e+e-reconstruction in pion induced reaction

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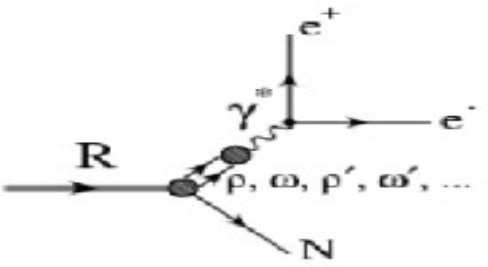
Physics motivations

- unknown process

  $R \rightarrow N\, \gamma^{*}$

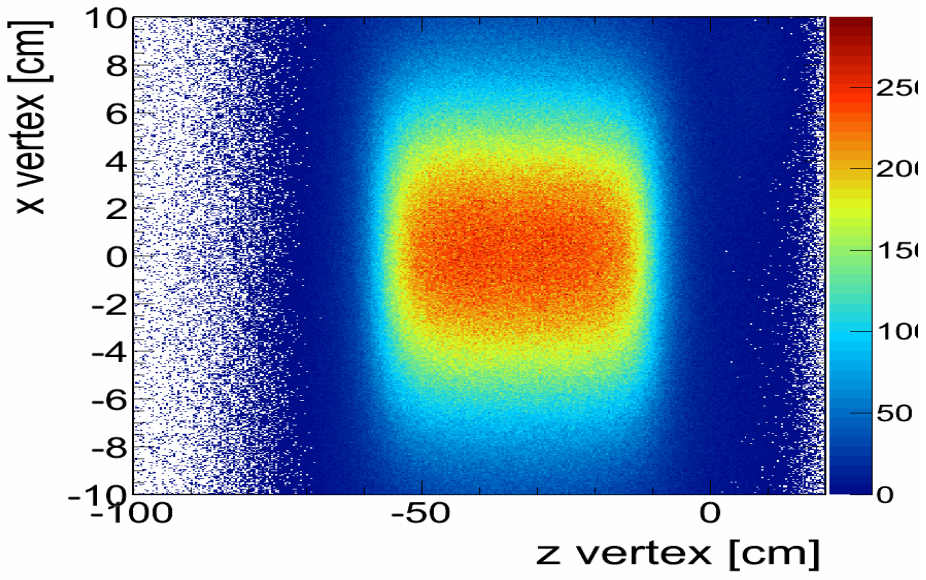
- interpretation of p+Nb → cold nuclear matter effects
- interpretation of A+A → hot and dense matter effects
- input for models (i.e. GiBUU)

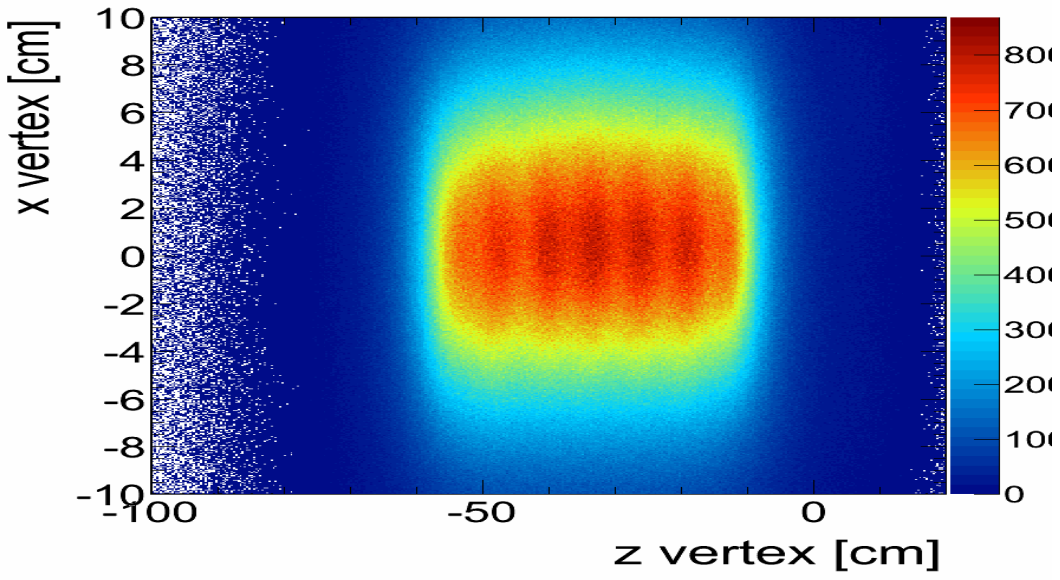


Overview of π beams

Momentum (GeV/c)	PE	C	W
0.612	X	47.8 M	X
0.656	42.4 M	41.9 M	X
0.690	774.7 M	115.7 M	X
0.700	100 M	4.6 M	X
0.748	76.5 M	42.2 M	X
0.800	52.4 M	41.2 M	X
1.700	X	127 M	200 M

- W (3 segm.), C (3 segm.) targets; (July)
- C (7 segm.), PE homogeneous targets; (Aug)
- trigger: Start + (TOF + RPC);
- field: 72 % of maximum value, I = 2450 A





Lepton ID

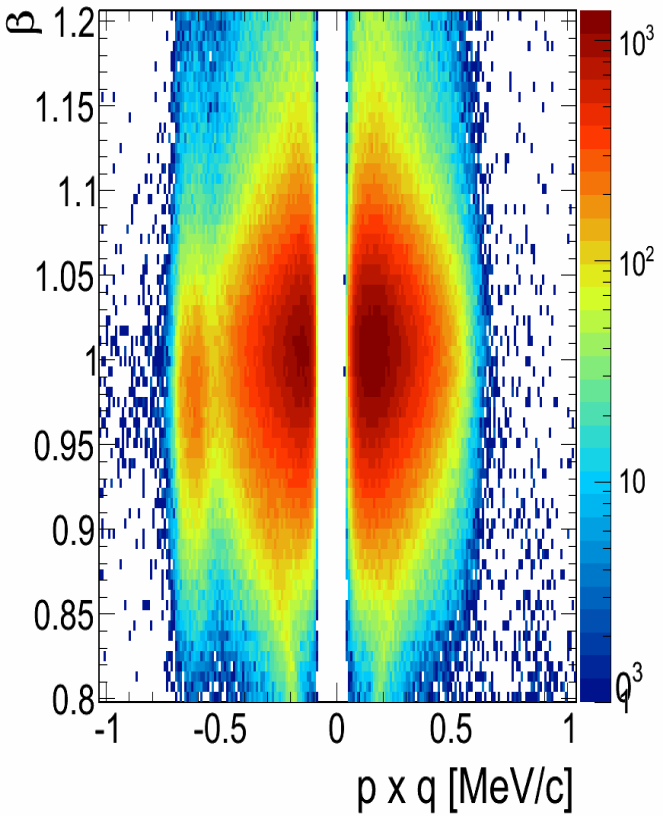
- Track sorting
  - χ 2 in > 0
  - χ 2 out > 0
  - RKχ 2 > 0
  - META Matching Quality < 4
- ID cut
  - velocity cut, richQa cut & RICH hit ($\Delta\theta$, $\Delta\varphi < 8°$)

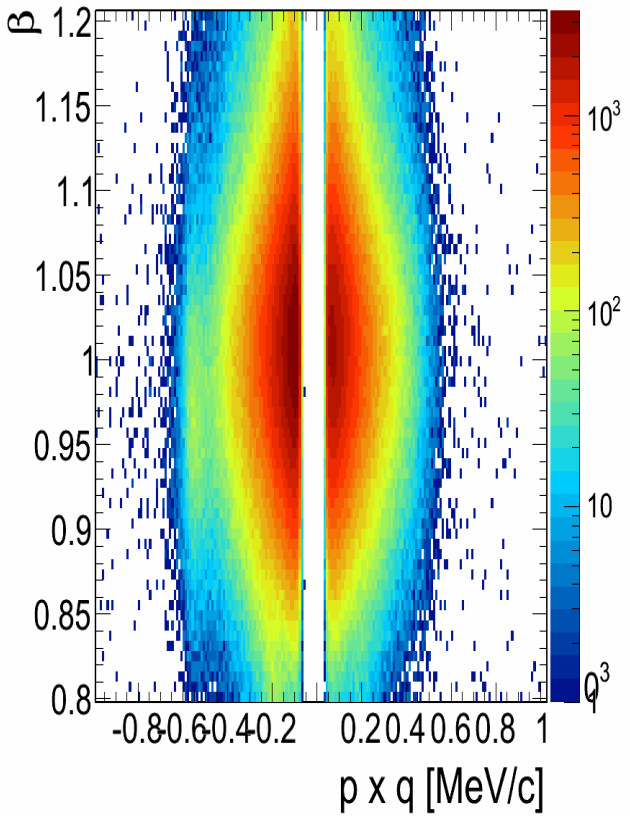
β vs p, PE target, π beam momentum = 0.69 GeV

