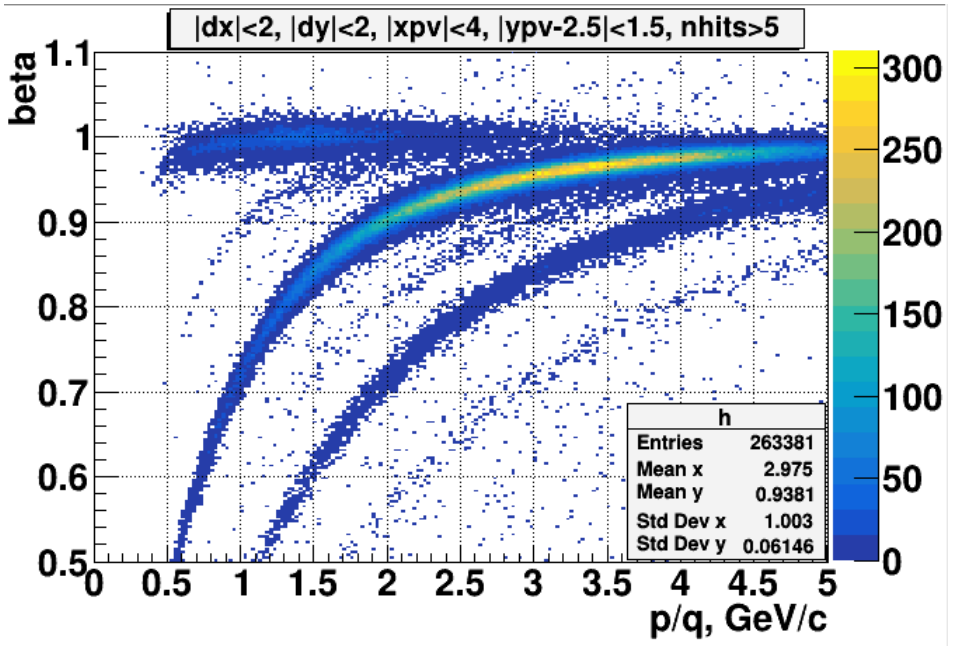
Thank you for your attention

Backup

Influence of INL of TDC adn Slewing correction of TOF400



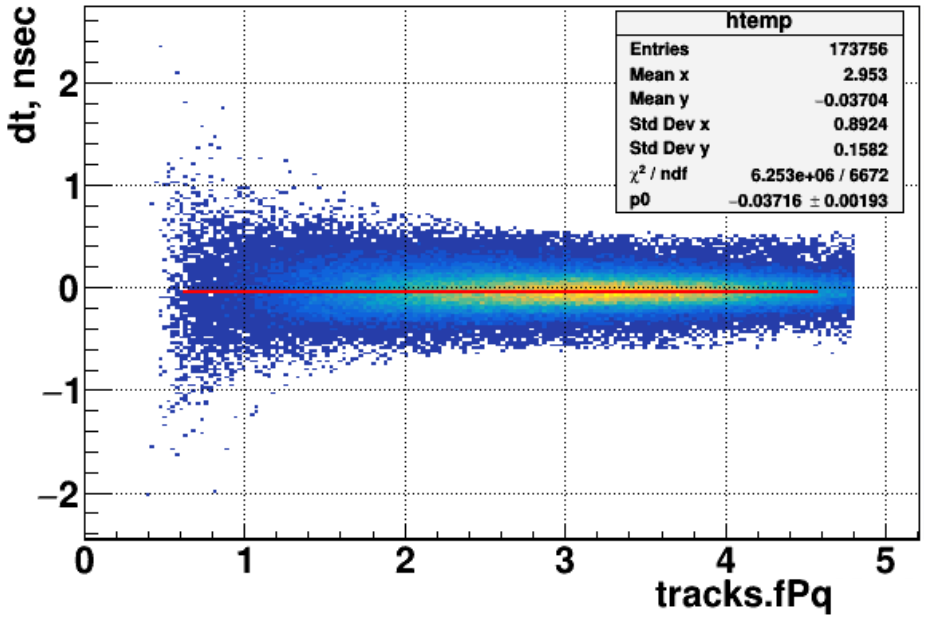
Without INL and Slewing correction.
Time resolution ~350 ps

