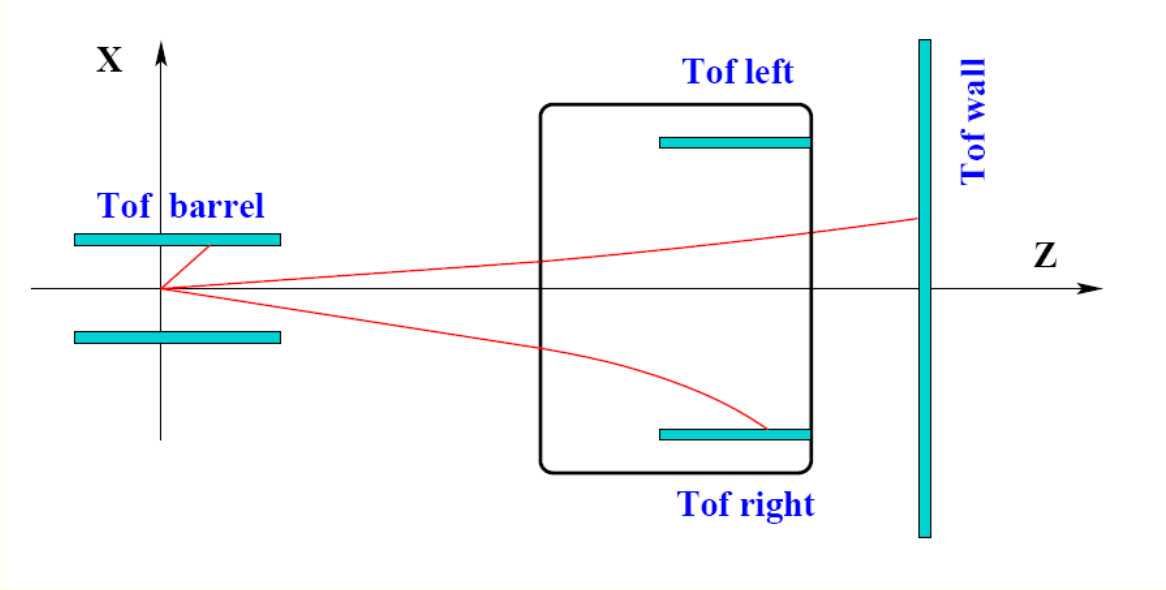
Tof – Tof correlations and PID

Pythia + Geant3 used, $p_{bar}p \rightarrow \Lambda^o (\bar{\Lambda}^o) + X$ @ 15 GeV/c

