

# Relative TOF and PID

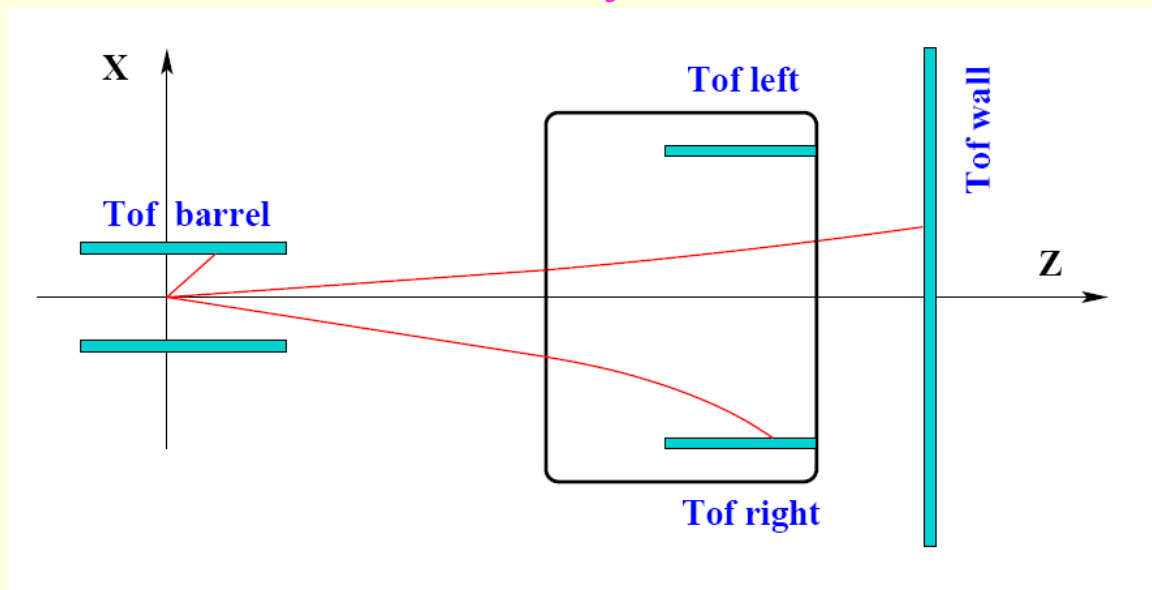


Pythia + Geant3 used,  
200000 events generated

$p_{\text{bar}}p$  elastic+inelastic @ 15 GeV/c

- 46% - accepted by Tof Wall
- 3.1% - accepted by Tof side left
- 3.5% - accepted by Tof side right
- 47% - accepted by Barrel Tof

## Geometry



## Coincidence:

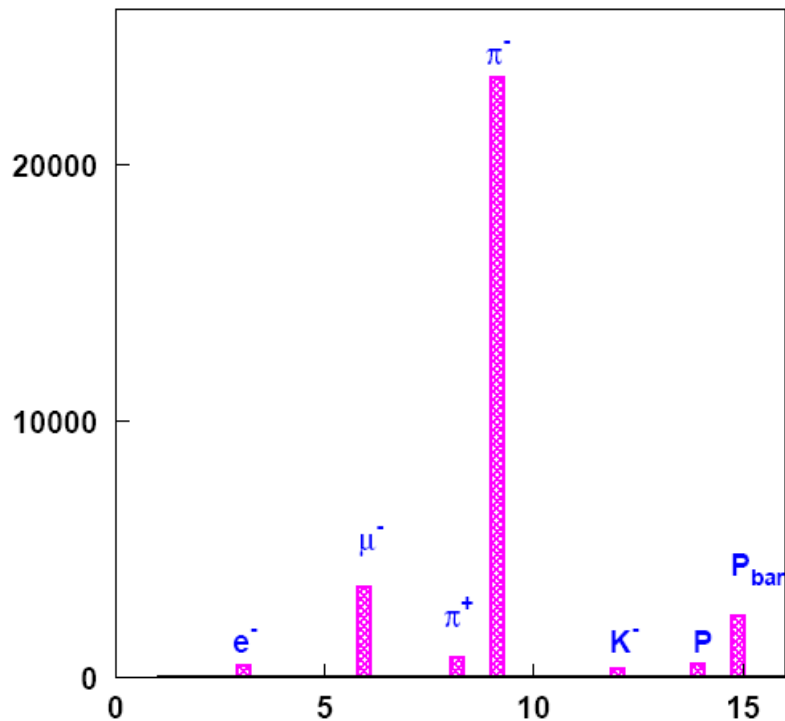
- Tof wall - Tof barrel
- Tof wall - Tof left
- Tof wall - Tof right
- Tof wall - Tof wall