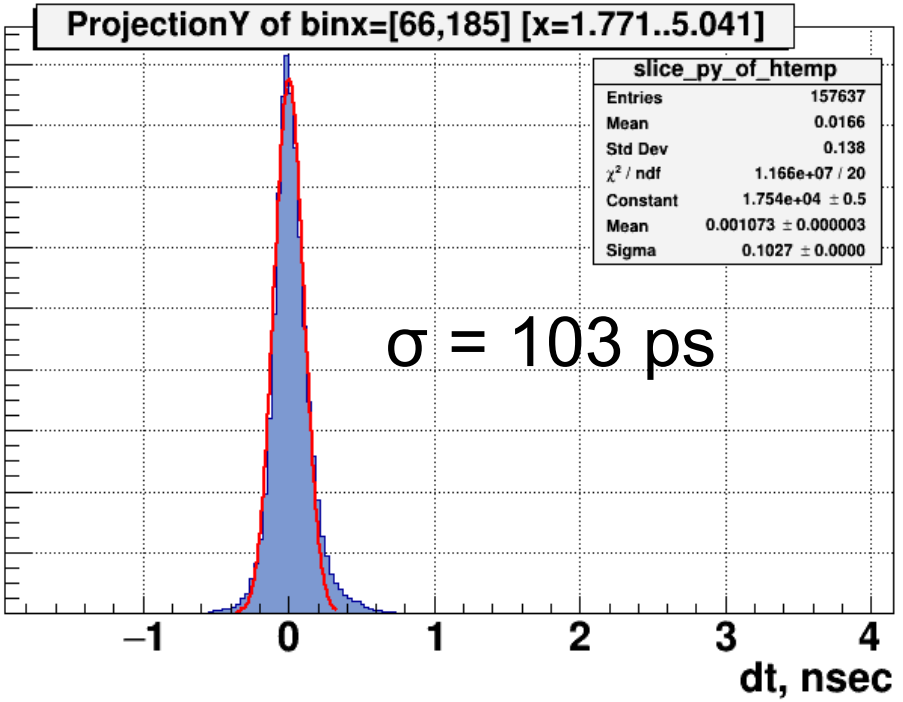


With INL and Slewing correction.
Time resolution ~100 ps.

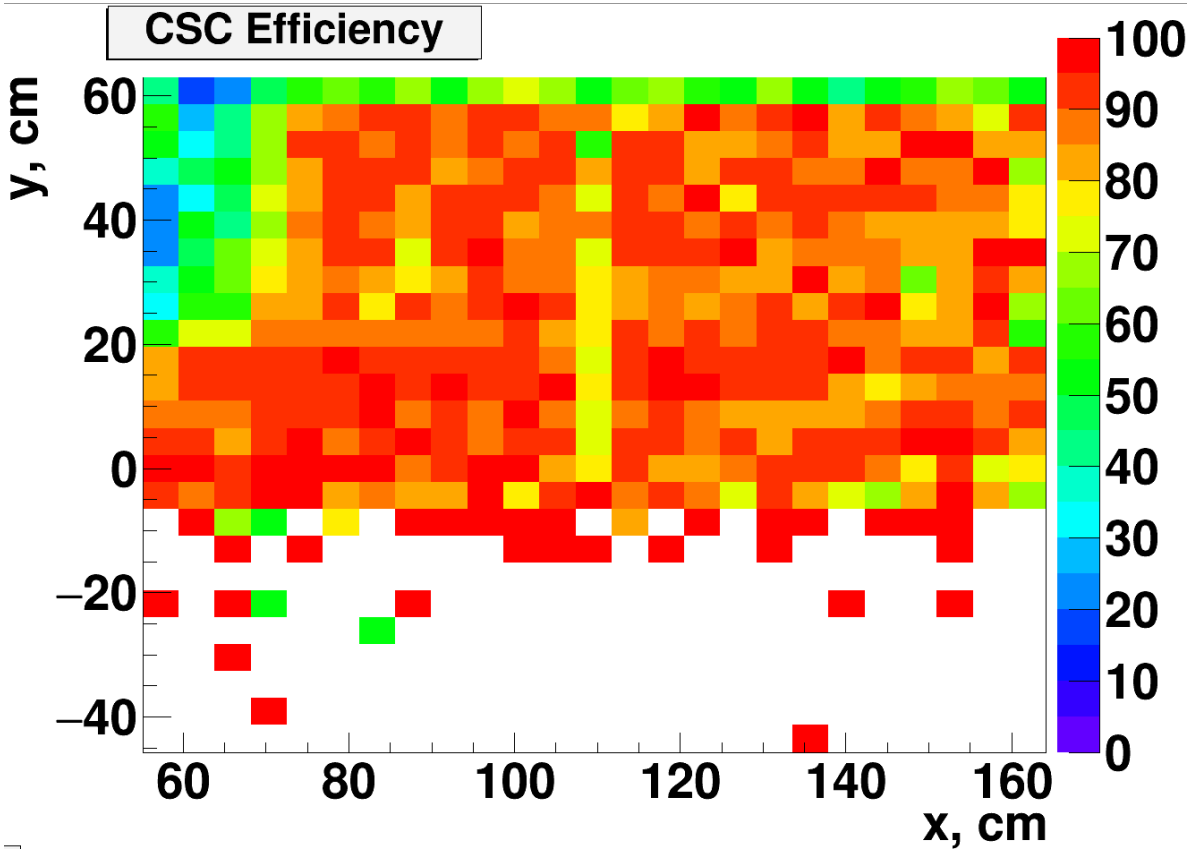
Time resolution of ToF system (TOF400 + T0)