Geometry

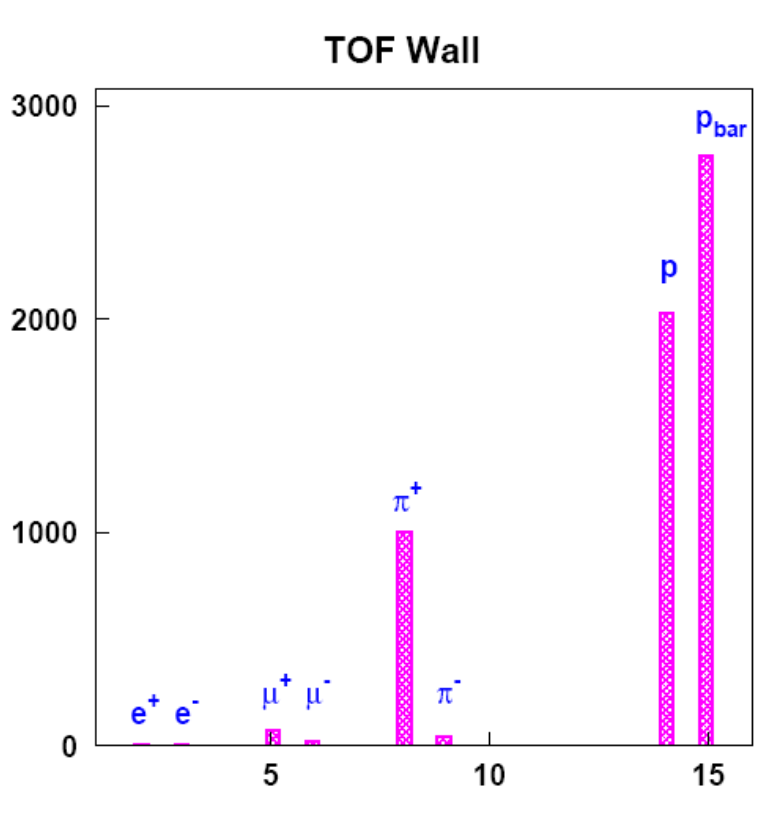


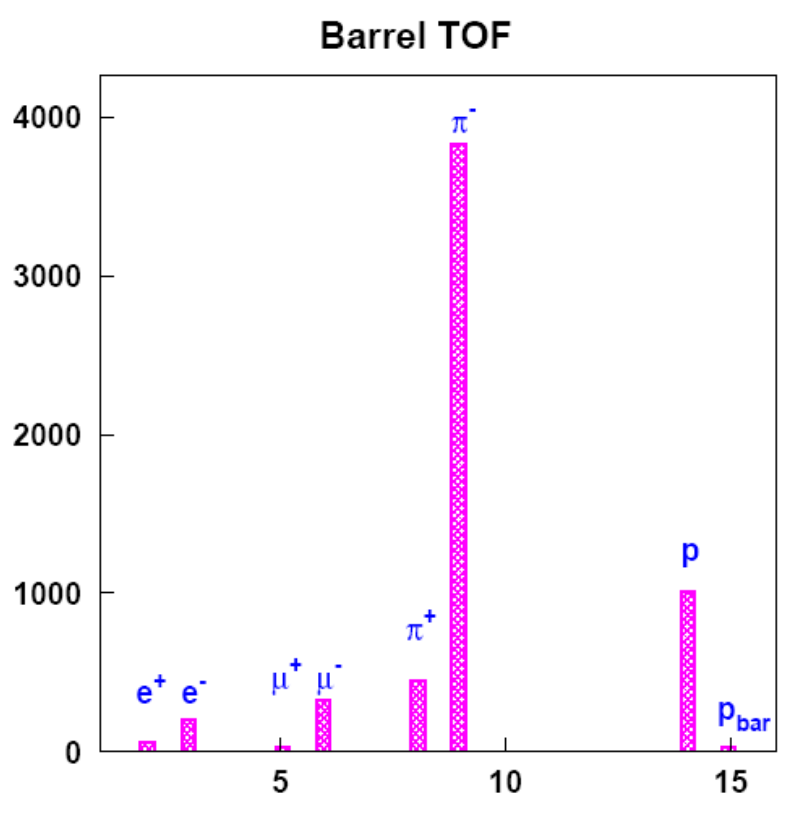
Correlations:

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

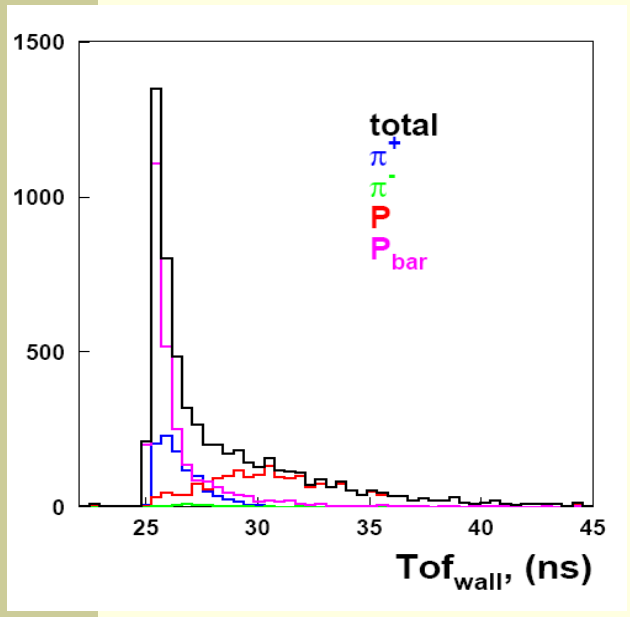
$Tof_{wall} - Tof_{barrel}$ correlations