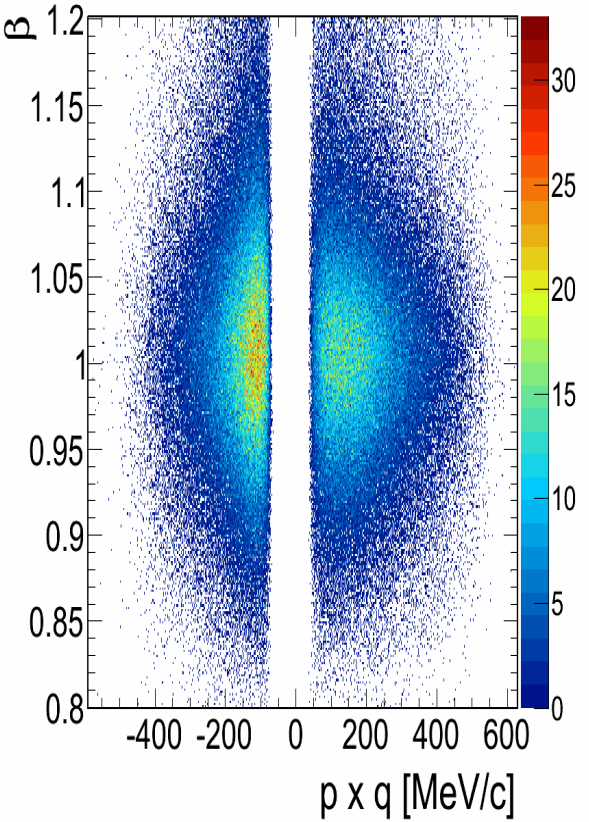
All tracks after track selection and RICH Hit condition sys 0