- Separate the Proton
- Calculate Ideal Time of Flight for proton
- Histogram the difference of Ideal and measured time of flight
- Cat the momentum of protom p > 1.7 GeV/c





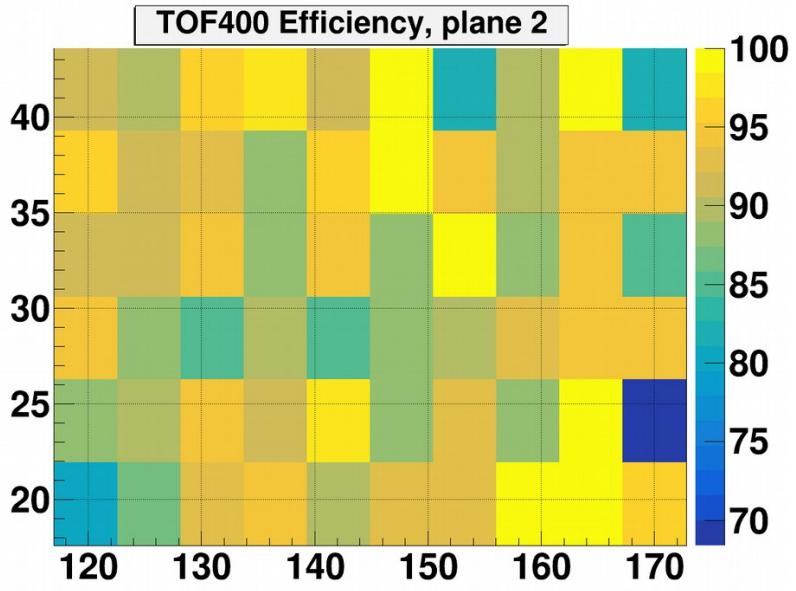
CSC efficiency, 4.4x4.4 cm^2