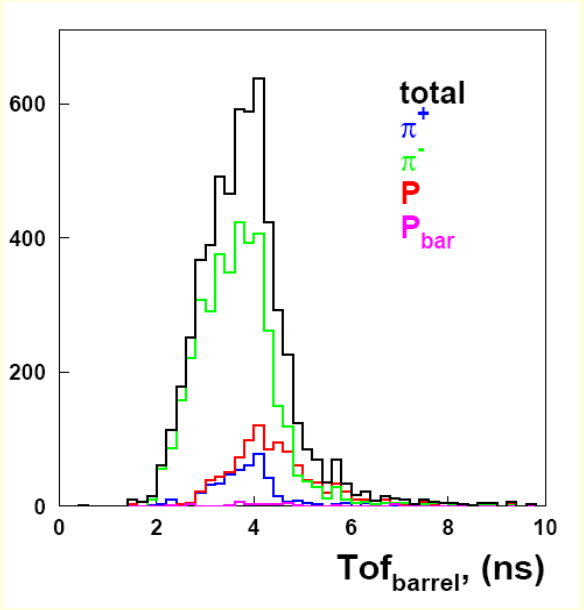
Charged particles accepted by Tof wall & Barrel Tof

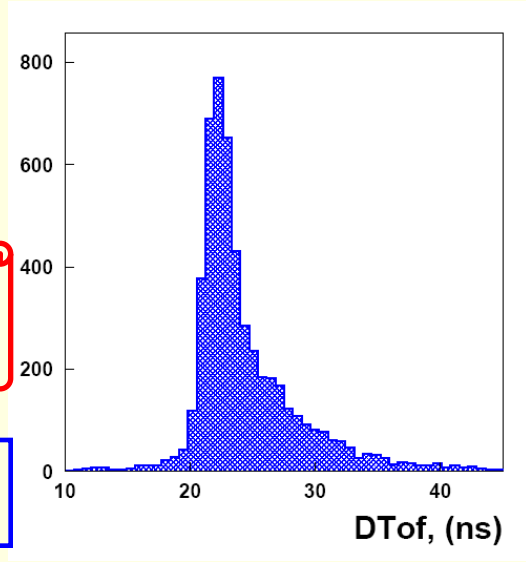




$Tof_{wall} - Tof_{barrel}$ correlations







$\pi^{+/-}$ - main yield to the barrel time of flight distribution (~80.6%)

Relative Tof

$dtof = Tof_{wall} - Tof_{barrel}$

Tof wall mass reconstruction

using particles detected by barrel Tof

From the reconstructed event we know:

– particle's charge (C_{wall}, C_{barrel})

– momentum (P_{wall}, P_{barrel})

– track length (L_{wall}, L_{barrel})

