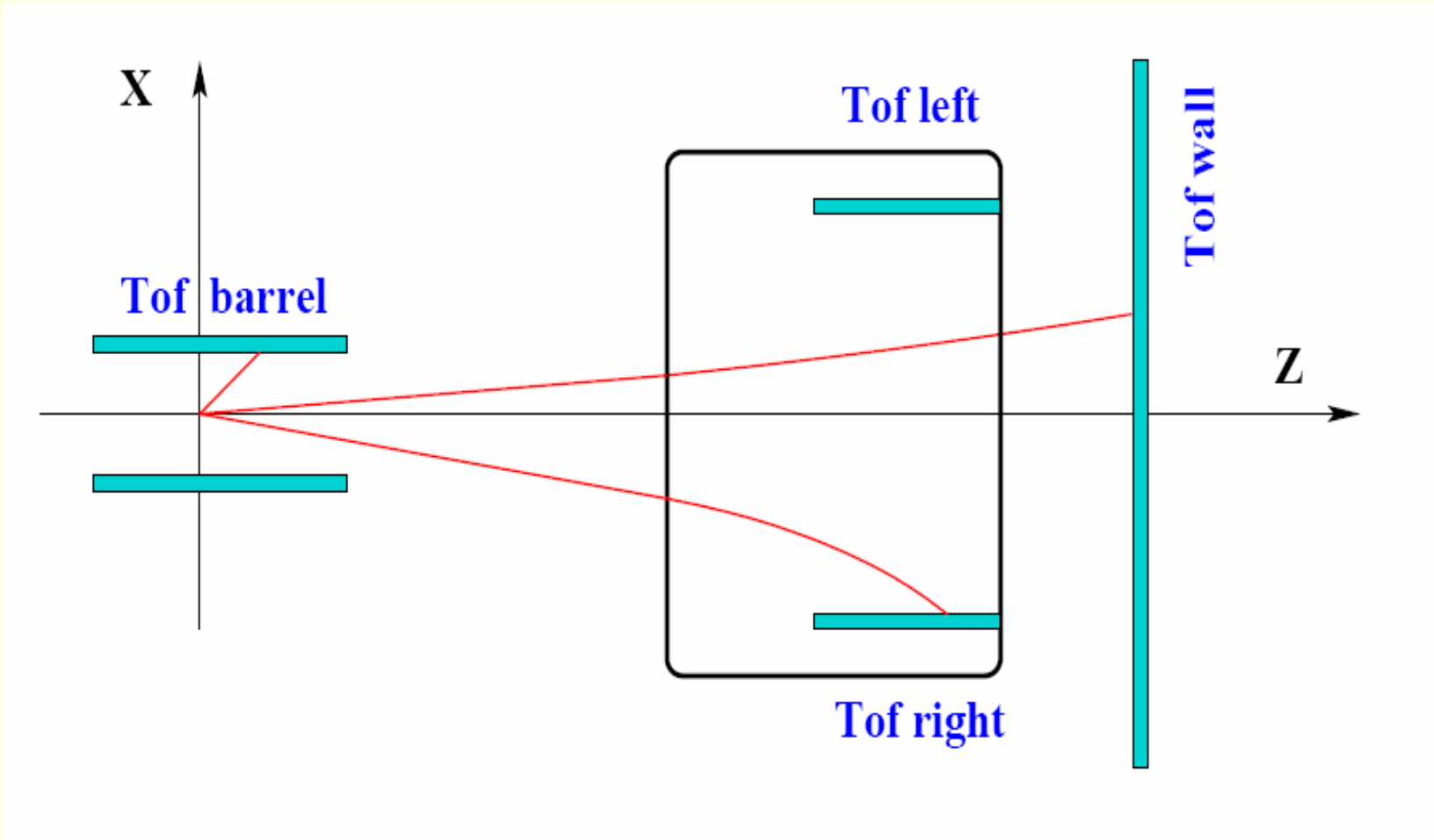
TOF @ PANDA - MC simulation

- Pythia + Geant3 used
- $p_{bar}p$ @ 15 GeV/c elastic & inelastic events
- no magnetic field and material in the target spectrometer

