π^0 Cross analysis for $x_B = 0.36$

Mongi Dlamini
DVCS Collaboration Meeting

Ohio University

January 26, 2018

Introduction

- The goal is to extract a π^0 production cross section as a function of kinematic variables Q^2, t, x_B, ϕ_e and ϕ_π parametrized as:

$$\frac{d^5\sigma}{dQ^2 dx_B dt d\phi_e d\phi_\pi} = \Gamma \frac{d^2\sigma}{dt d\phi_\pi}$$
$$\Gamma = \frac{\alpha}{2\pi}\frac{K}{Q^2}\frac{k'}{k}\frac{1}{1-\epsilon}$$
$$\frac{d^2\sigma}{dt d\phi_\pi} = \frac{d^2\sigma_T}{dt d\phi_\pi} + \epsilon\frac{d^2\sigma_L}{dt d\phi_\pi} + \sqrt{2\epsilon(1+\epsilon)}\frac{d^2\sigma_{LT}}{dt d\phi_\pi}\cdot cos(\phi_\pi)$$
$$+\epsilon\frac{d^2\sigma_{TT}}{dt d\phi_\pi}\cdot cos(2\phi_\pi) + h\sqrt{2\epsilon(1-\epsilon)}\frac{d^2\sigma_{LT'}}{dt d\phi_\pi}\cdot sin(\phi_\pi) \quad (1)$$

Total polarization part - 3 parameters to be fitted with one beam energy.
Polarized part.

Summary of Kinematics

Table : Kinematic Information

Kinematic setting	E_B (GeV)	Q^2 (GeV^2)
Kin36_1	7.35	3.2
Kin36_2	8.52	4.0
Kin36_3	10.59	4.7