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

This we used for PID

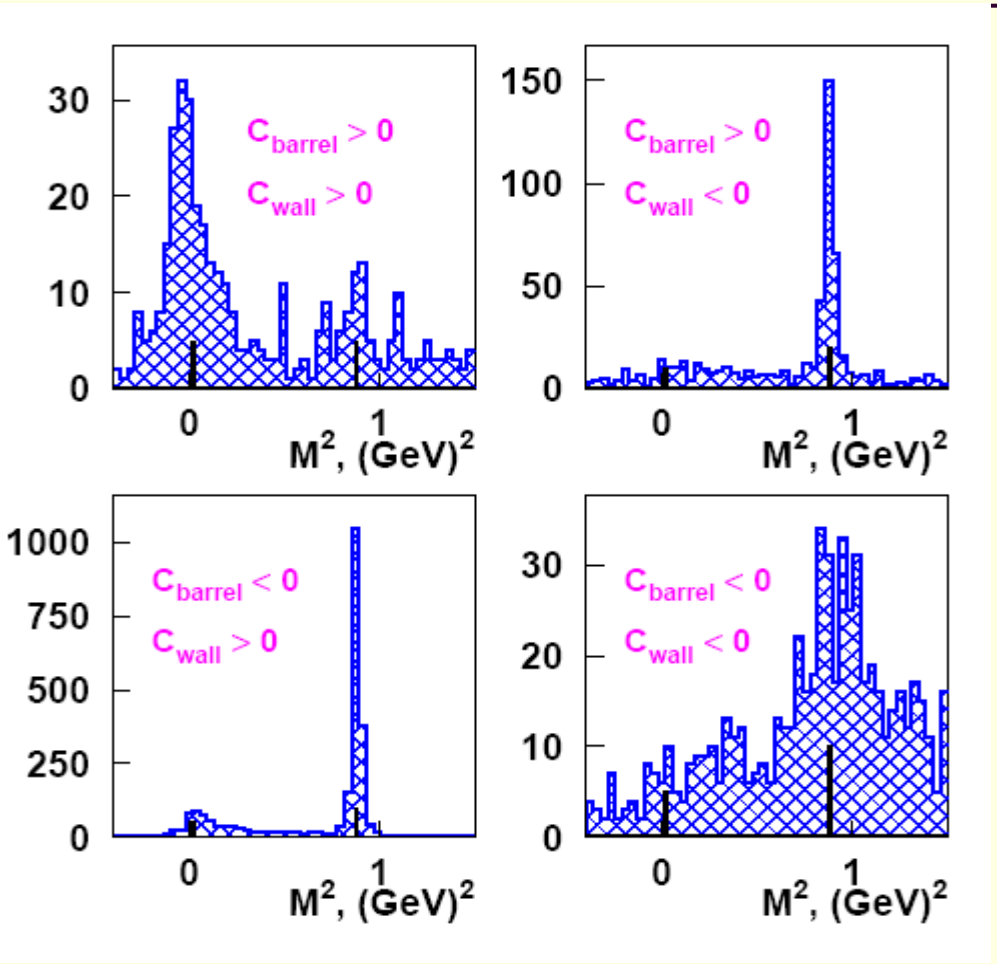
$$tof^{calc}_{barrel}(\pi) = \frac{L_{barrel}}{c}\sqrt{1+\left(\frac{m_{\pi}}{p_{barrel}}\right)^2}$$