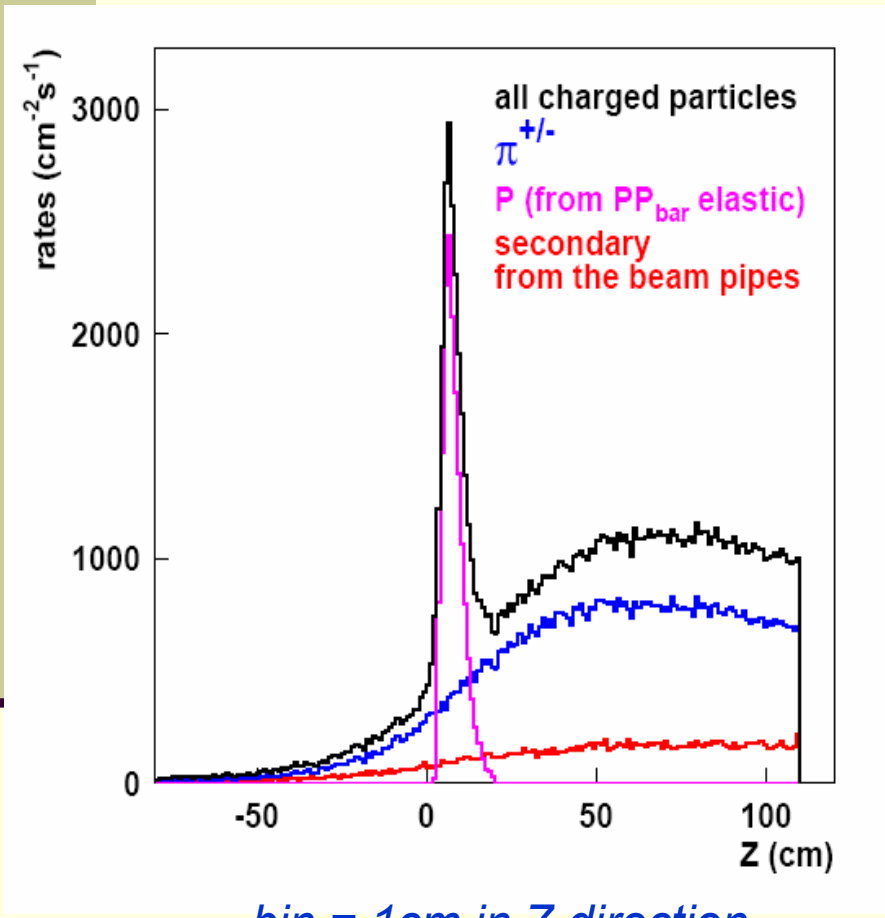
barrel Tof – Tof wall correlations are investigated

we didn't put the stress on the type of barrel TOF (RPC or Scintillator)

Geometry



TOF barrel, charged rates



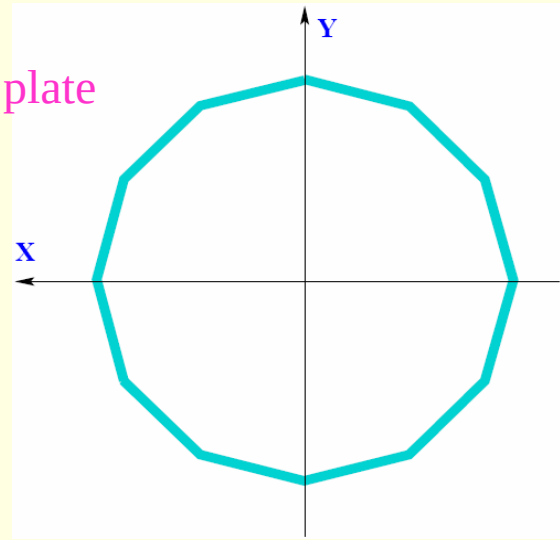
bin = 1cm in Z direction

Rates normalized to 10^7 interaction/s in the target.

For inelastic events calculated rates are compatible with simulation made by Aida Galoyan with DPM generator.