All tracks after track selection and RICH Hit condition sys 1

- All dileptons tracks



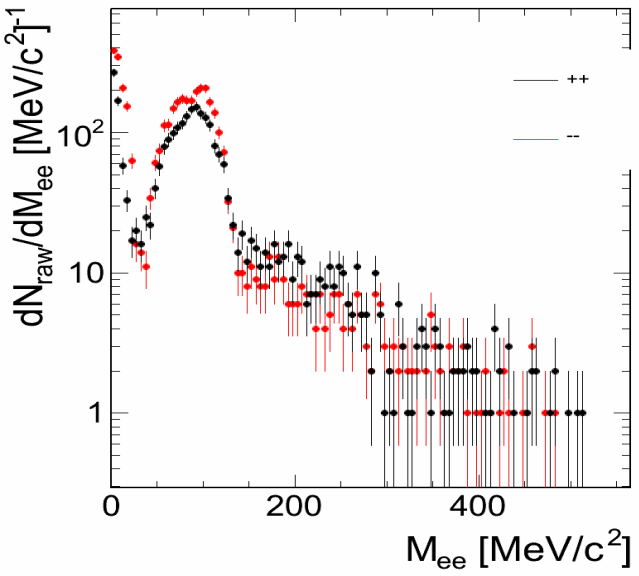


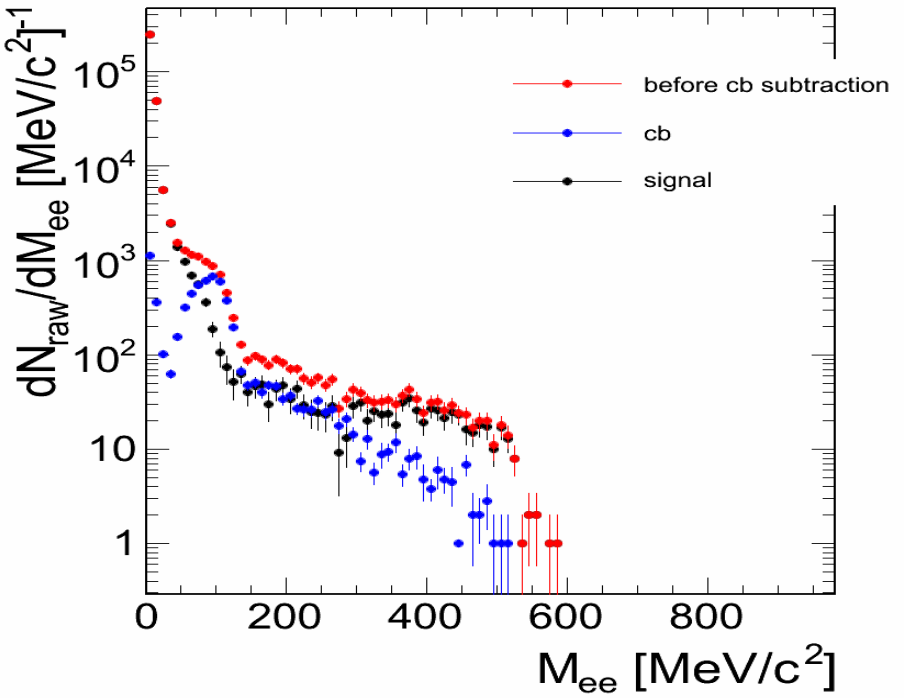


Invariant mass distribution, P =0.69GeV/c ,target PE

- Signal = N +− - CB
- CB = 2 sqrt(N ++ ⋆ N −−)
- if N ++ =0 or N −− =0

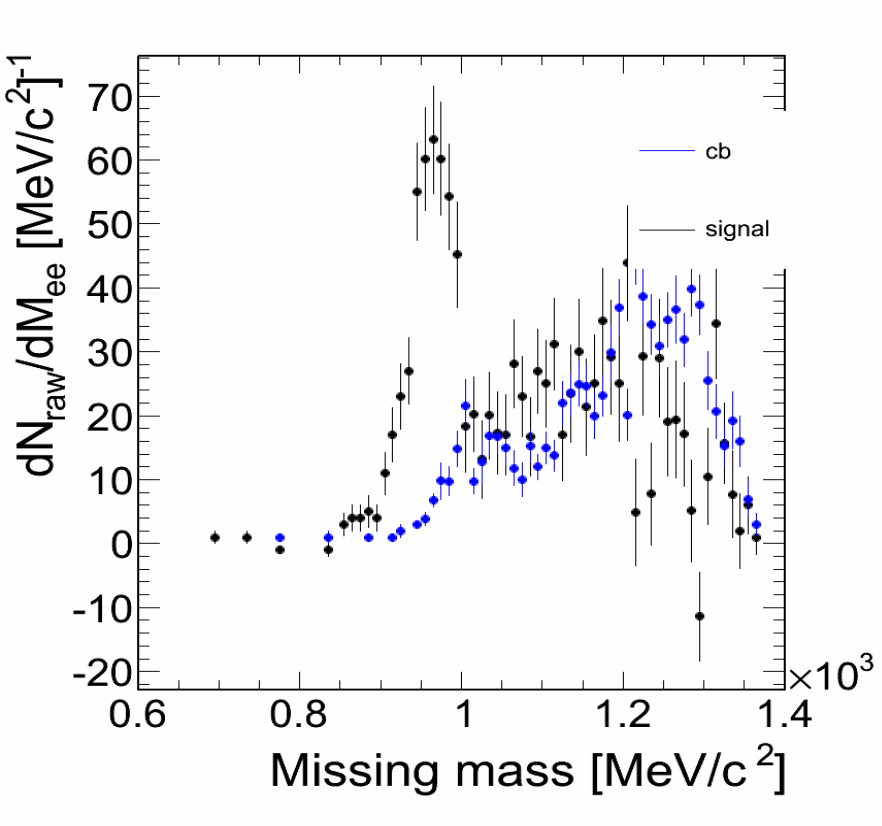
  CB = N ++ + N −−

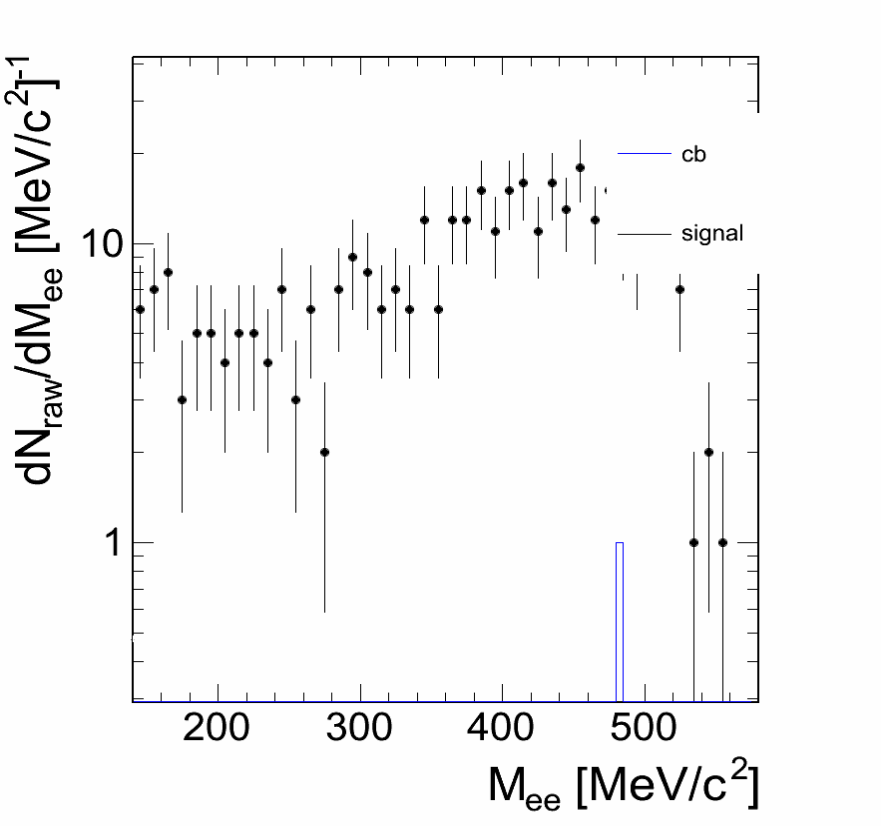




- # count > 140 : 1012
- Online : 1016

Missing mass spectrum, PE target



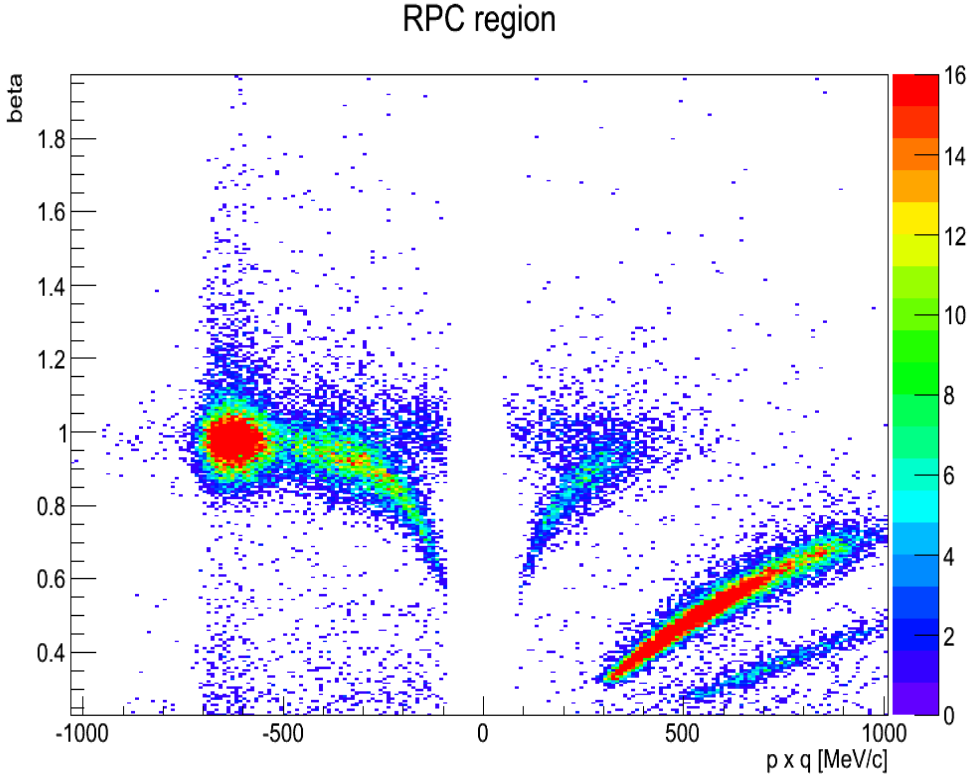


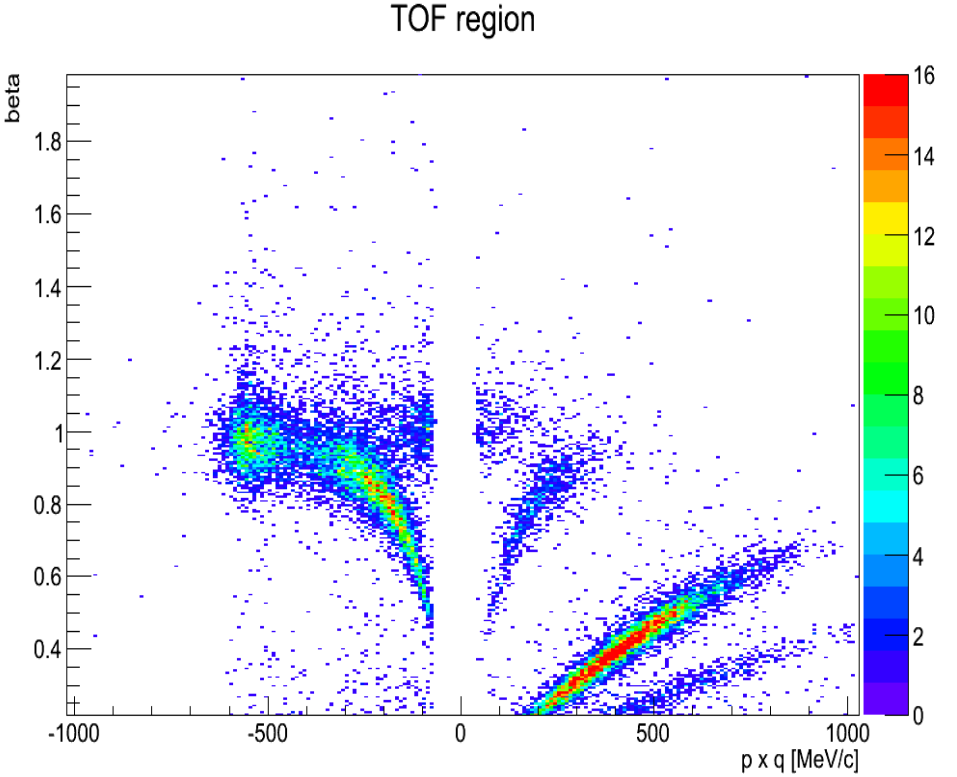
- Mean: 966 MeV
- Sigma: 31 MeV

- # counts: 355
- Online: 347

RICH rotation

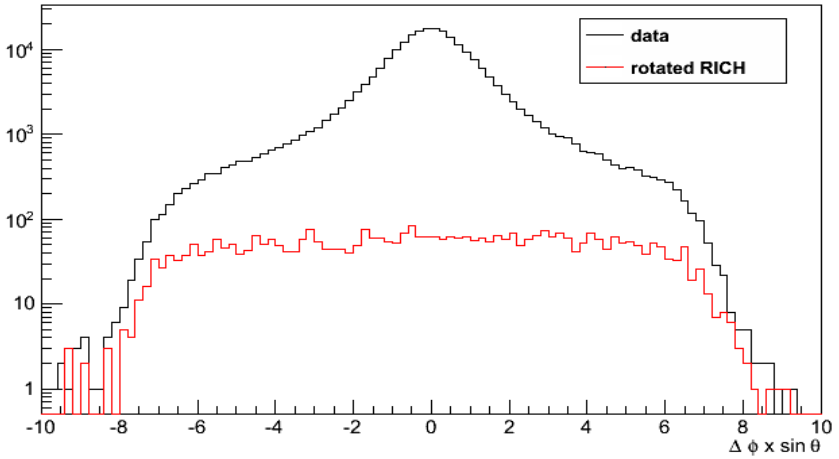
- 2 days statistics (day 237-day 238)
- DST gen0b
- RICH rotated by 60°