$$Tof_{wall} = \overline{d_{tof}} + tof^{calc}_{barrel}(\pi)$$

We assume

Tof wall mass reconstruction

in case of pion accepted by barrel Tof

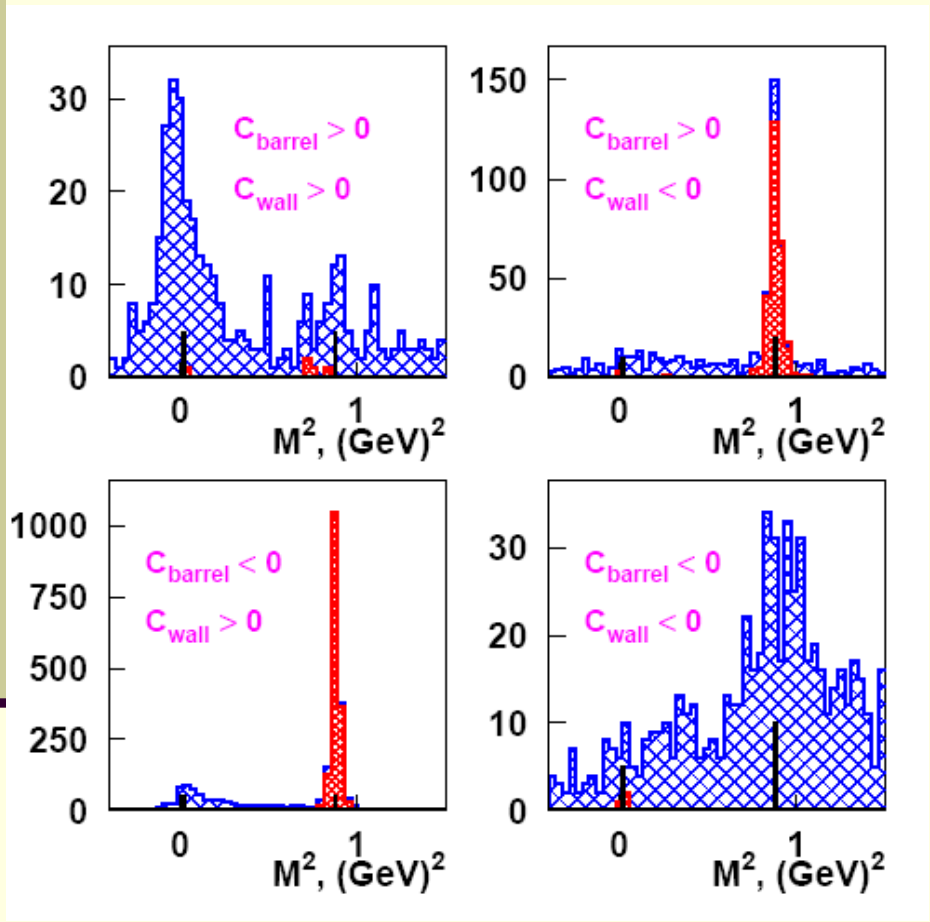


$$m_{wall} = \frac{P_{wall}}{c}\sqrt{\frac{c^2 tof_{wall}^2}{L_{wall}^2} - 1}$$

$C_{barrel} > 0 \& C_{wall} > 0$
$C_{barrel} > 0 \& C_{wall} < 0$
$C_{barrel} < 0 \& C_{wall} > 0$
$C_{barrel} < 0 \& C_{wall} < 0$

Tof wall mass reconstruction

in case of pion accepted by barrel Tof



Red colour – particles accepted by TOF Wall and Barrel TOF have the same vertex.

$C_{barrel} > 0 \& C_{wall} < 0 \rightarrow \pi^+ p_{bar}$ $(\overline{\Lambda^o})$

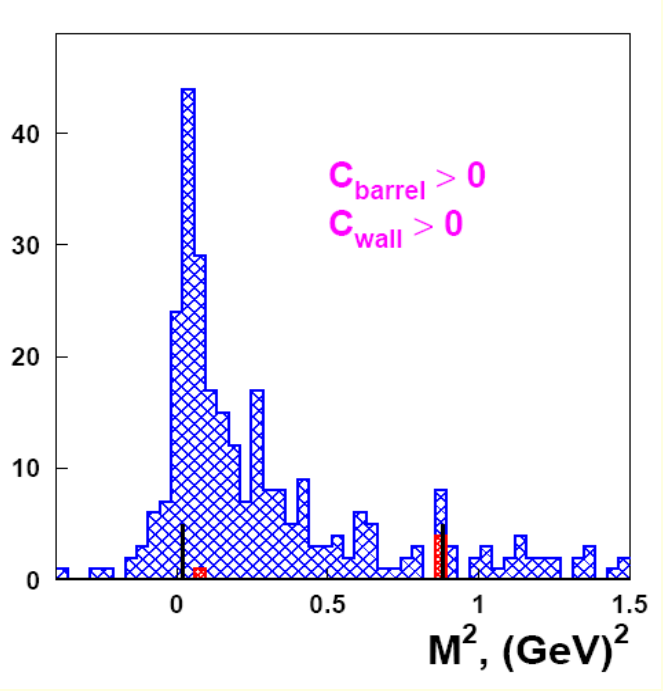
$C_{barrel} < 0 \& C_{wall} > 0 \rightarrow \pi^- p$ (Λ^o)

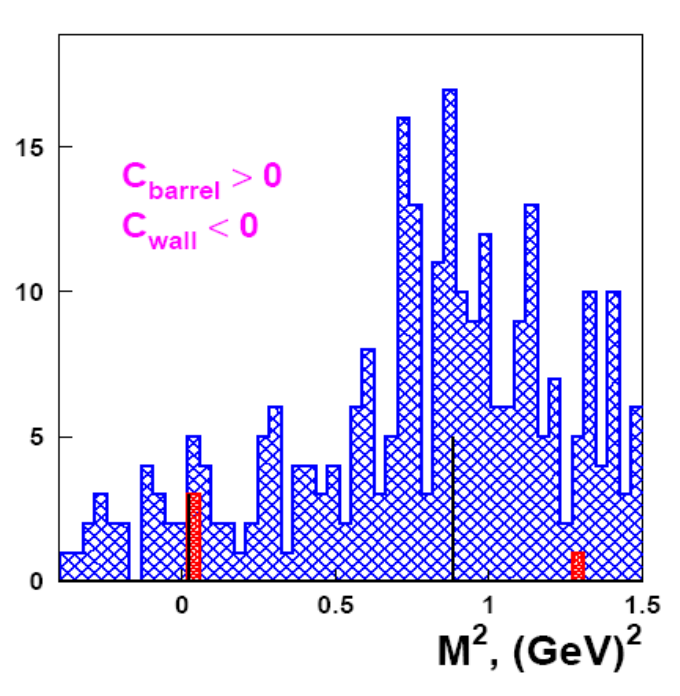
Tof wall mass reconstruction

in case of proton accepted by barrel Tof

$$tof^{calc}_{barrel}(p) = \frac{L_{barrel}}{c}\sqrt{1+\left(\frac{m_p}{p_{barrel}}\right)^2}$$