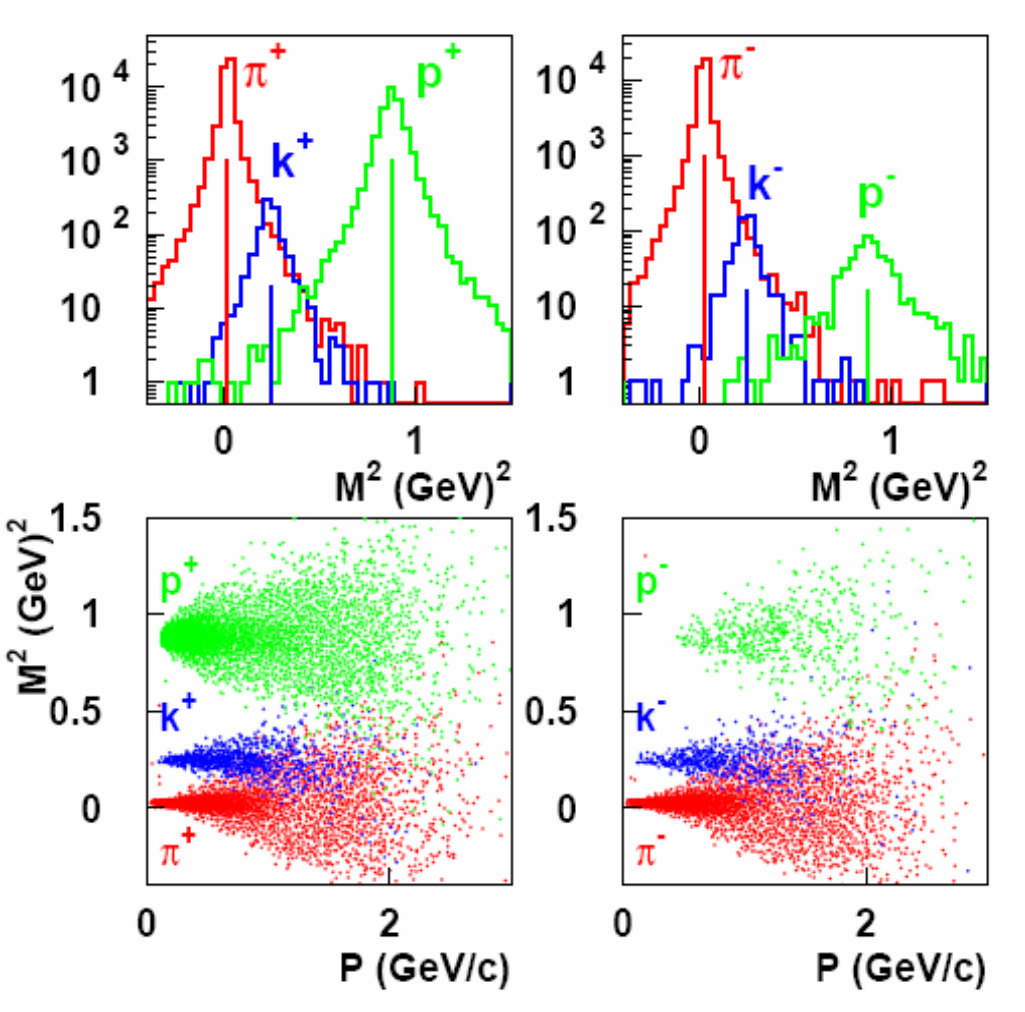
For 12 plates in phi

rate = 10500 1/s per plate



Tof barrel, mass reconstruction assuming T_0

positive charge negative charge

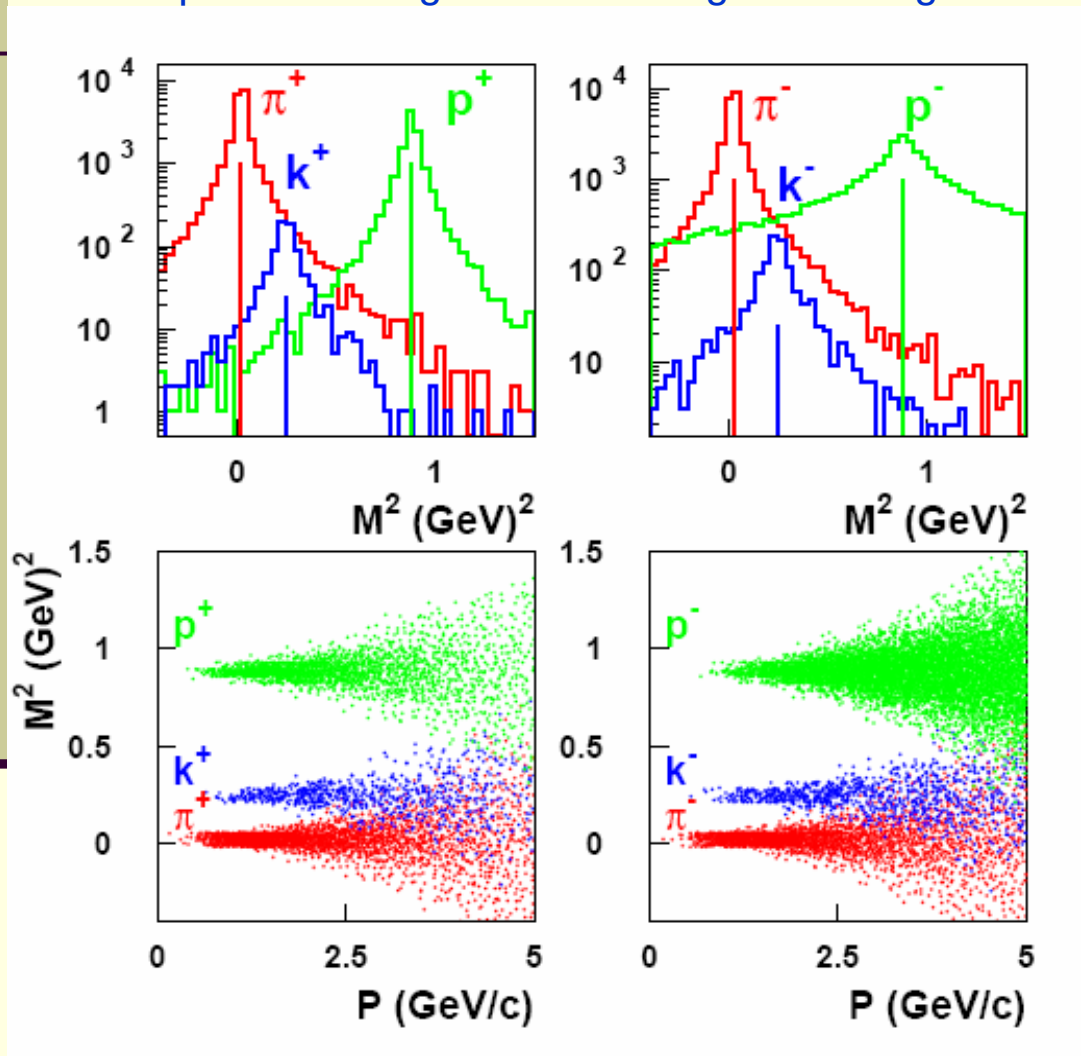


T_0 – event start time

total resolution
(barrel Tof + start T_0)