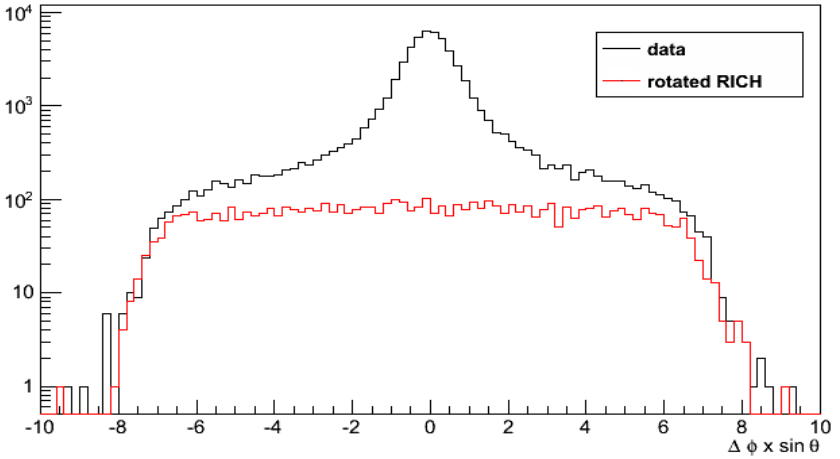


Δφ x sin θ distribution

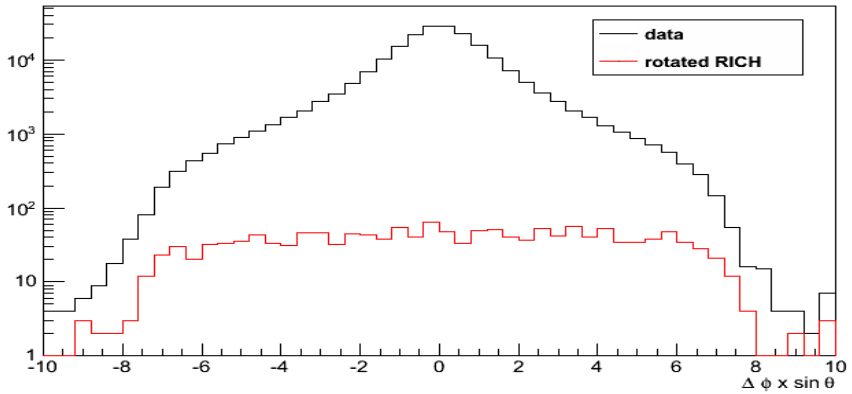
negative tracks mom < 250 MeV/c



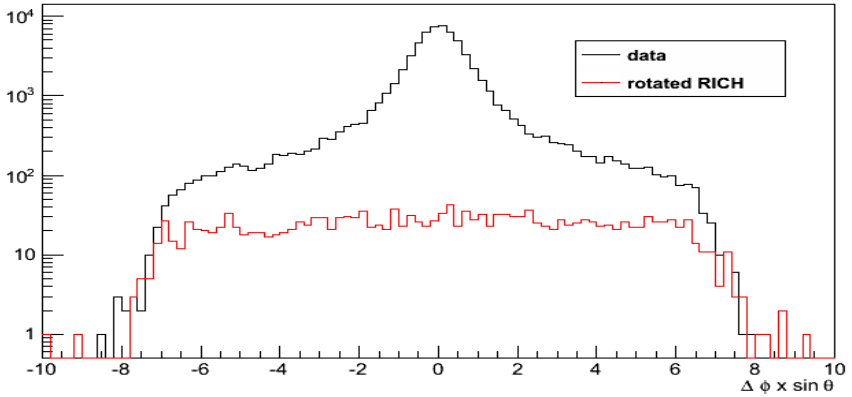
negative tracks 250 MeV/c < mom < 400 MeV/c



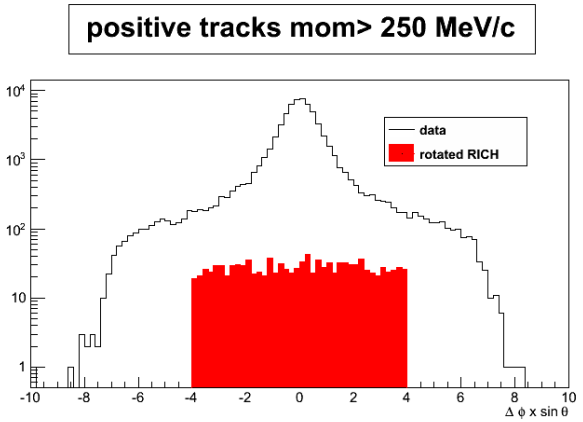
positive tracks mom < 250 MeV/c



positive tracks mom > 250 MeV/c



Purity

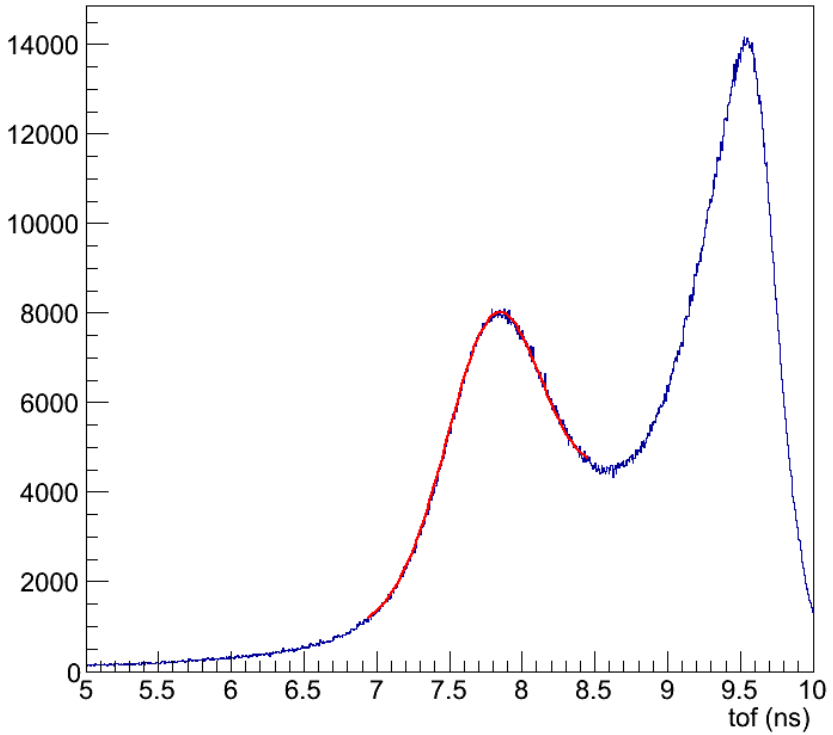


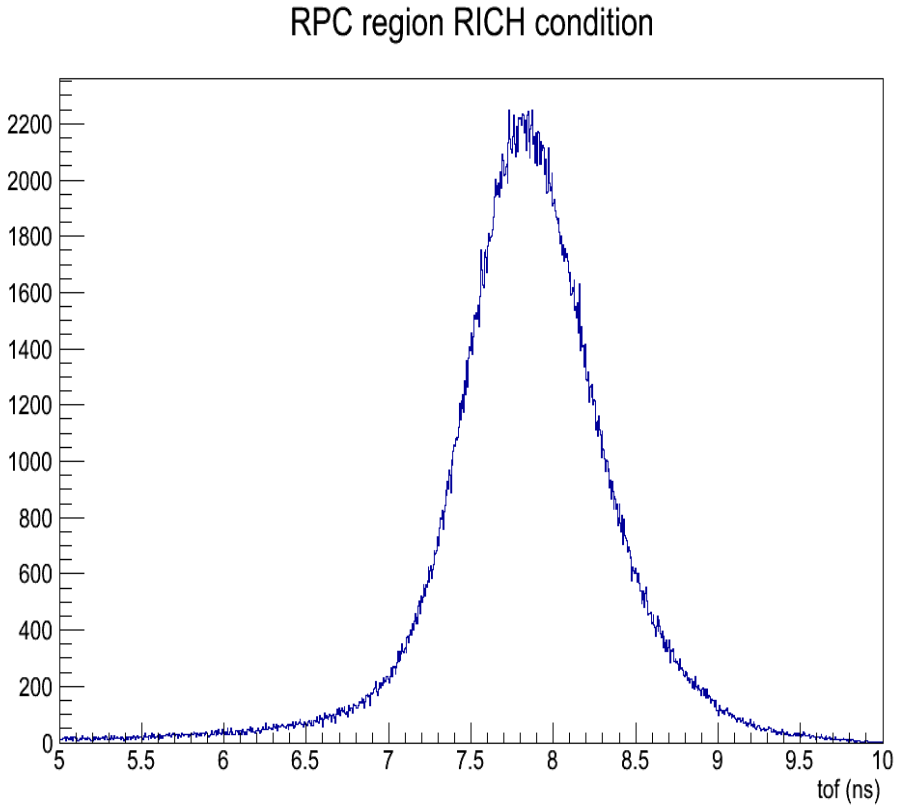
- Background (read area) from rotated RICH after RICH Qa cut
- Signal from not rotated RICH after RICH Qa cut

- Purity = 1 - $\frac{rot\,.\,RICH}{not\,rot\,.\,RICH}$

	p < 250 MeV/c	250 MeV/c <p <400 MeV/c
Negative	98.9 %	93.4 %
Positive	99.5 %	98.2 %

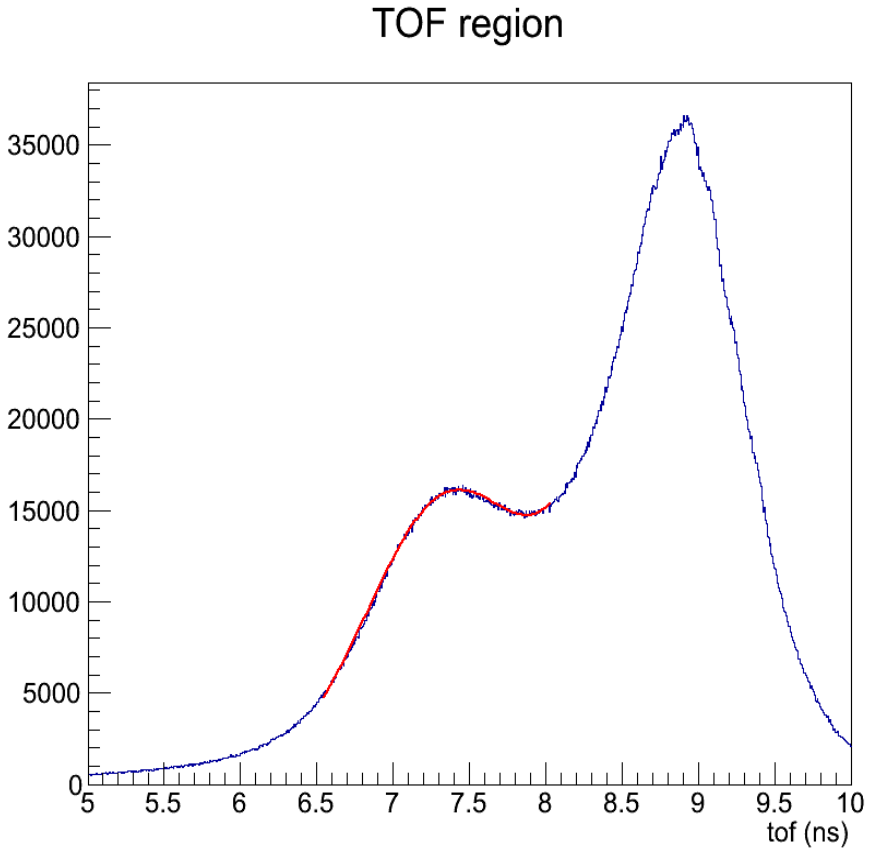
Time resolution (RPC region)