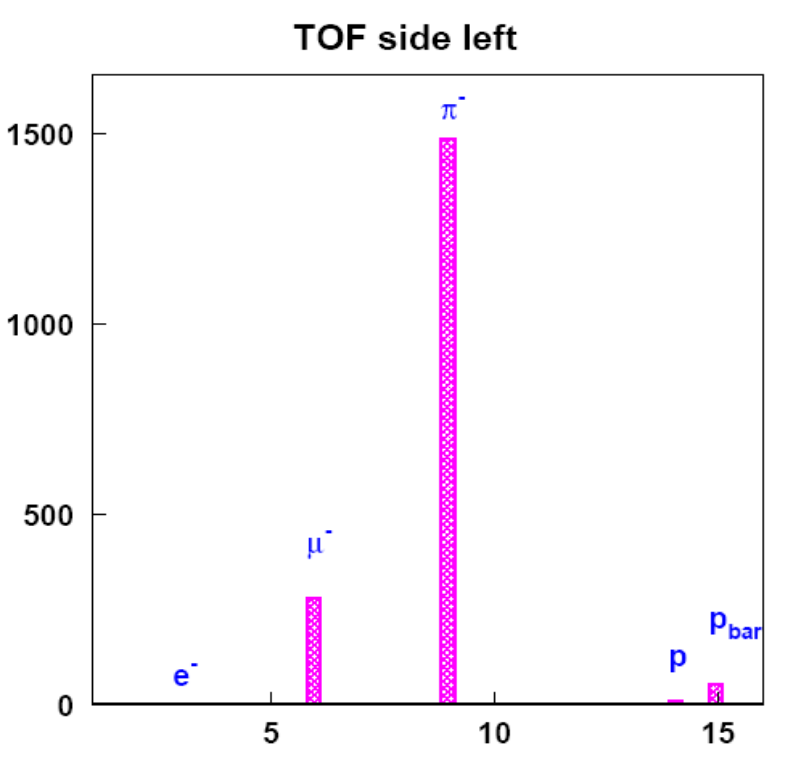
$$Tof_{wall} = \overline{dtof} + tof^{calc}_{barrel}(p)$$