# Tof<sub>wall</sub> – Tof<sub>side</sub> coincidence

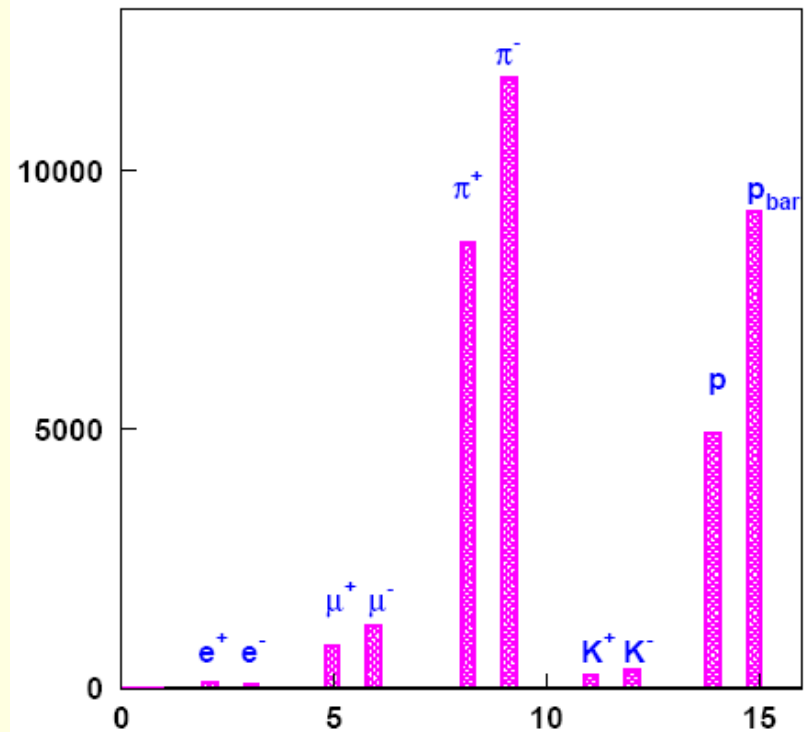


Charged particles type accepted by Tof side left & Tof wall

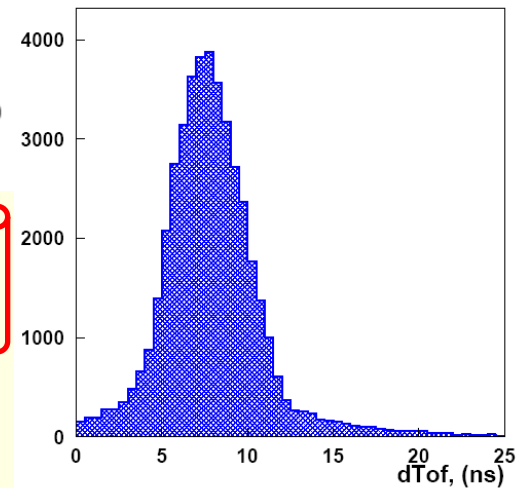
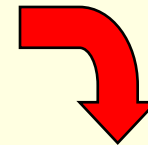
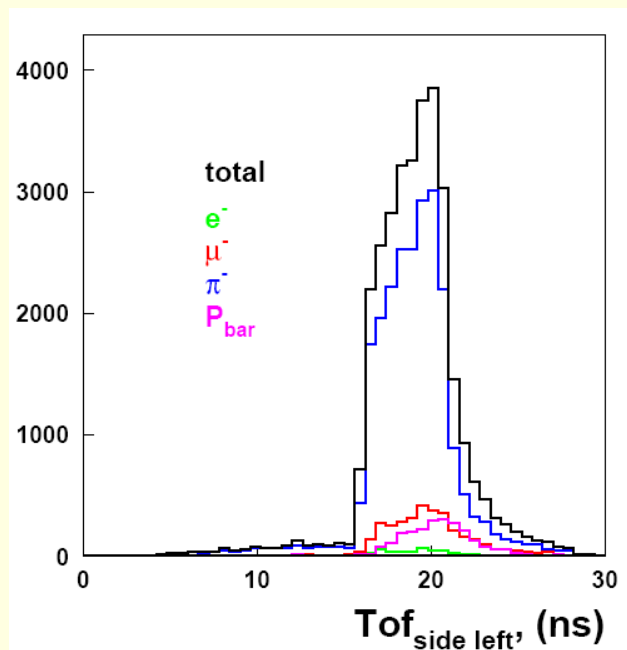
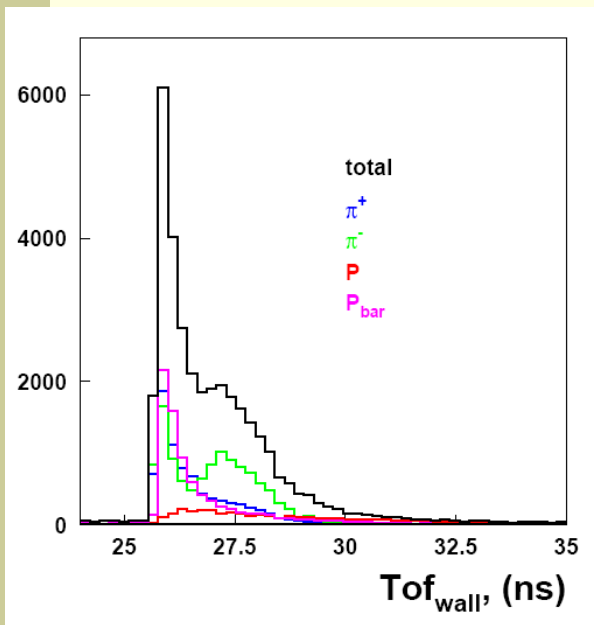
Tof side left