σ_{tof} = 100 ps.

Tof wall, mass reconstruction assuming T_o

positive charge negative charge



T0 – event start time

total resolution

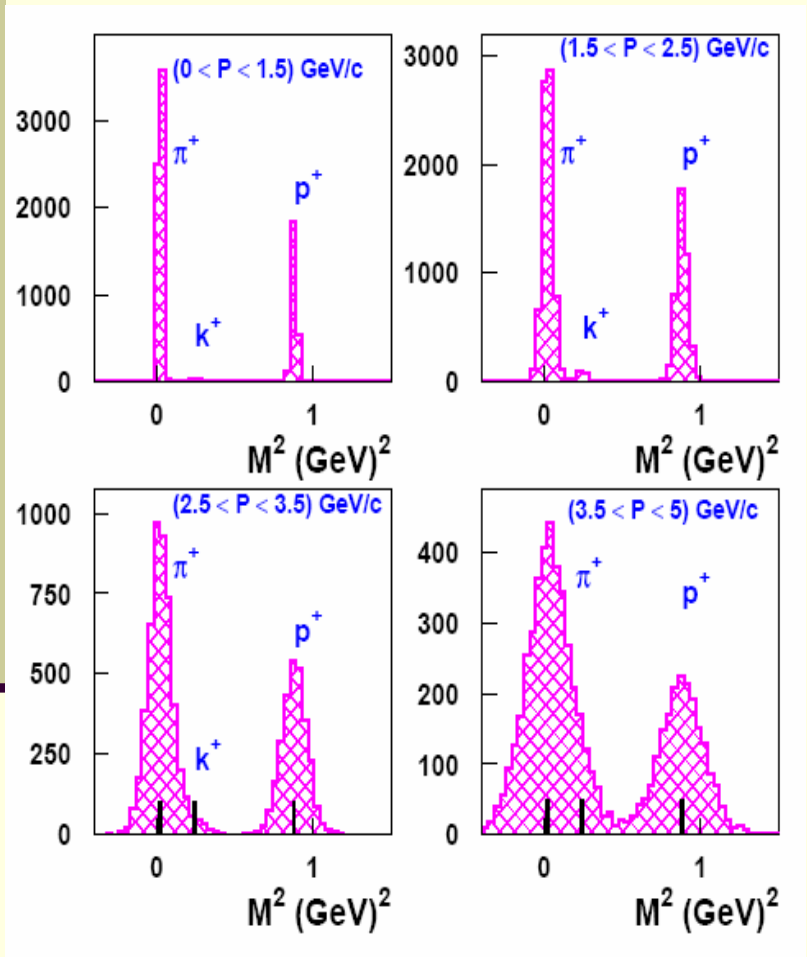
(Tof wall + start T_0)

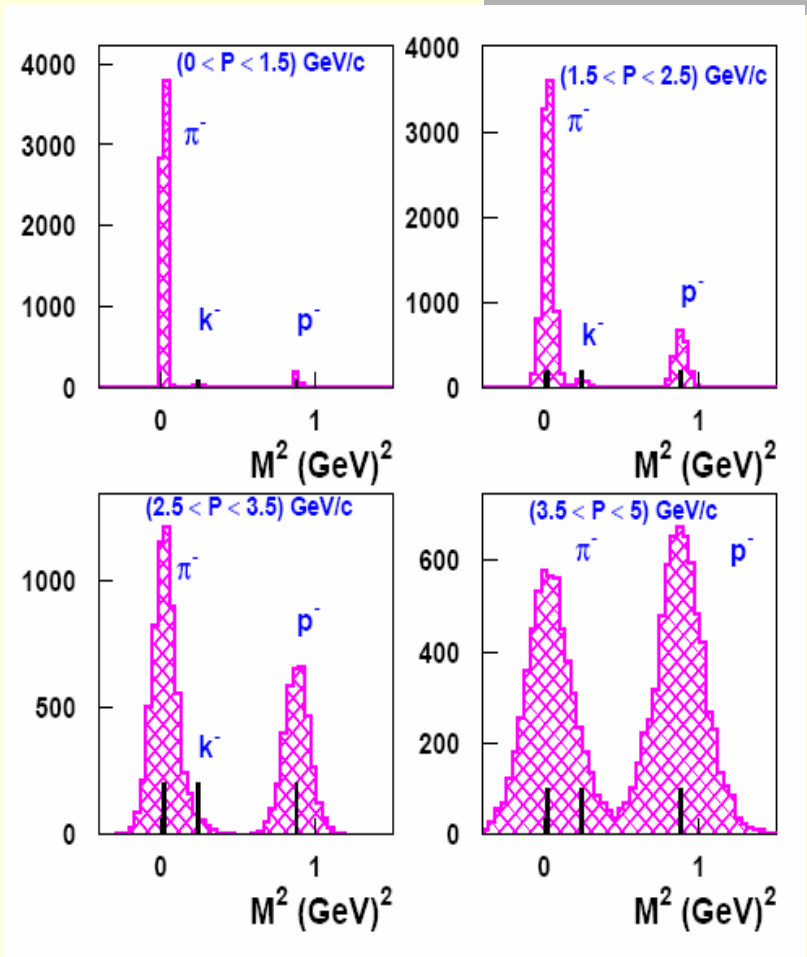
σ_{tof} = 100 ps.