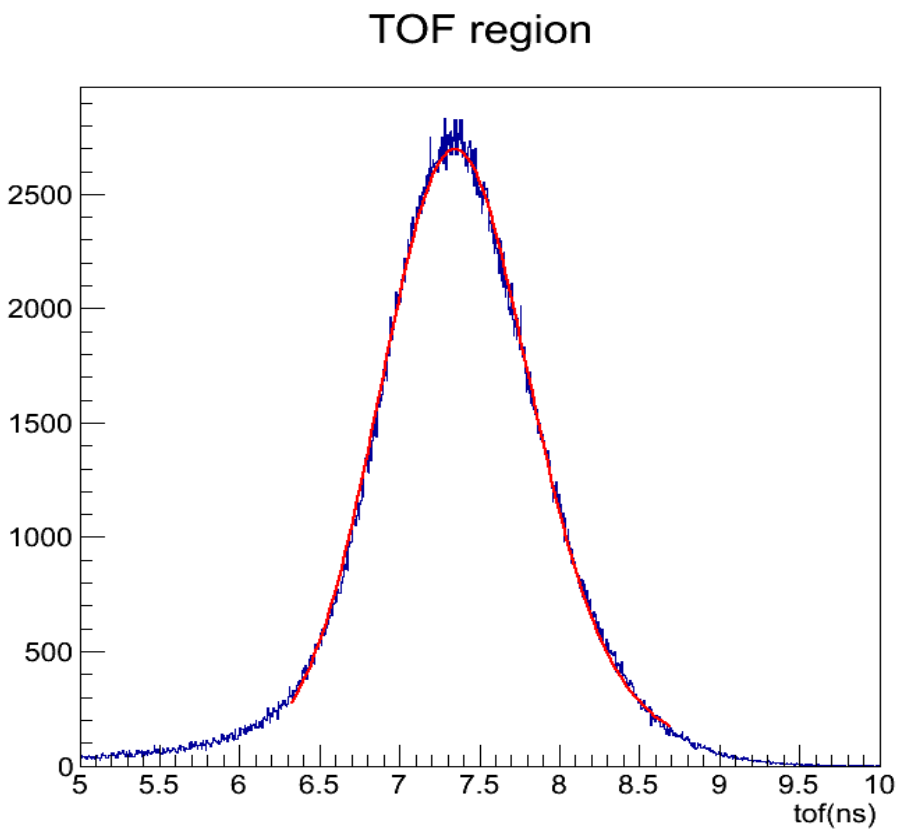




- P < 250 MeV/c, β > 0.8, no RICH condition (left),RICH condition (right)
- Fit gauss+expo → σ ~ 330 ps

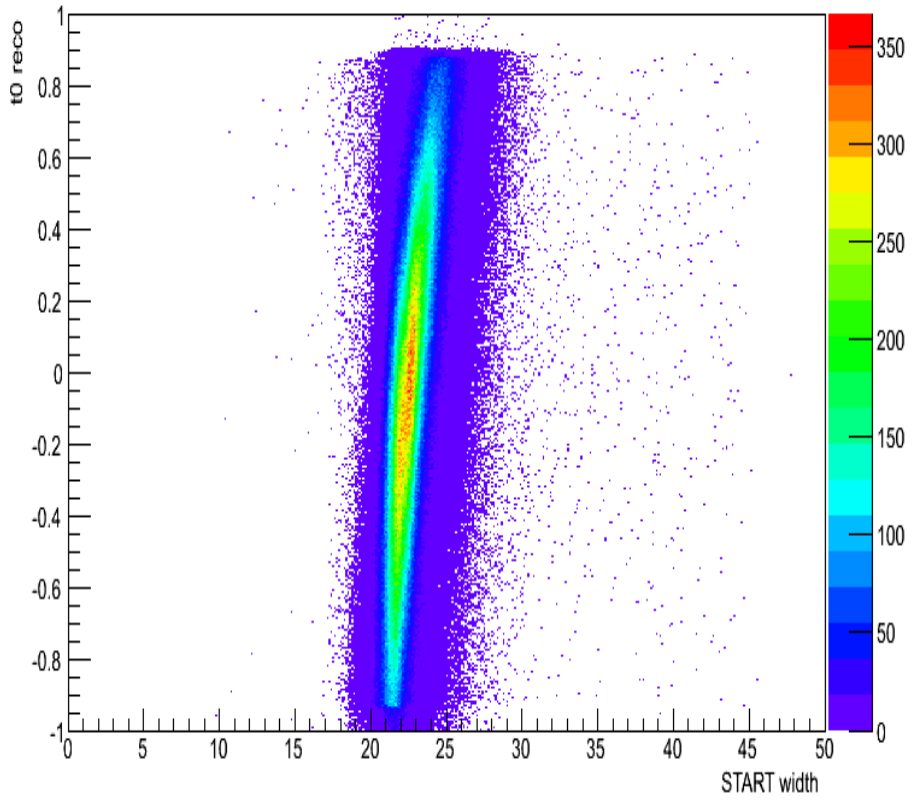
Time resolution (TOF region)