TOF Wall



# Tof<sub>wall</sub> - Tof<sub>side</sub> coincidence



$\pi^-$  - main yield to the Tof side left time of flight distribution

Relative Tof  $\longrightarrow$   $d\text{tof} = \text{Tof}_{\text{wall}} - \text{Tof}_{\text{side left}}$

# Tof wall mass reconstruction

using particles detected by Tof side



From the reconstructed event we know:

- particle's charge  $(C_{\text{wall}}, C_{\text{side}})$
- momentum  $(P_{\text{wall}}, P_{\text{side}})$
- track length  $(L_{\text{wall}}, L_{\text{side}})$

$\overline{d_{\text{tof}}} = d_{\text{tof}}$  with smearing ( $\sigma_{\text{tof}} = 100 \text{ ps.}$ )

This we used for PID

$$\text{tof}_{\text{side}}^{\text{calc}}(\pi) = \frac{L_{\text{side}}}{c} \sqrt{1 + \left( \frac{m_{\pi}}{p_{\text{side}}} \right)^2}$$

We assume

$$\text{Tof}_{\text{wall}} = \overline{d_{\text{tof}}} + \text{tof}_{\text{side}}^{\text{calc}}(\pi)$$

$$m_{\text{wall}} = \frac{P_{\text{wall}}}{c} \sqrt{\frac{c^2 \text{tof}_{\text{wall}}^2}{L_{\text{wall}}^2} - 1}$$

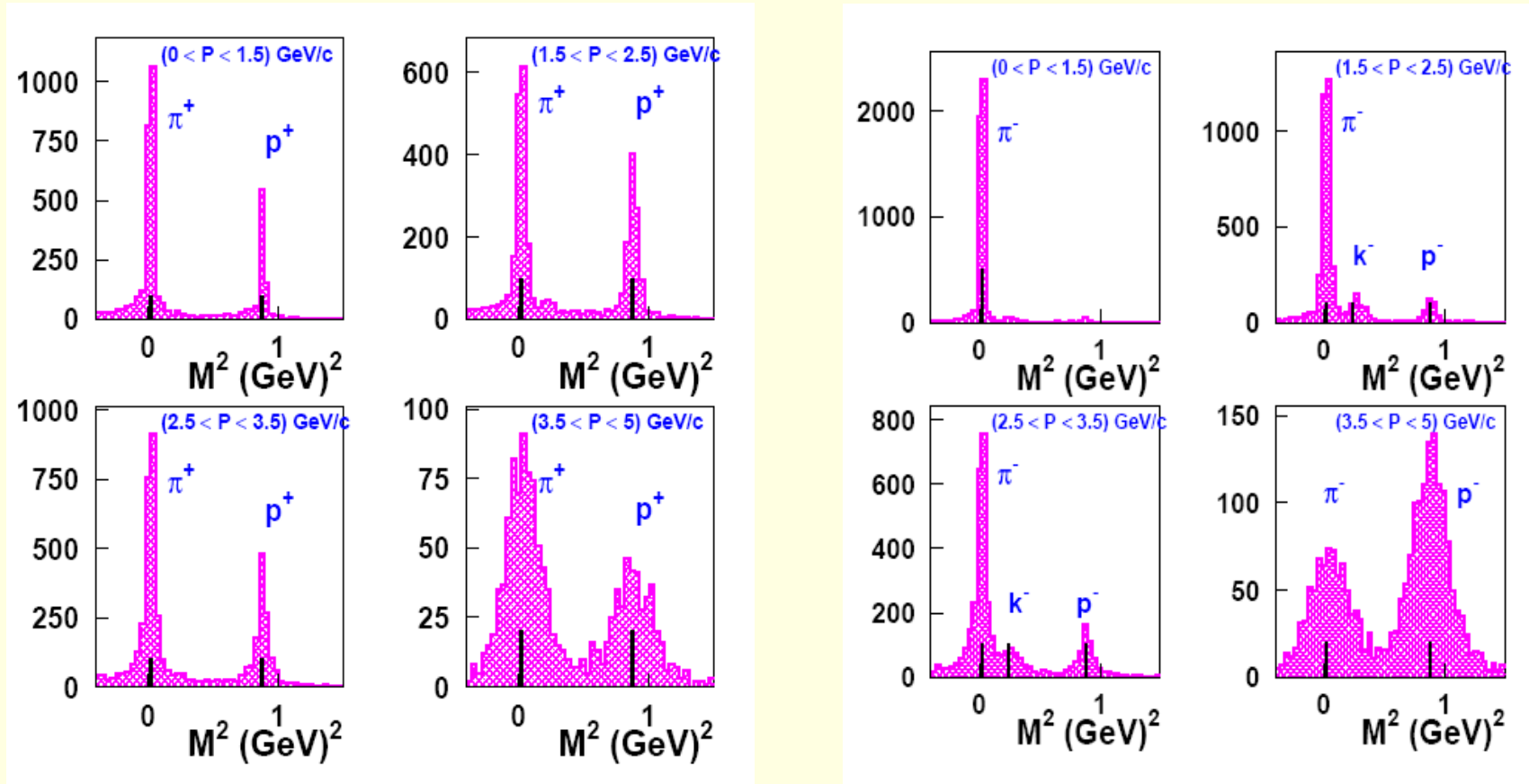
# Tof wall particle's mass reconstruction