Tof wall, mass reconstruction assuming T_o

positive charge

negative charge



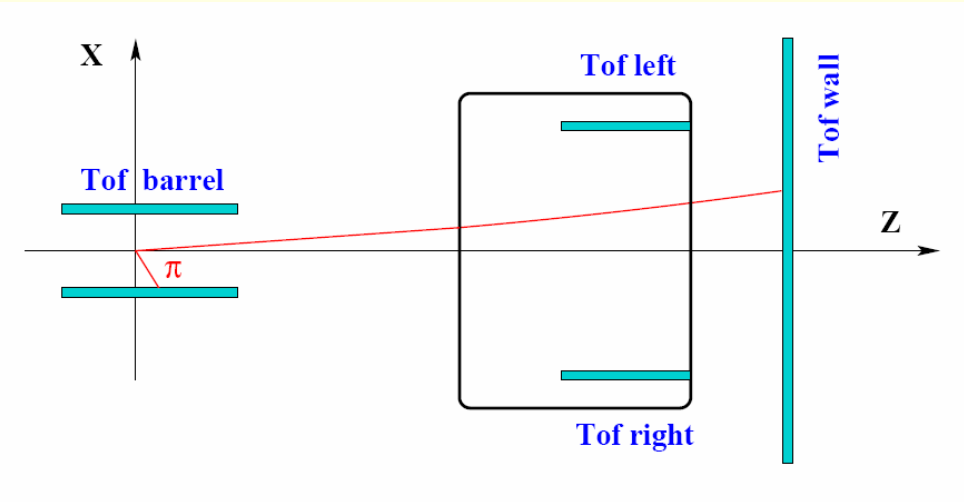


Tof - Tof correlations

Due to multiplicity of charged particles (up to 12), there are correlation between particles accepted by various TOF detectors in the single event.

Expected are Wall-Wall, Wall-Side, Wall-Barrel, Side-Barrel, Barrel-Barrel correlations.

As a first step we have analyzed Tof wall-barrel Tof correlations only.



From the reconstructed event we have:

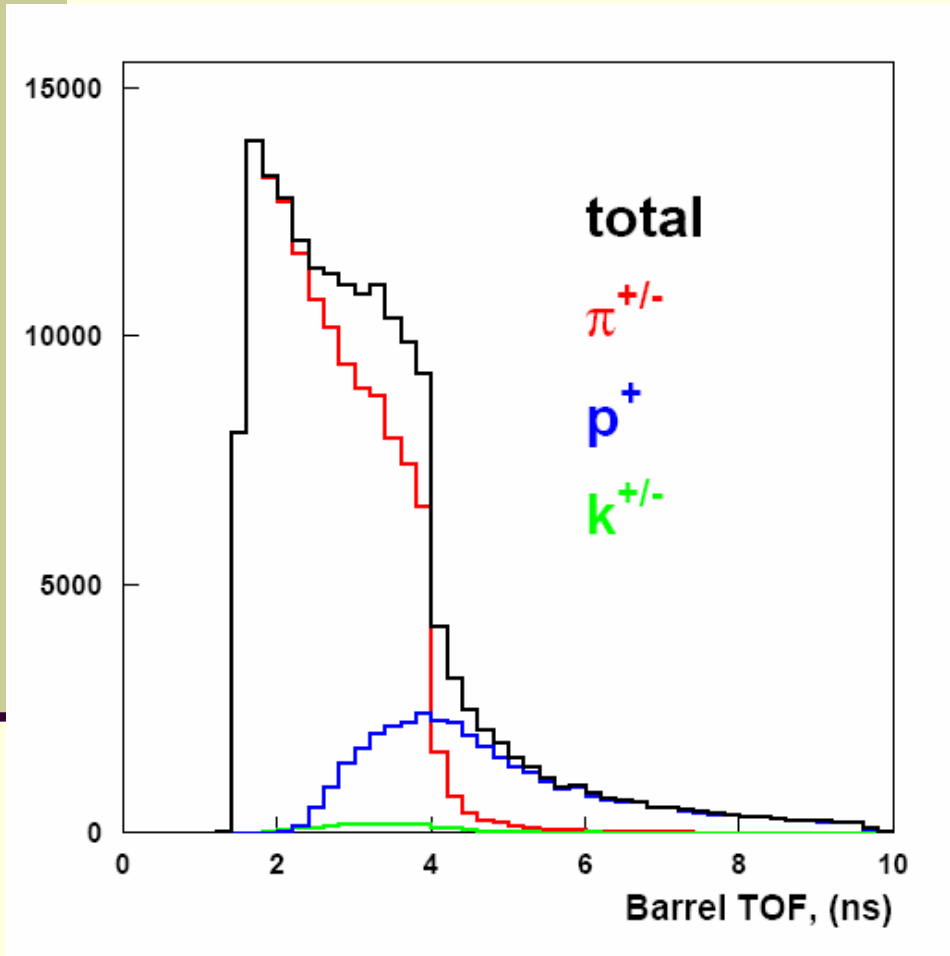
–charge & momentum of particles-

P_{wall}, P_{barrel}

– track length L_{wall}, L_{barrel}

– dtof = $Tof_{wall} - Tof_{barrel}$

Tof barrel time of flight



Time of flight for charged particles accepted by barrel Tof when any charged hits Tof wall.

Particle contribution to the total barrel Tof

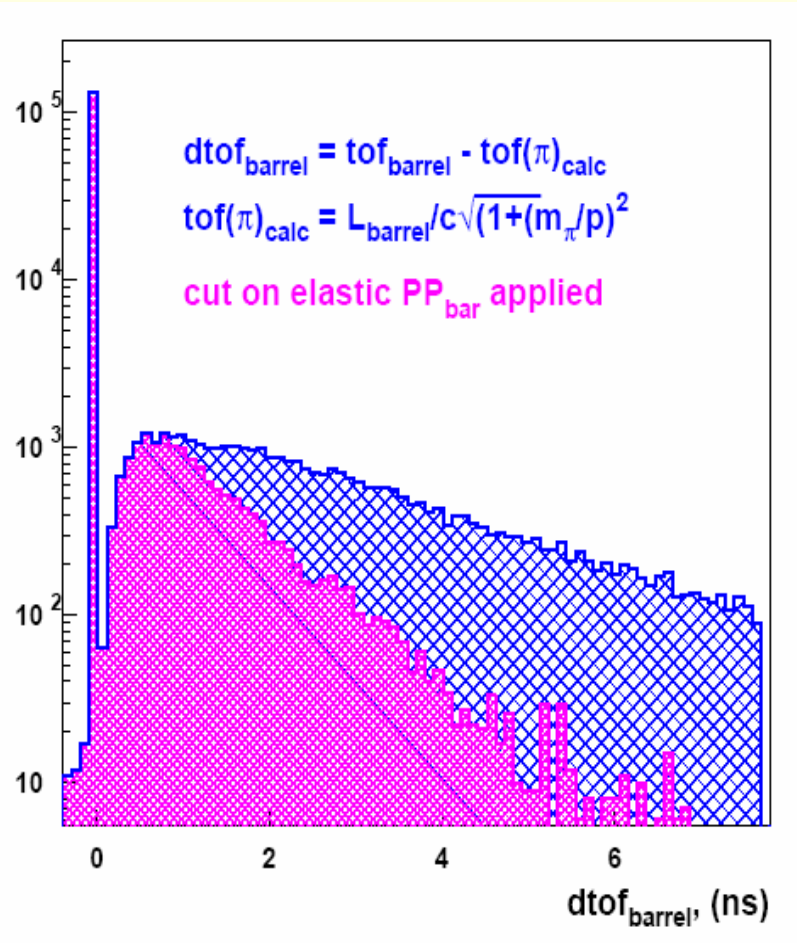
$\pi^{+/-}$ **- 77.2%**

$K^{+/-}$ **- 1%**

P^{+} **- 21.3%** **($P^{+}_{elastic}$ - 12.8%)**

$\pi^{+/-}$ – main yield to the barrel time of flight distribution.

Tof wall - Tof barrel correlations



$dtof_{barrel}$ - difference between time of flight for charged particles accepted by barrel Tof and calculated time of flight for pions.

L_{barrel} – particle's track length,

p - particle's momentum.

As a first step

Time of flight for barrel Tof could be approximated by pion time of flight.