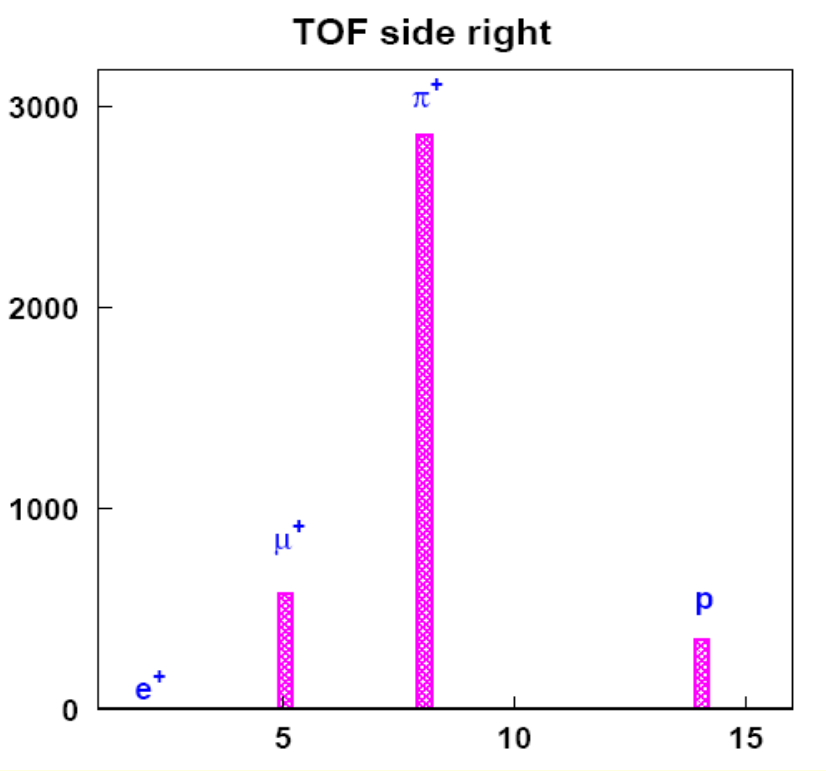




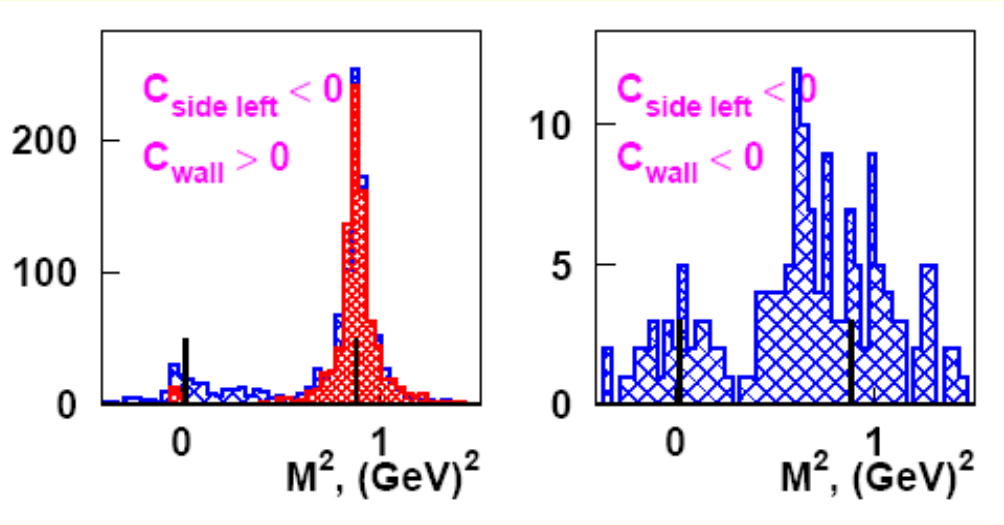
$Tof_{wall} - Tof_{side}$ correlations

Charged particles accepted by Tof side left & Tof side right

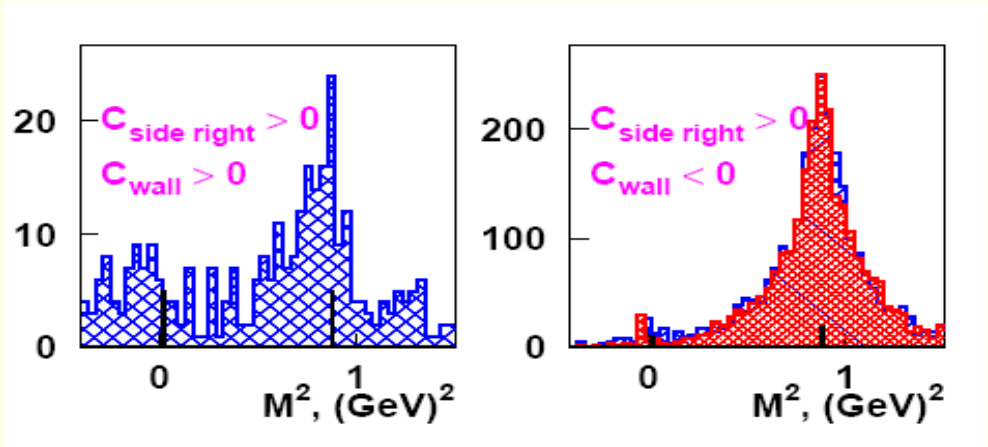




$Tof_{wall} - Tof_{side}$ correlations

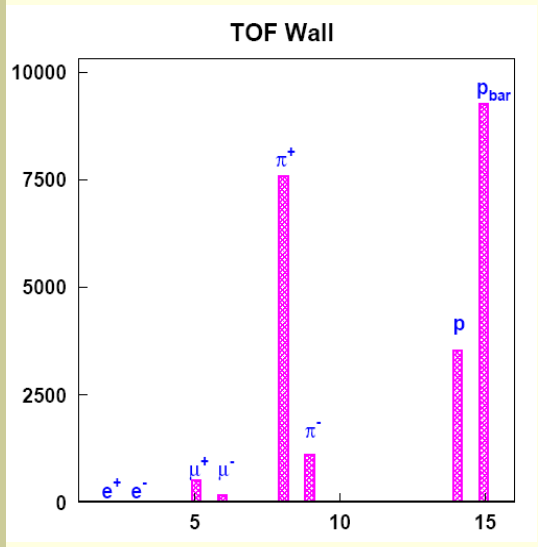


Tof wall mass reconstruction
(π^- accepted by Tof side left)



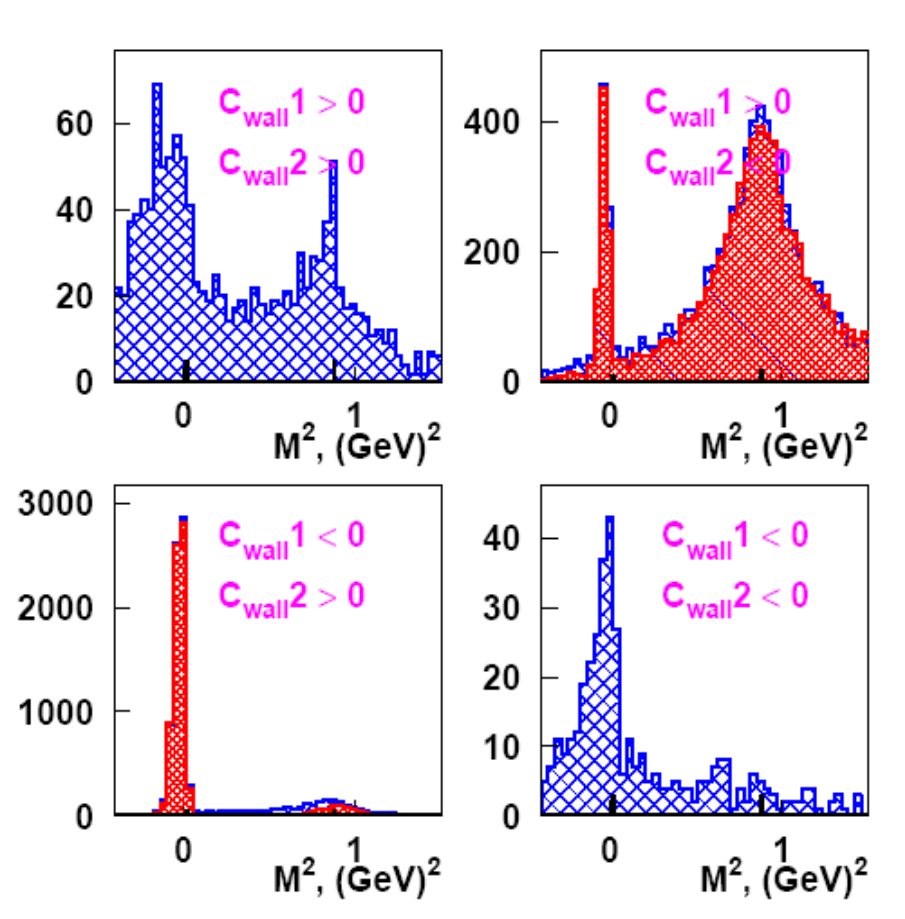
Tof wall mass reconstruction
(π^+ accepted by Tof side right)

Tof_{wall} – Tof_{wall} correlations



Tof wall mass reconstruction
(π- accepted by Tof wall)

$\pi^+ \pi^+$	$(\pi^+\pi^-)$, $(\pi^+ p_{bar})$
$(\pi^-\pi^+)$,$(\pi^- p)$	$\pi^- \pi^-$



Summary/Outlook

Mass of the particle's accepted by Tof wall reconstructed using dtof – relative time between different TOF sub detectors.

This method could help us for PID in the Forward direction.

Investigation of other possibility for PID in the Forward direction without start detector (T_o)