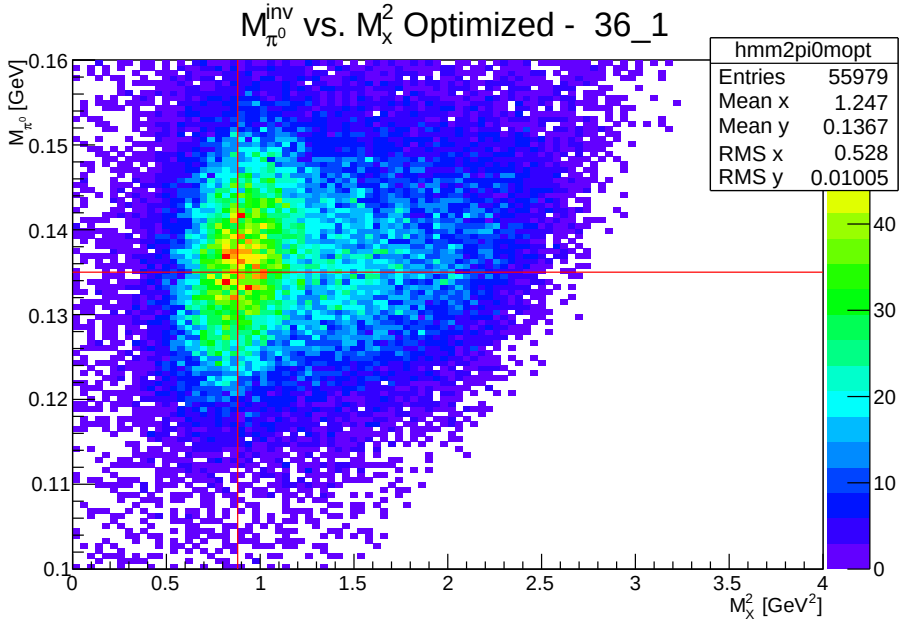
Table : Clustering Information

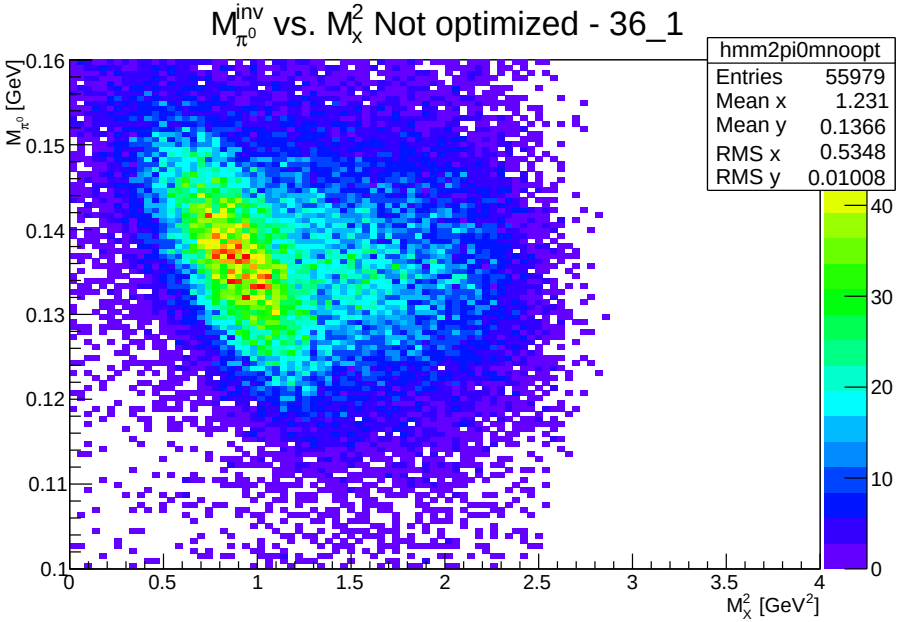
Information	Kin36_1	Kin36_2	Kin36_3
DAQ threshold (GeV)	1.1	1.48	1.48
Expected γ^{DVCS} energy (GeV)	4.5	5.2	6.5
TriggerSim threshold(GeV)	1.2	1.5	1.5

M_X^2 Optimization (before event selection)

Rotation of M_X^2 about average of $M_{inv}^{\pi^0}$ - removes the correlation between the two.

The same has to be applied to simulation.