in case of  $\pi^-$  accepted by Tof side



positive

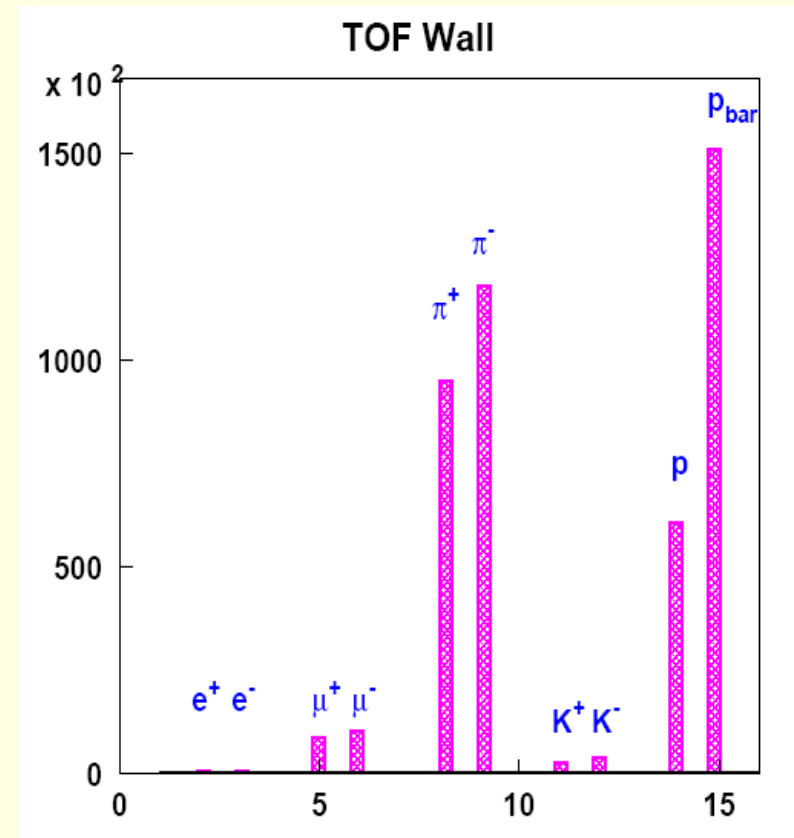
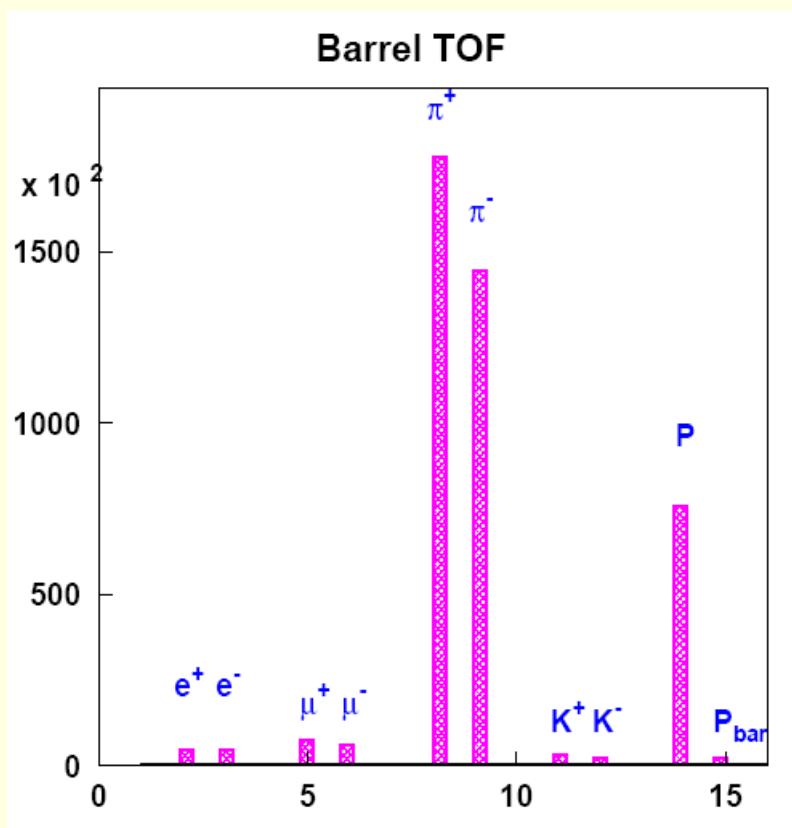
negative