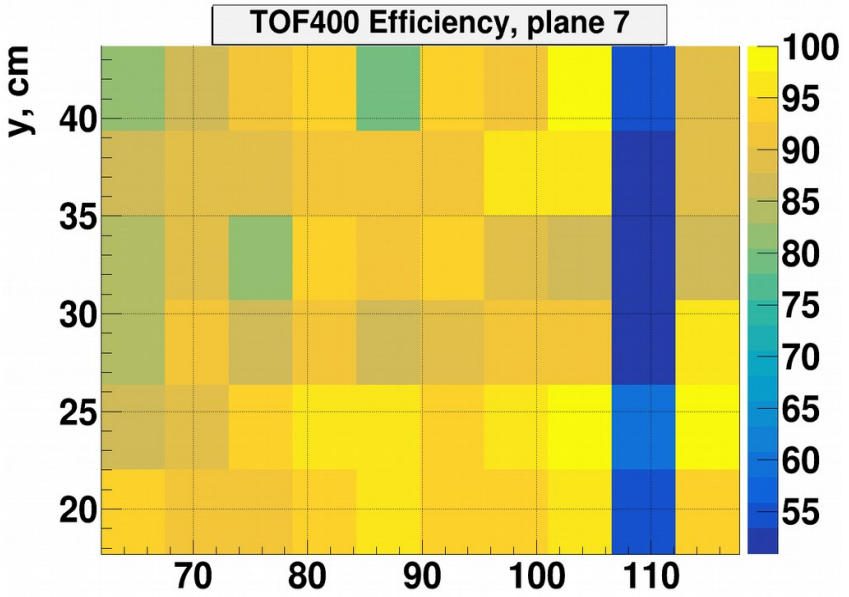


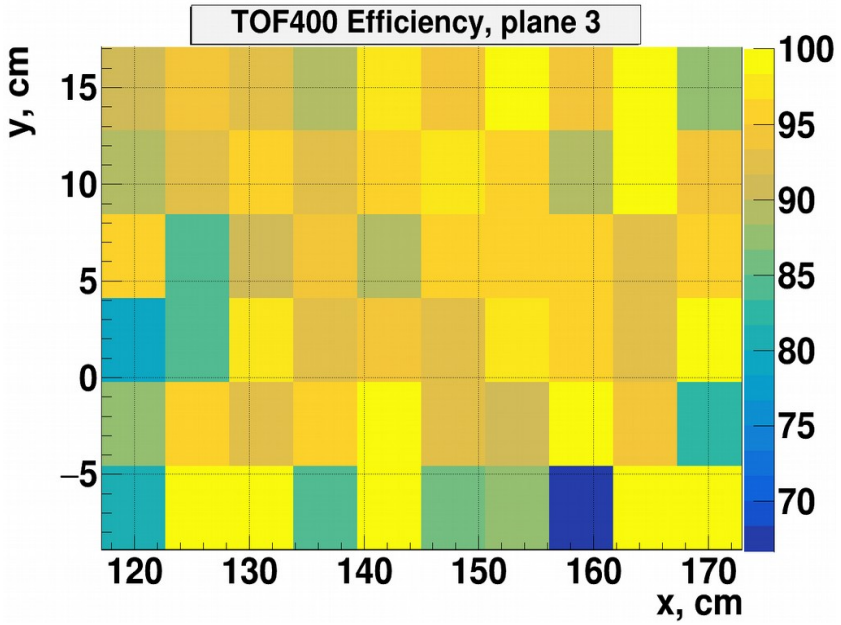
- $e = N_{CSCHit} / N_{CSCAll}$
-
- Extrapolation from GEM
-
- Residual to CSC hit less than 2 cm

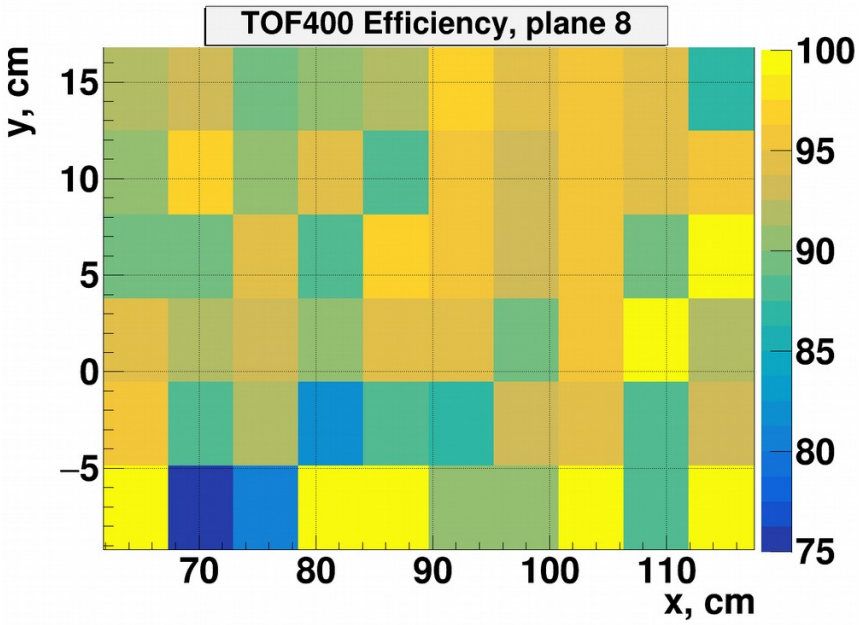
- Efficiency more than 80% (on the average)