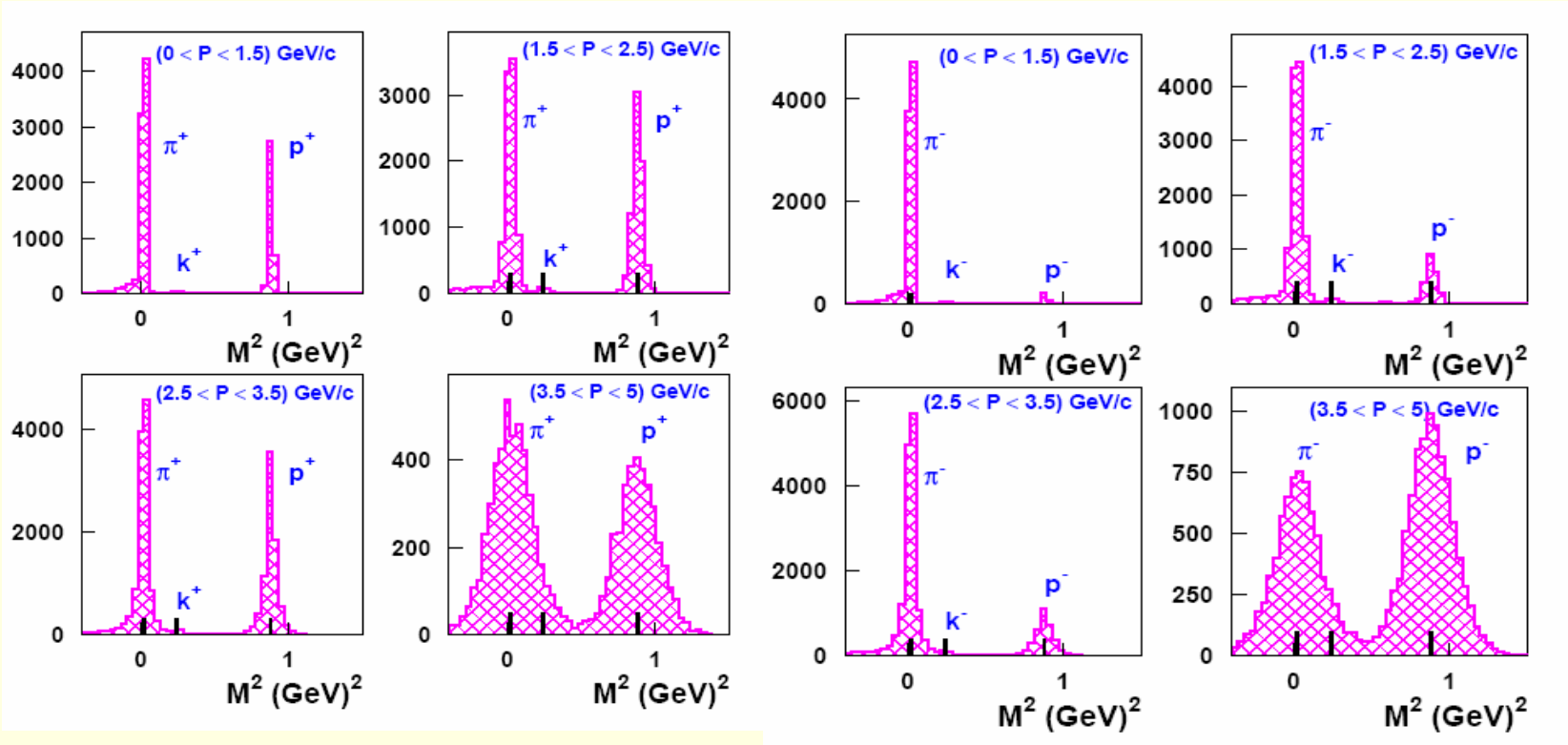
Tof wall mass reconstruction

using pions detected by barrel Tof

Then time of flight particles accepted by TOF wall is approximated as

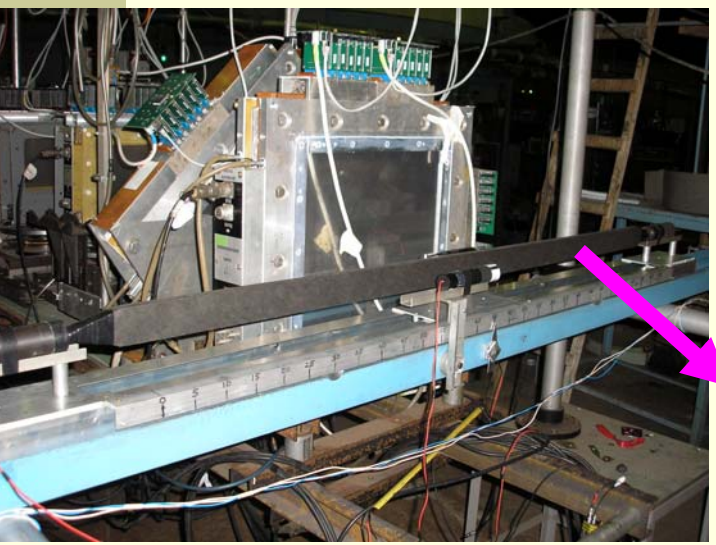
$tof_{wall} = \overline{dtof} + tof_{calc}(\pi)$, where $\overline{dtof}$ = dtof with smearing (σ_{tof} = *100 ps.)*