# $\text{Tof}_{\text{wall}} - \text{Tof}_{\text{barrel}}$ coincidence



Charged particles type accepted by Barrel ToF & ToF wall



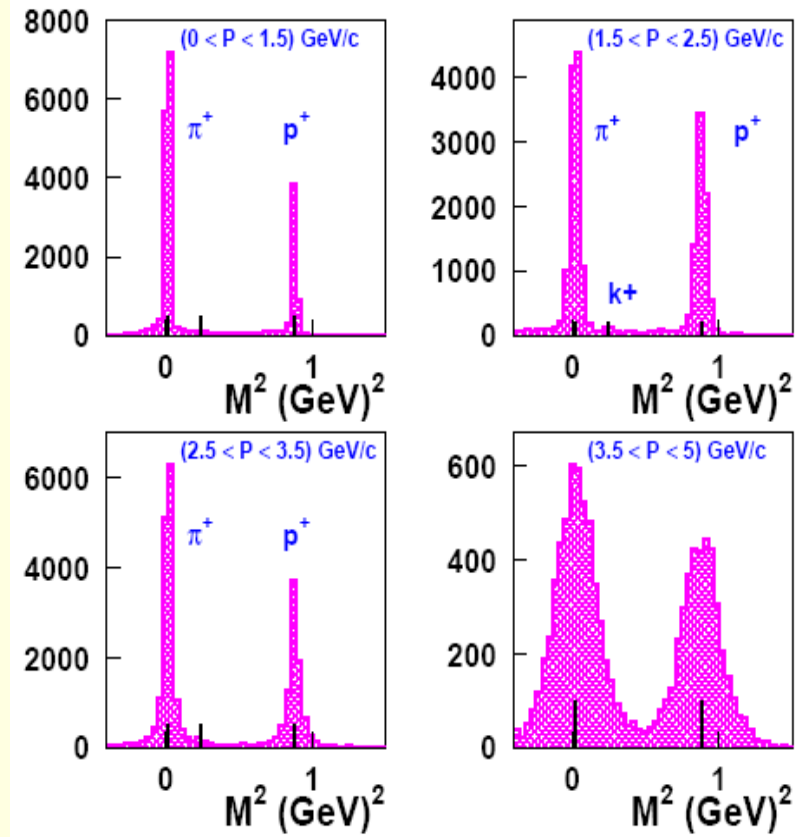
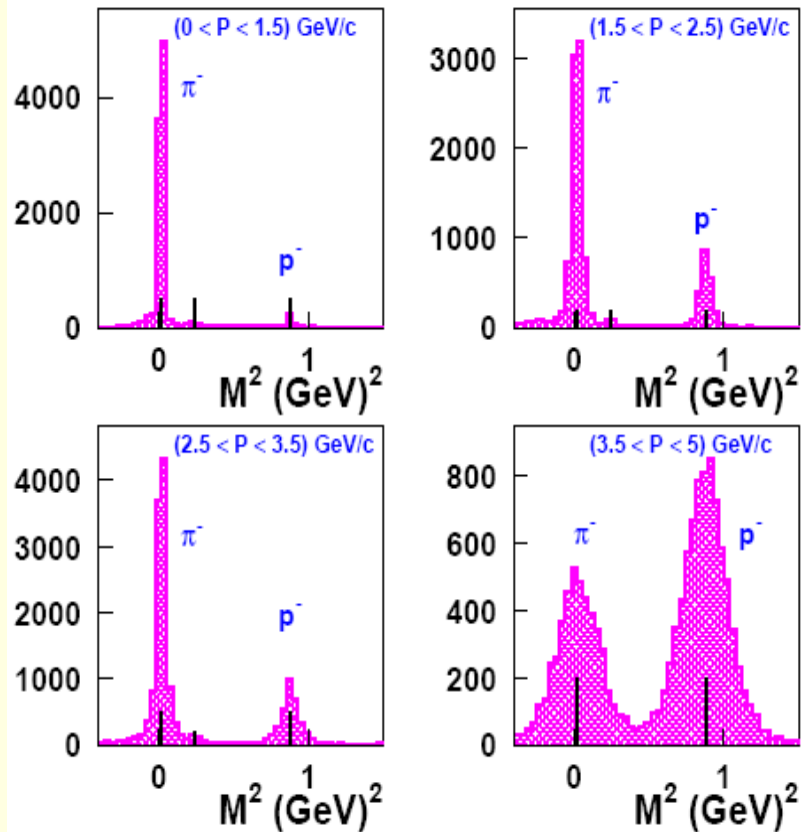
# Tof wall mass reconstruction