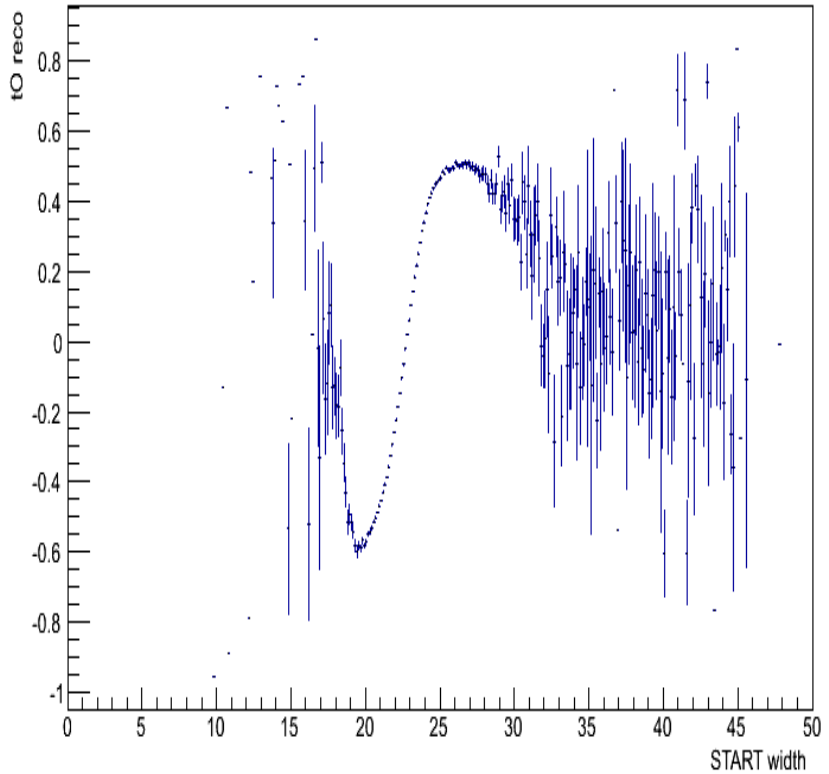




- Fit without RICH condition not reliable
- Fit 2 gauss → σ ~ 485 ps

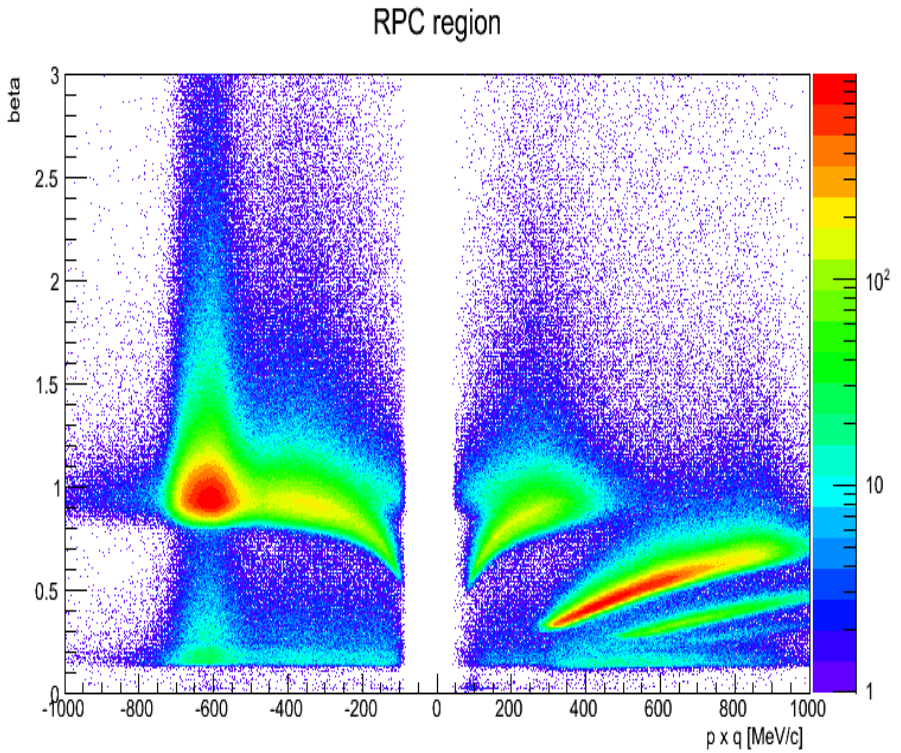
Walk correction

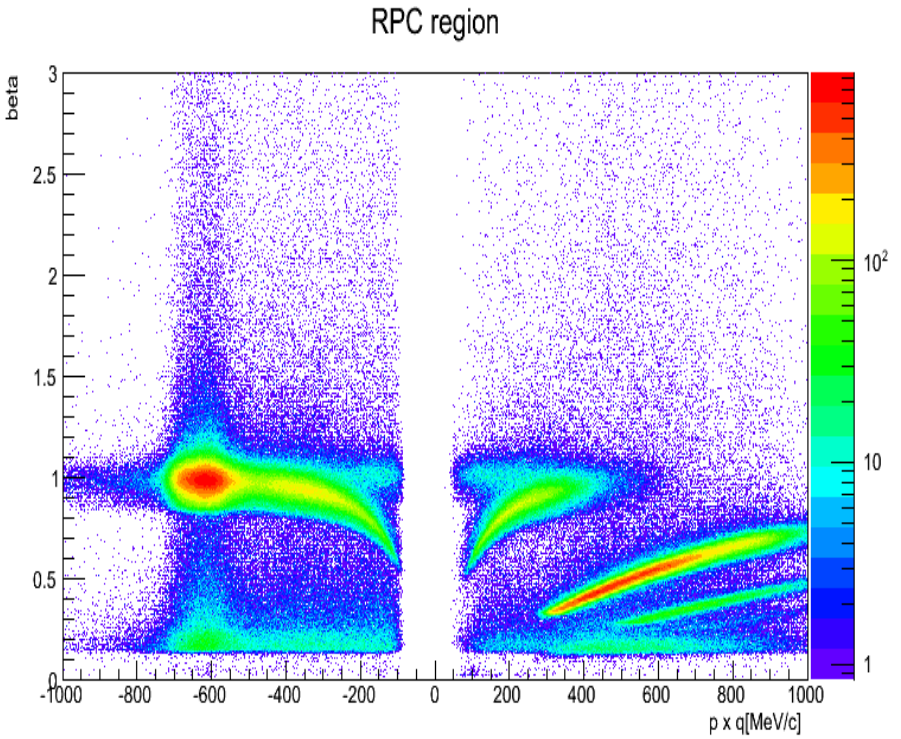




- T0 after correction using Georgy's function
- Walk correction using profile histo channel by channel

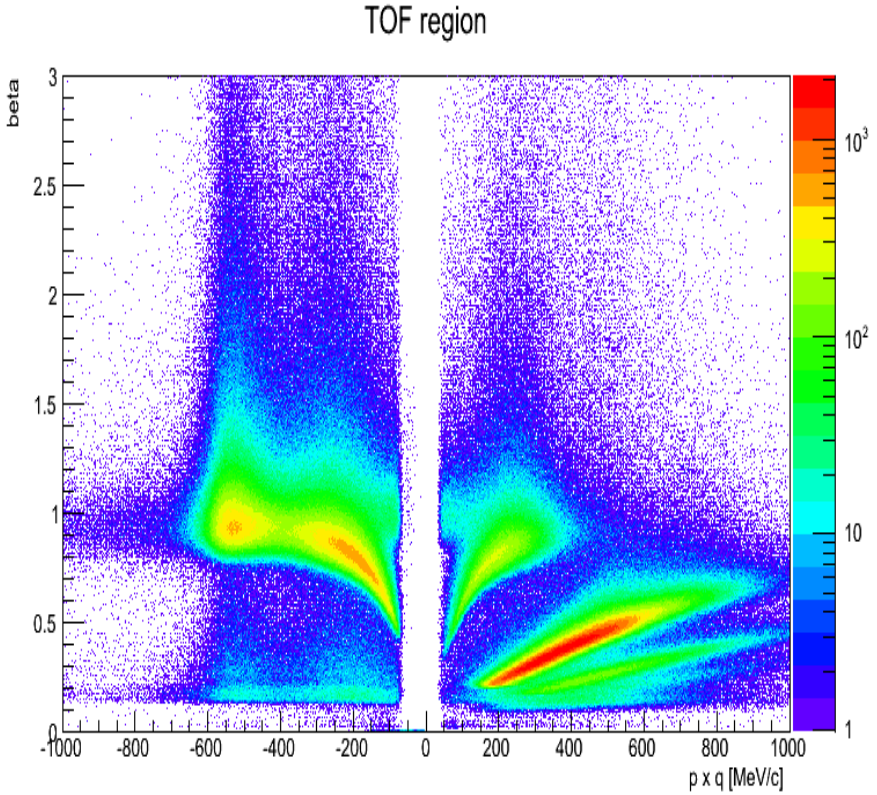
START strips behaviour

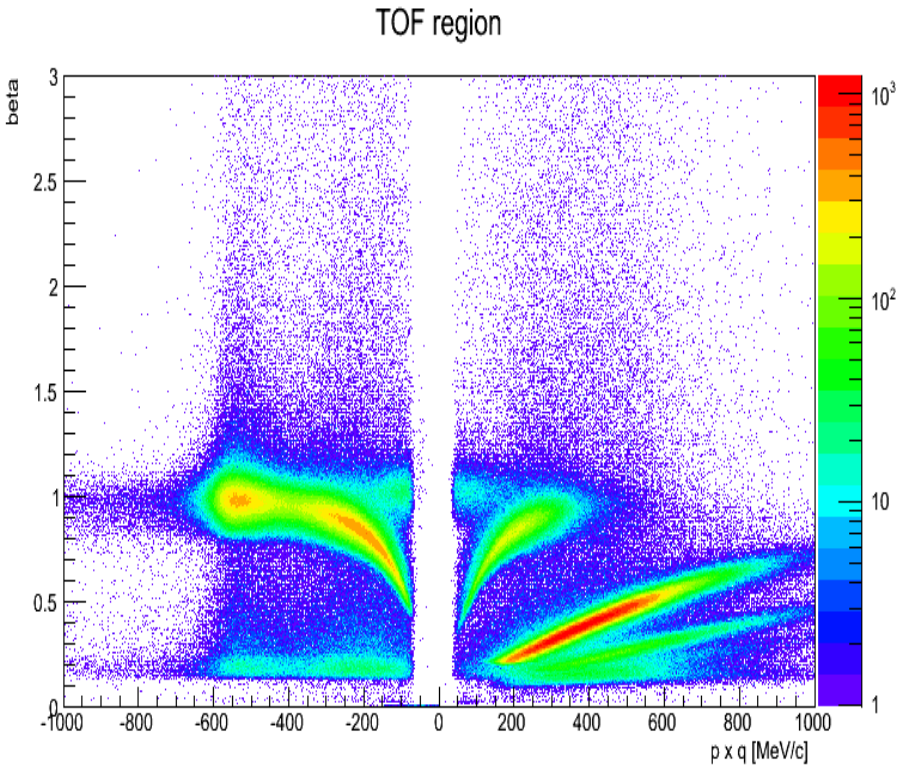




- Clear dependence from the strip used
- Trying excluding the strips with a bad resolution

START strips (TOF region)