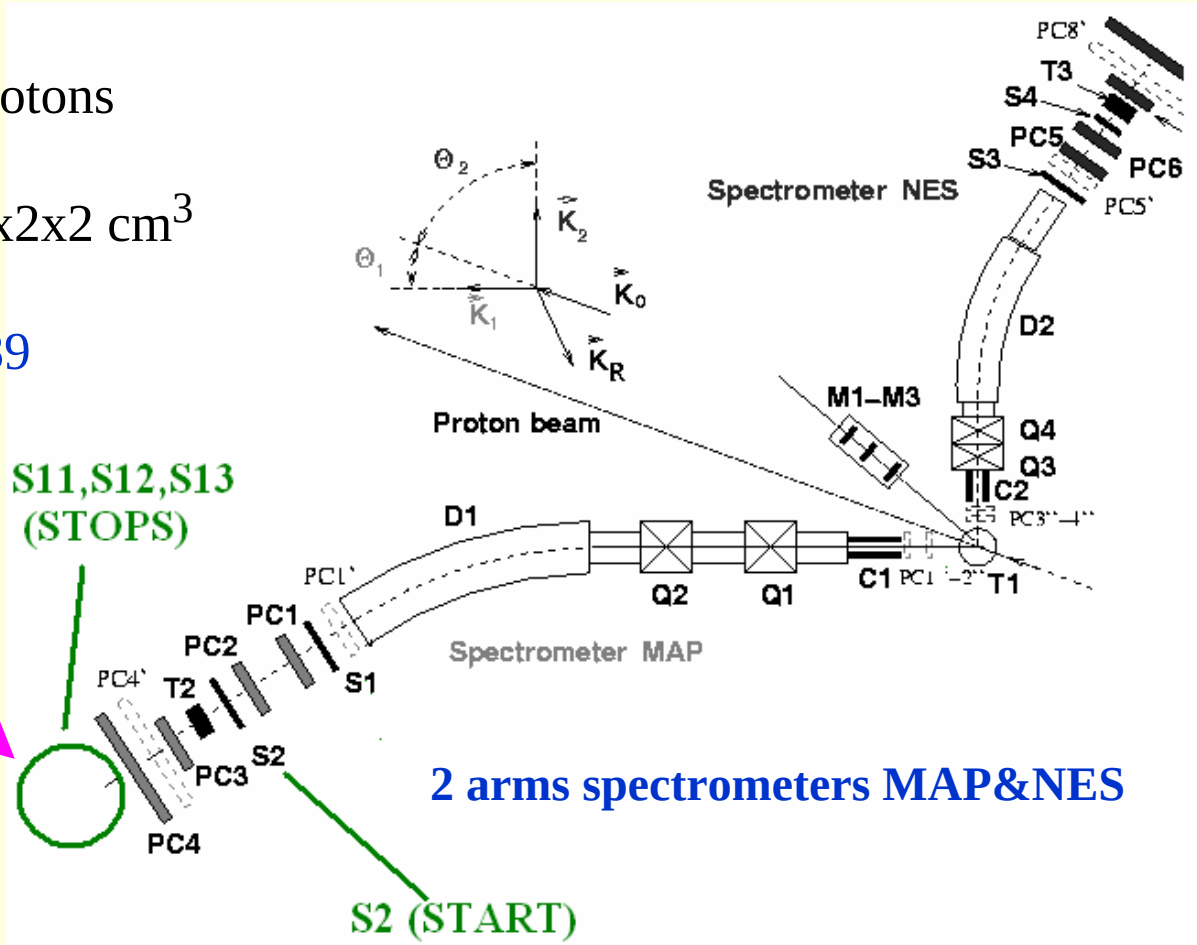
and now we can reconstruct the mass of the particles accepted by Tof wall :



TOF prototype test @ 1 GeV proton beam

Elastic pp scattering
test @ MAP ~750MeV protons
Prototype: 140∗5∗1.5 cm^3
Small counters S11(12) 2x2x2 cm^3
Plastic: Bicron 408
PMT's: Hamamatsu R4889





Summary/Outlook

- Barrel Tof –Tof wall correlations have been investigated.
- Mass of the particle's accepted by Tof wall reconstructed using dtof – relative time between barrel Tof and Tof wall.
- Result of April beam test - preliminary obtained TOF resolution σ_{tof} =100ps

- Other correlation (wall-wall, wall-side,…..) will be investigated
- Reconstruction of the event time (start T_0 time)
- Next test run – end of November 2009