in case of  $\pi^-$  accepted by Barrel Tof



negative

positive



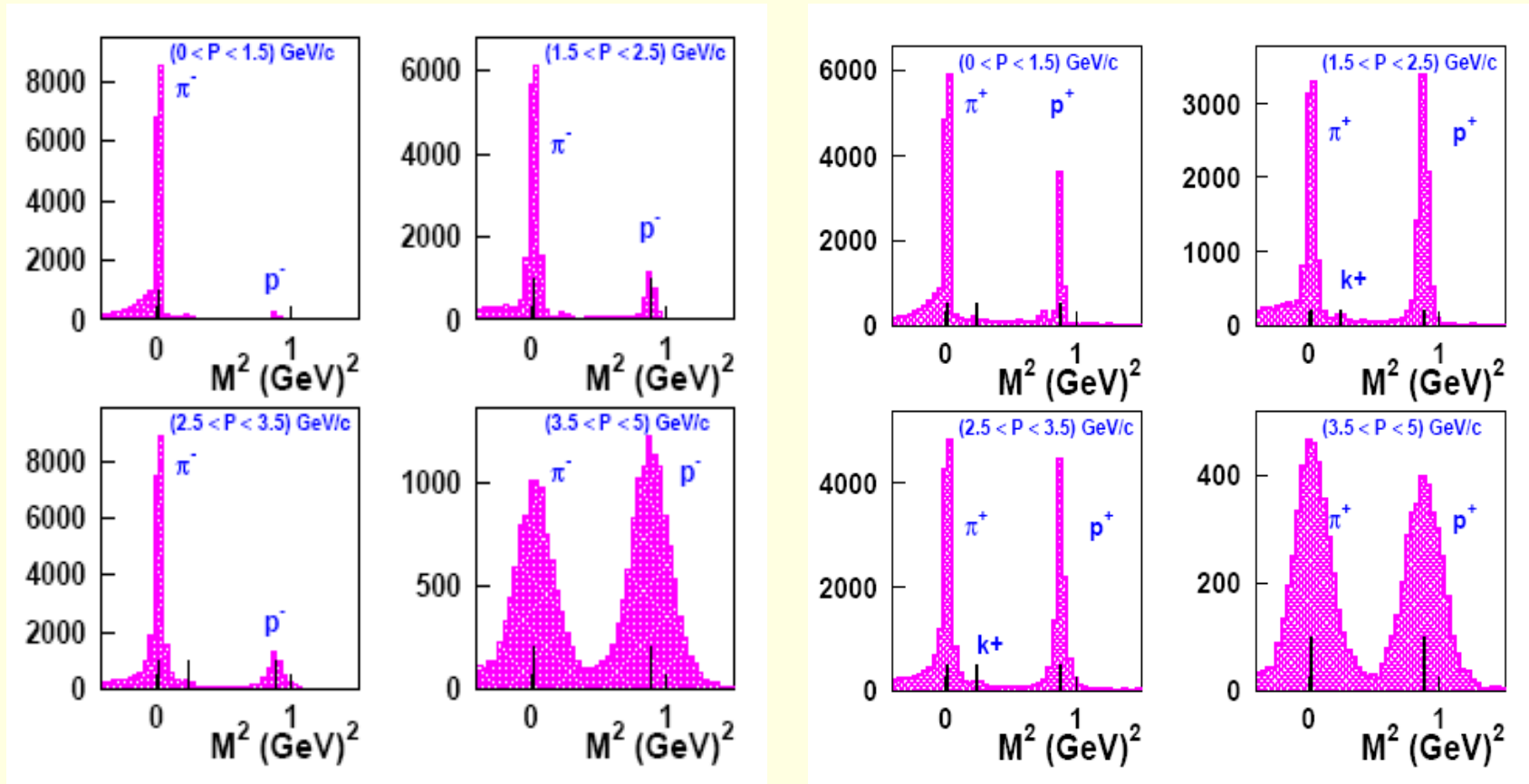
# Tof wall mass reconstruction

in case of  $\pi^+$  accepted by Barrel Tof