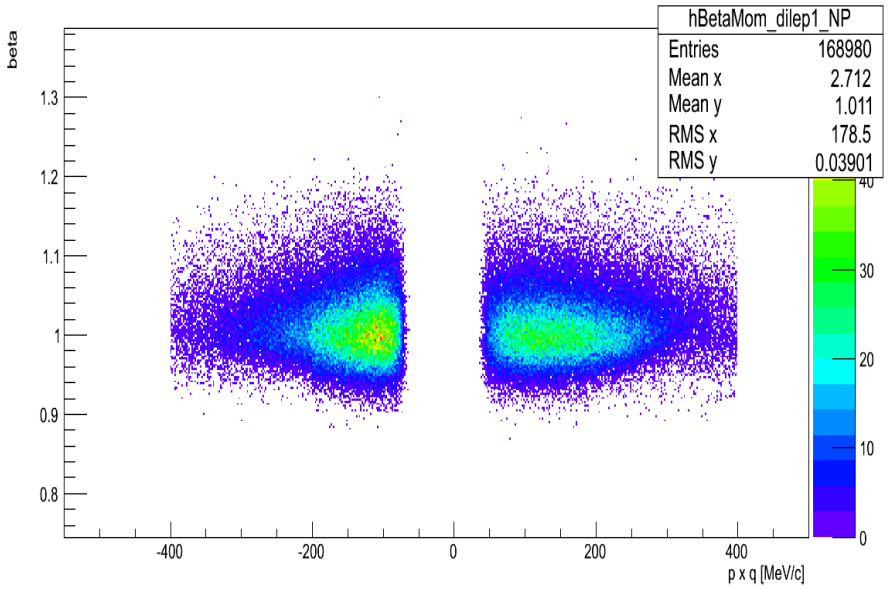


- Beta vs mom distribution for the same strips in TOF region

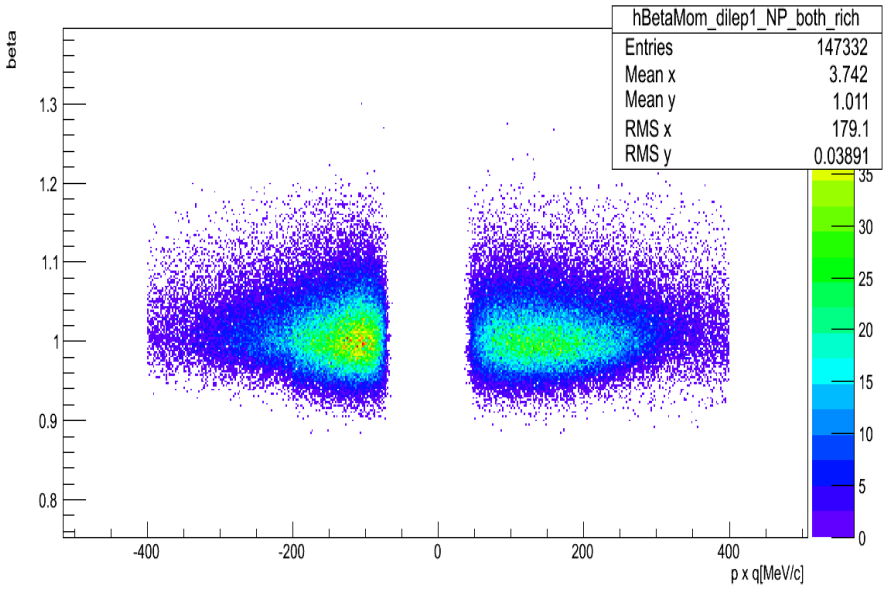
One RICH condition

- Is it possible to gain signal not requiring RICH for the second track?
- Cleaning of the data:
  - Δt of the 2 tracks inside 2σ (σ ~ 120 ps RPC, σ ~ 270 ps TOF)
  - Beta cut momentum dependent
  - dE/dx cut momentum dependent