TOF-400 planes efficiency

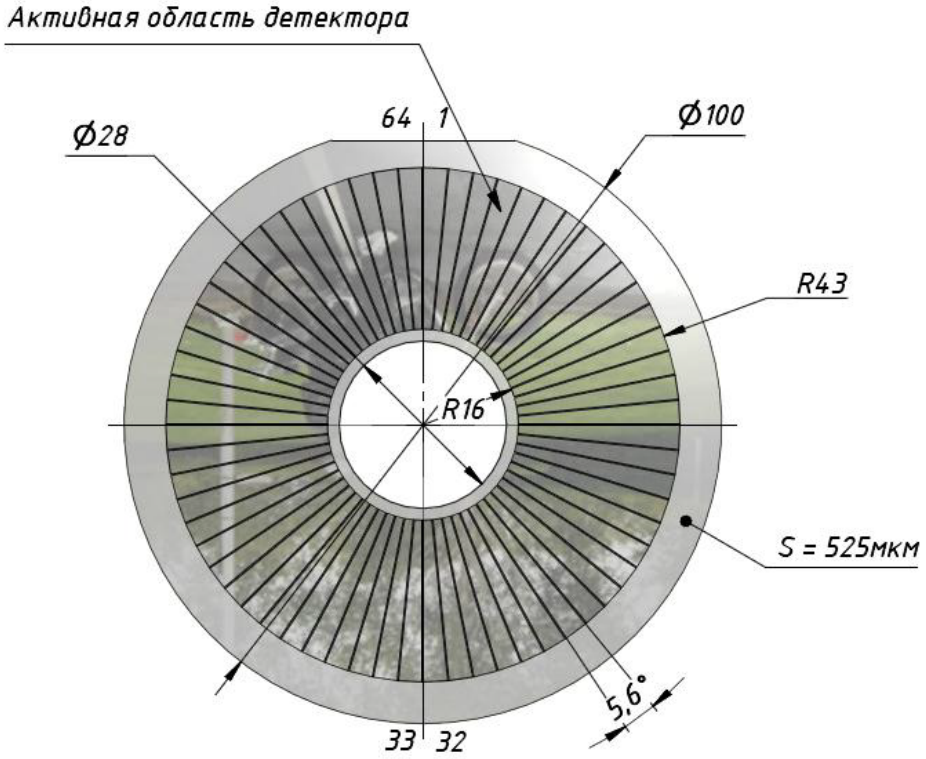




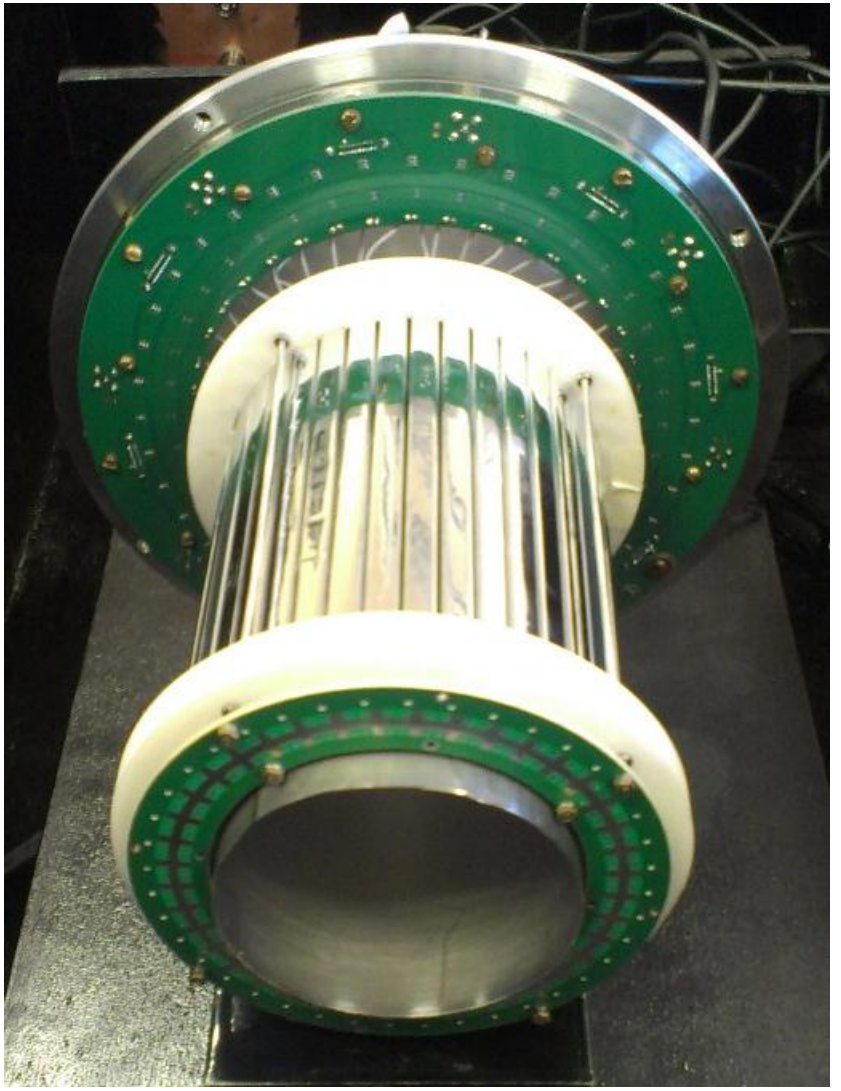




Efficiency about 90%



A view of the front side of Si detector.



A view of the new BD prepared for run 2018