negative

positive

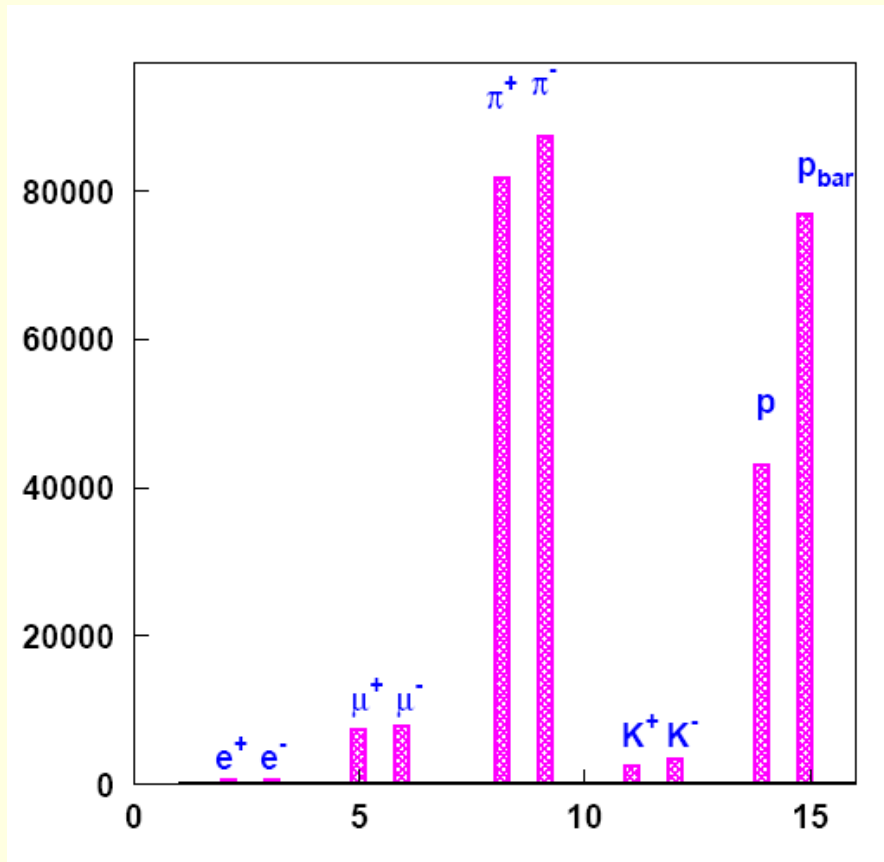




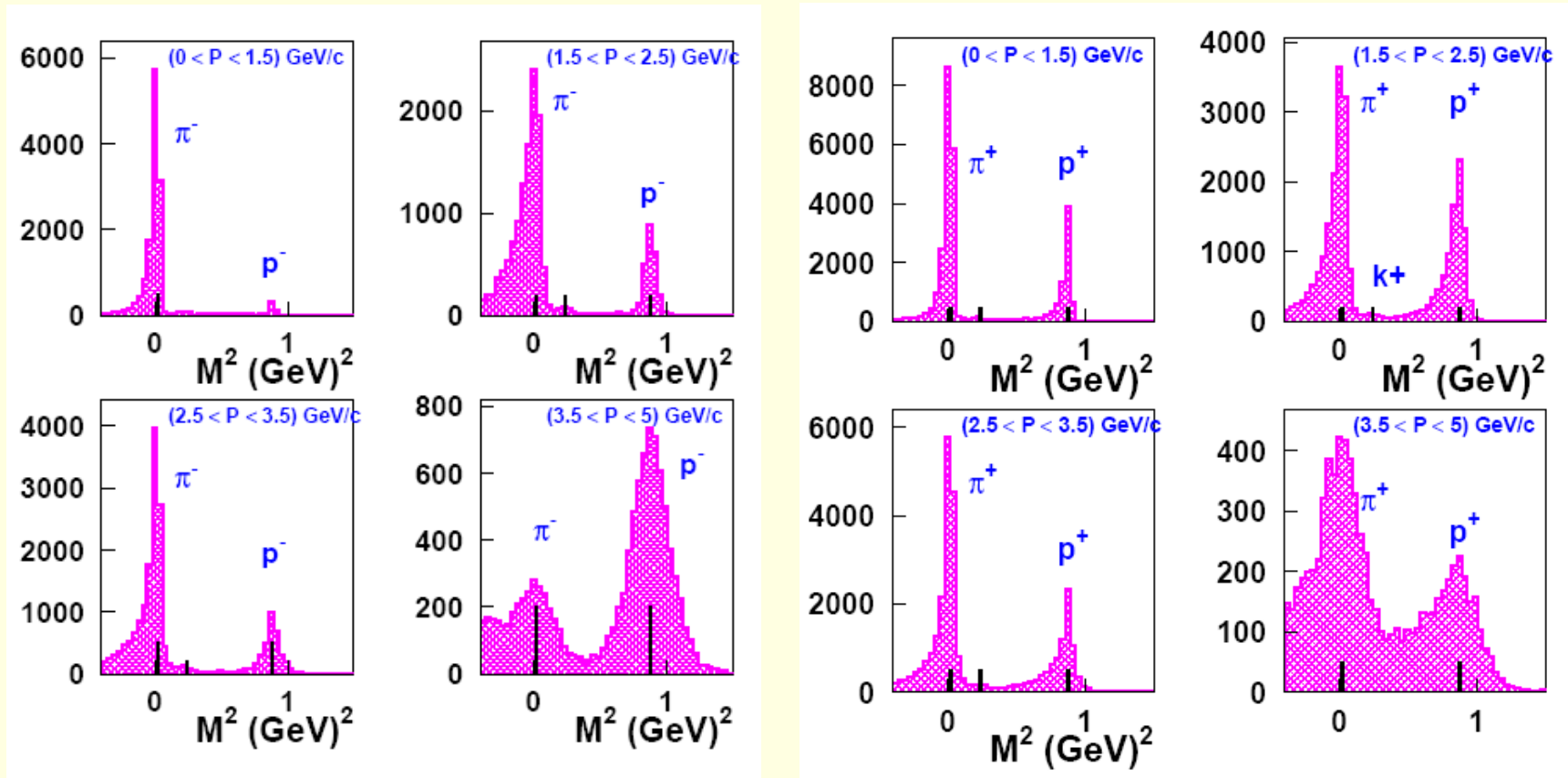
# 2 charged particles (at least) in Tof<sub>wall</sub>