1 RICH

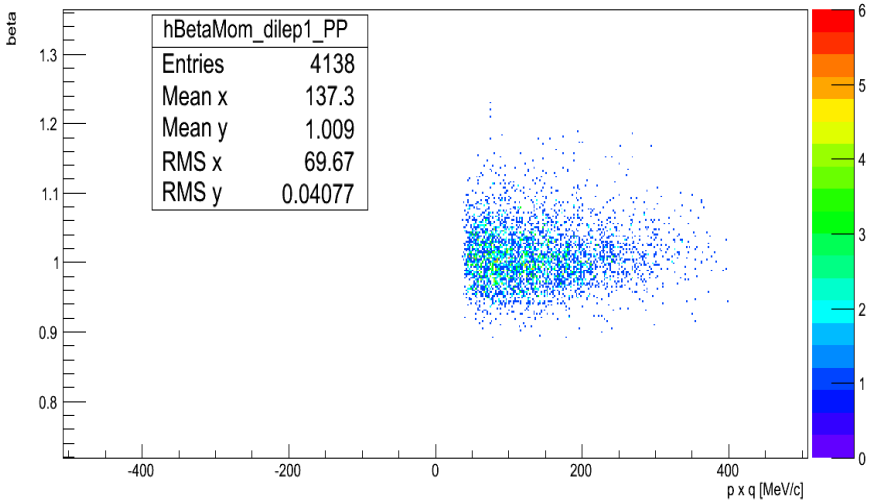


2 RICH

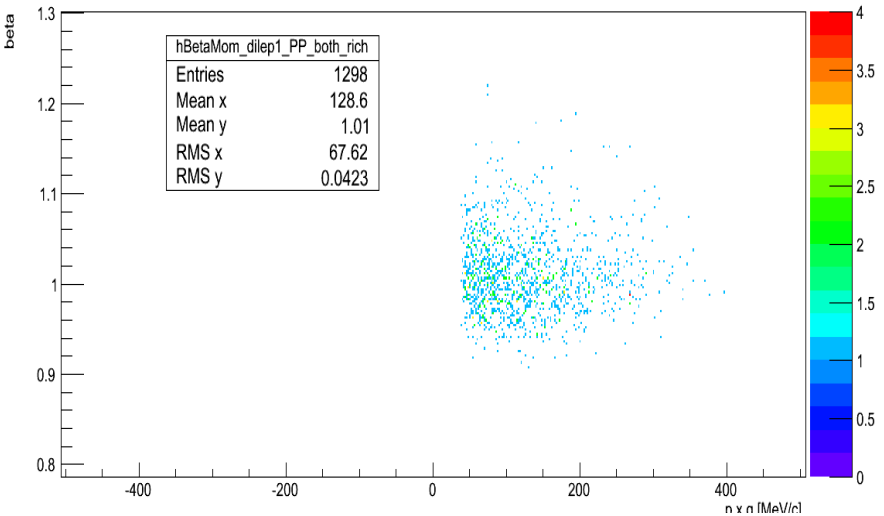


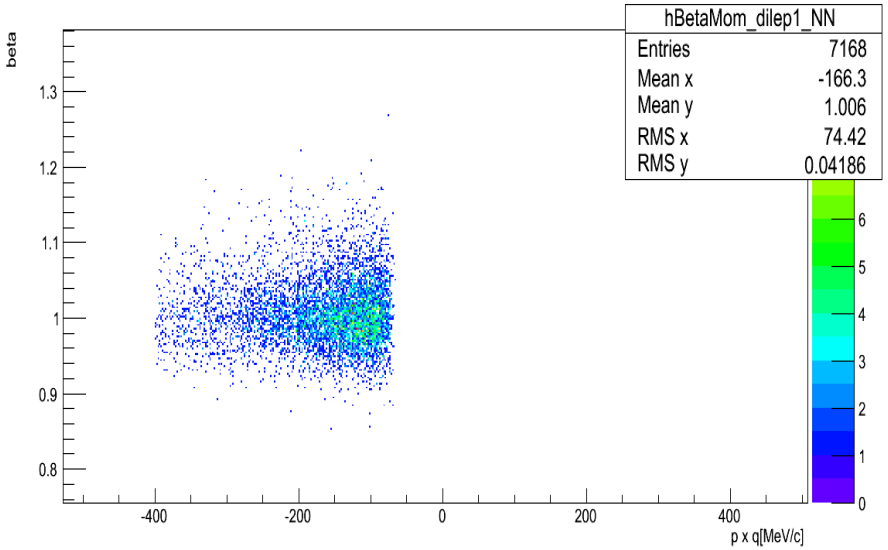
Like sign pairs

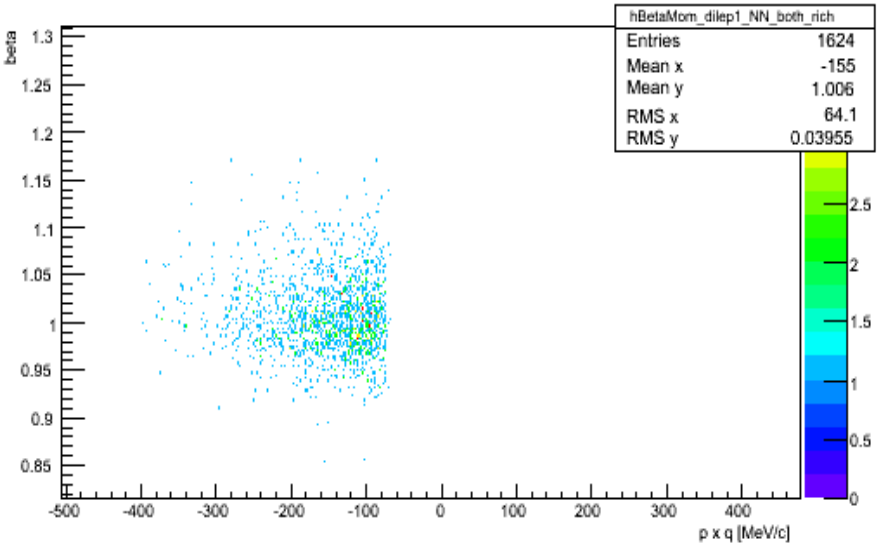
1 RICH



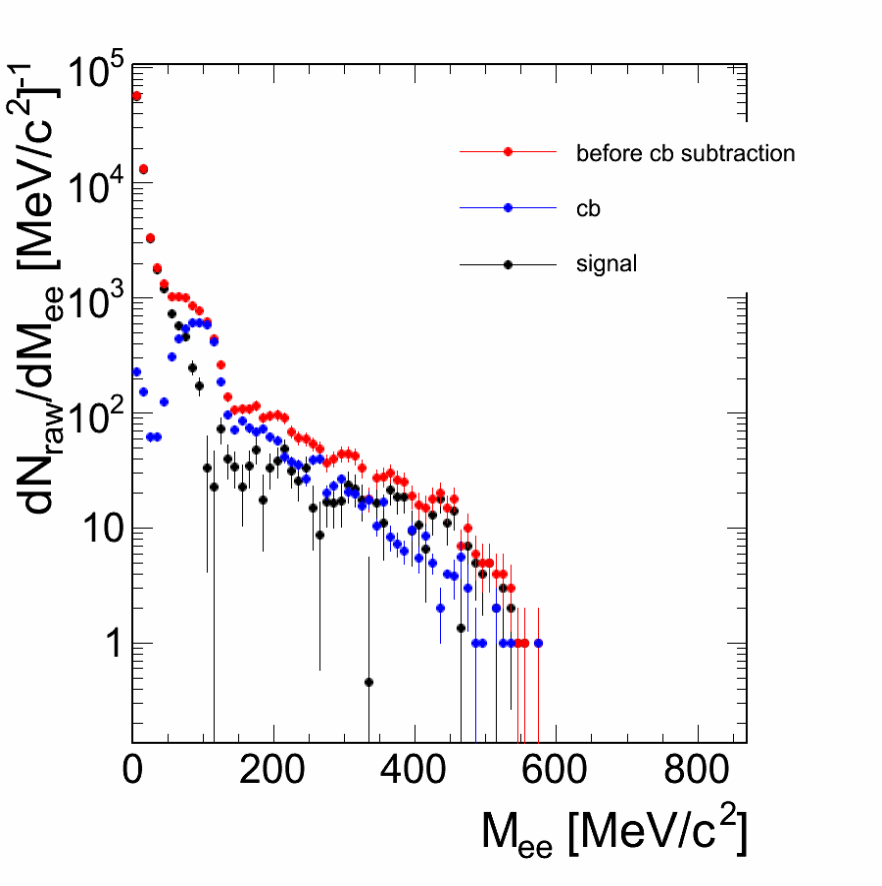
2 RICH

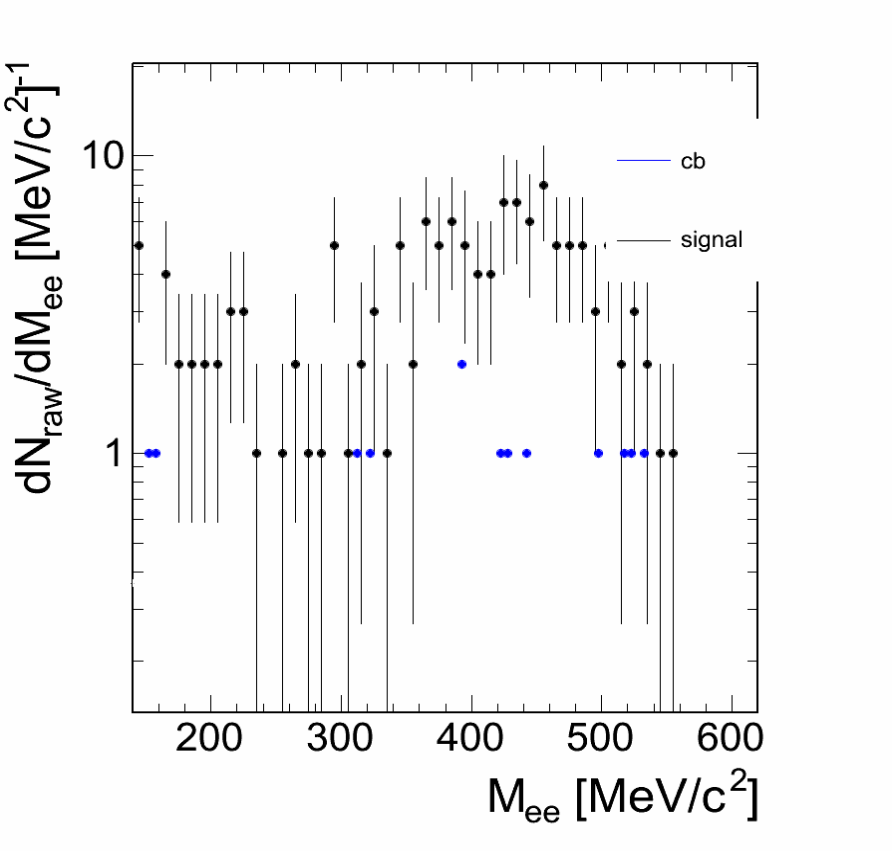






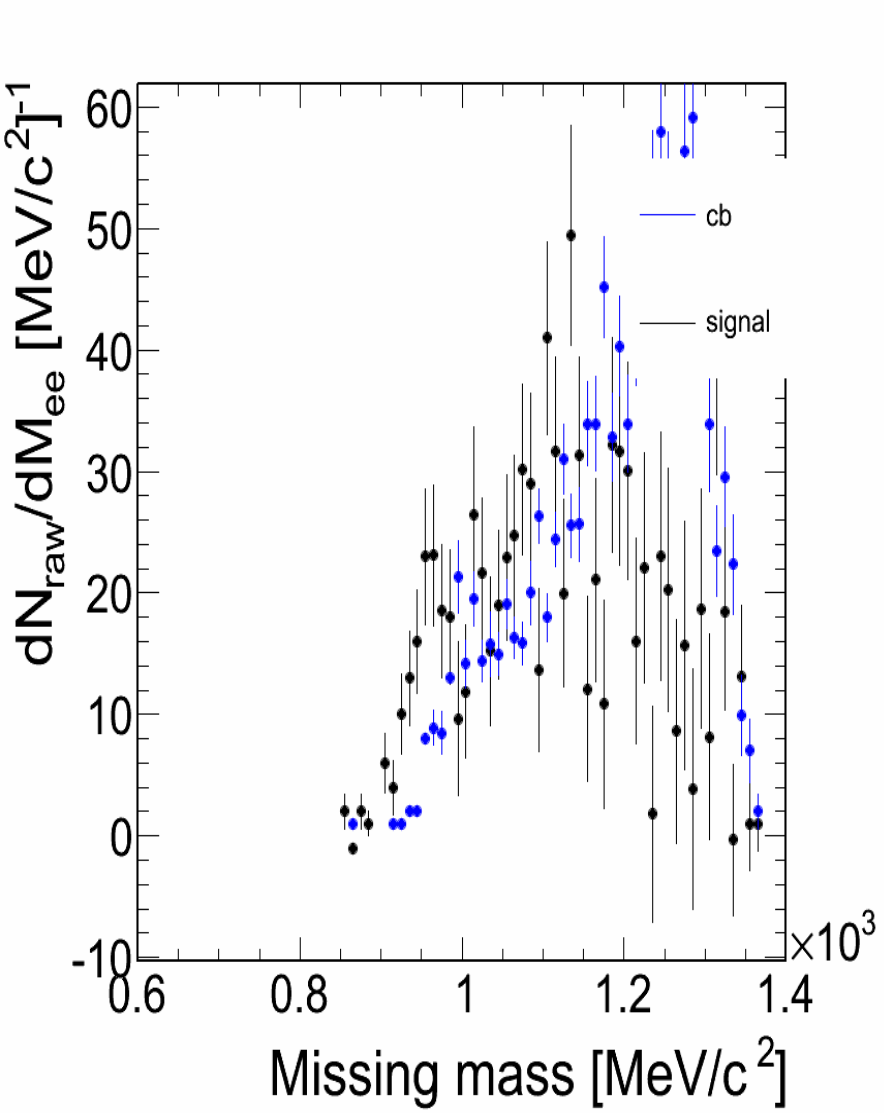
Invariant mass (1 RICH condition)





- #counts > 140 MeV: 708
- #counts > 140 MeV: 137

Missing mass



- Clear increase of background in comparison with 2 RICH request

Outline

- The statistics remains similar in gen0b with respect to the online data
- Clearly different behaviour of strips in START
- Using only 1 track-ring pions are still contributing to the e+e- spectra
- Working in progress