## Charged particles accepted by Tof wall



# Tof wall mass reconstruction in case of $\pi^-$ accepted by Tof wall

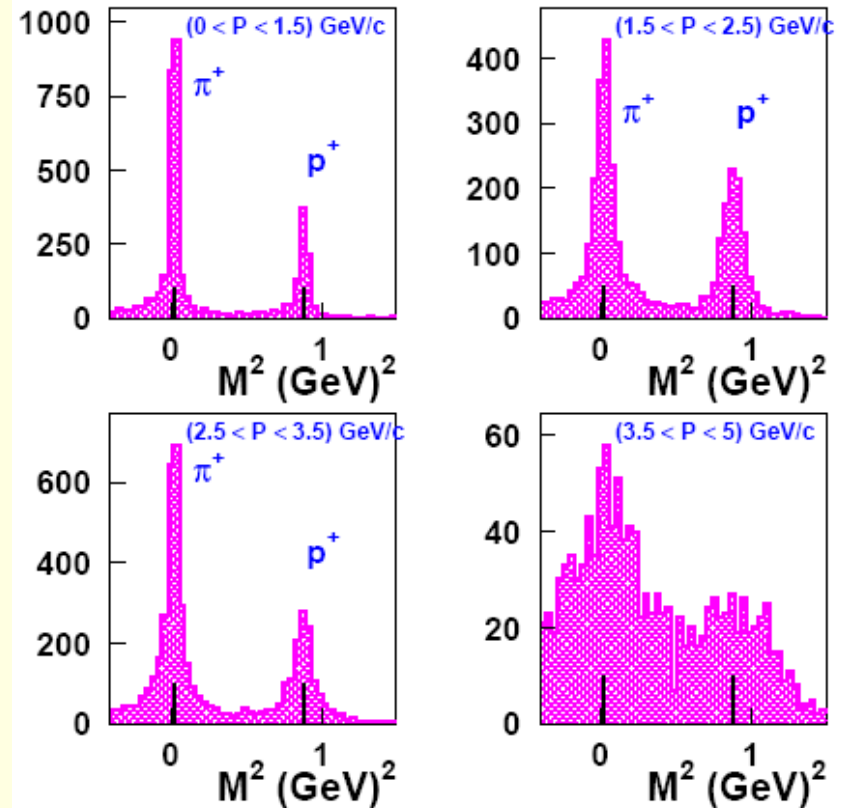
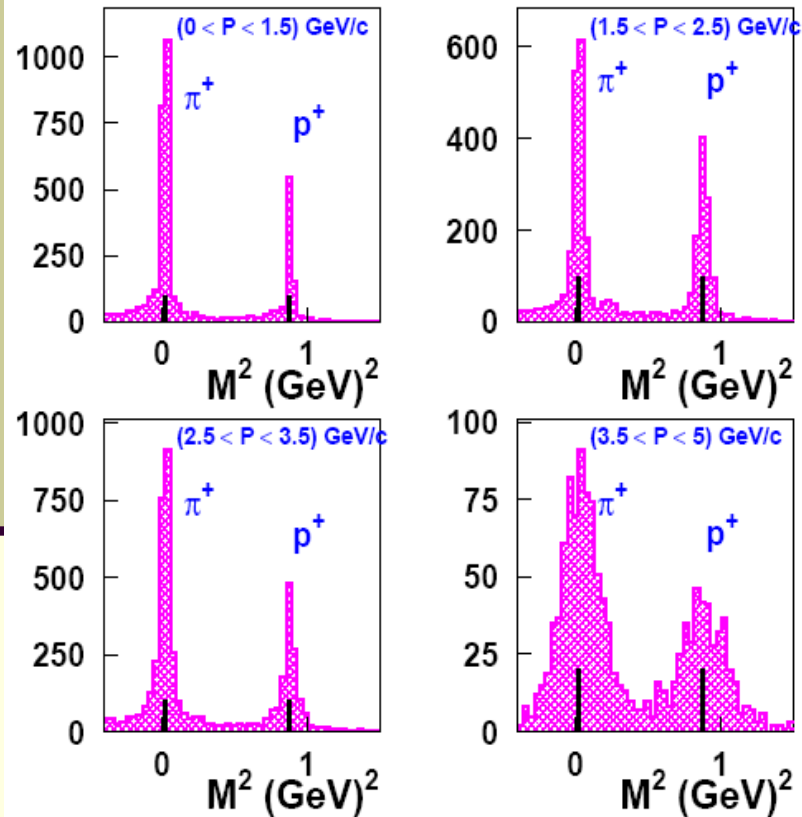


# $Tof_{wall} - Tof_{side}$ The effect of resolution



$(\sigma_{tof} = 100 \text{ ps.})$

$(\sigma_{tof} = 200 \text{ ps.})$



# Summary/Outlook



Pion and proton in the forward direction can be separated using **dtof** – relative time between various TOF sub detectors up to 4 GeV/c with  $\sigma_{\text{tof}} < 200$  ps

- Turn to the PANDA ROOT
- TDR

# Magnetic field in ToF wall area