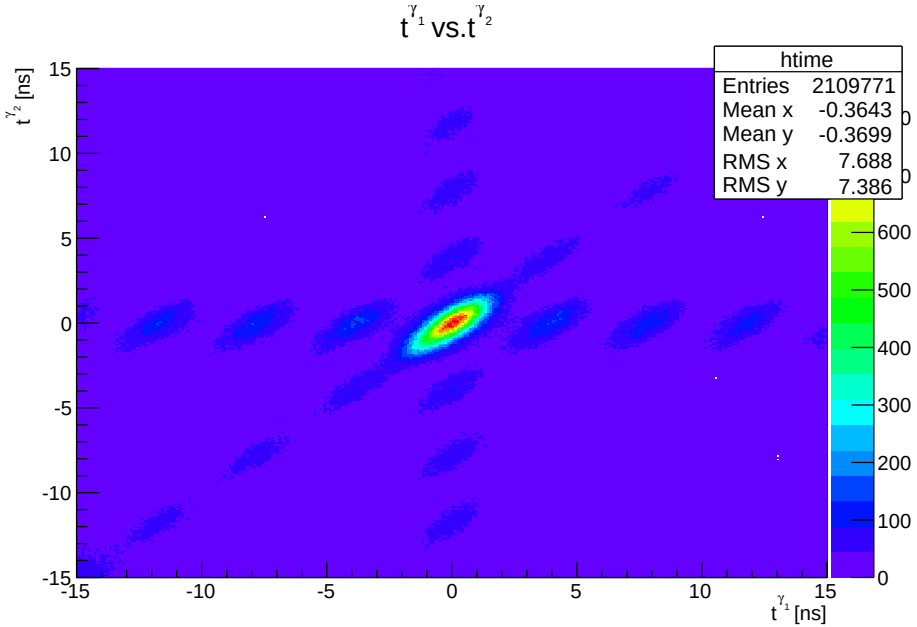


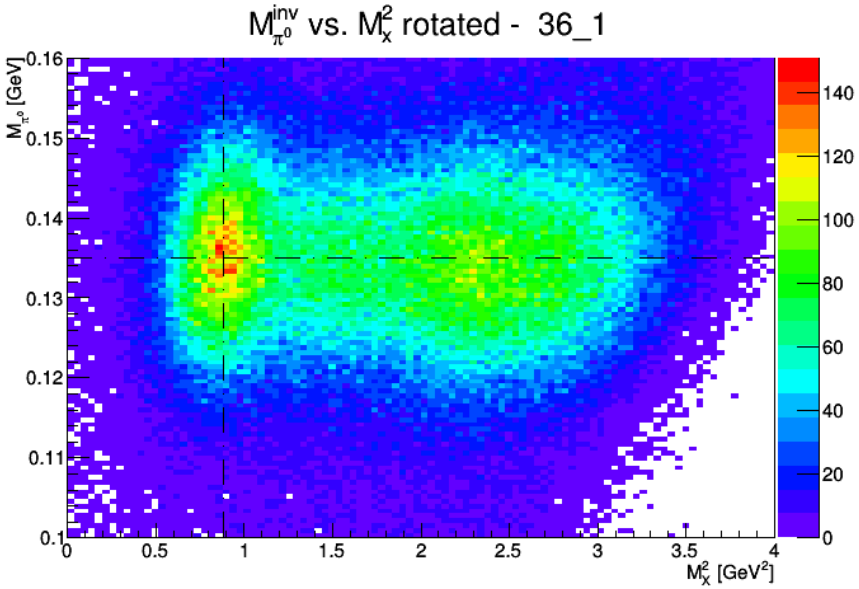


← after rotation.

Exclusive events - selection

Exclusivity cuts
M_X^2 rotation allows to
make 1D cuts for exclusivity →





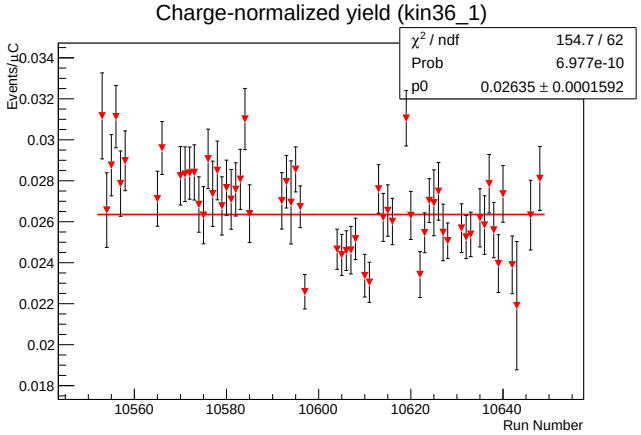
Time cuts and accidentals:

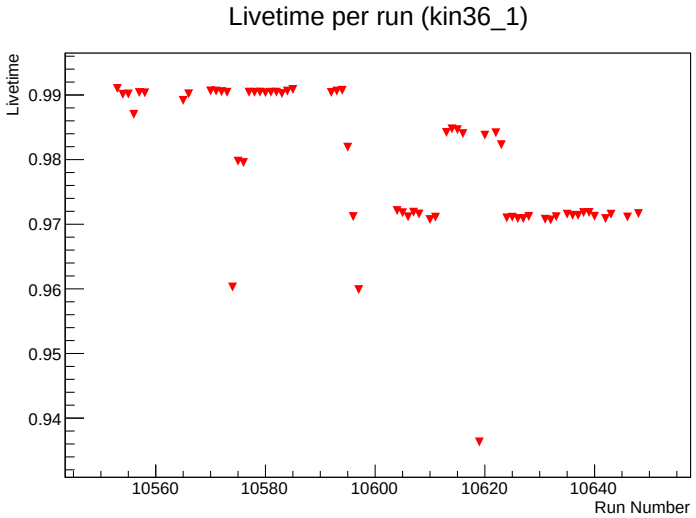
- $e\gamma\gamma$ pure randoms - everywhere
- $e\gamma\gamma$ acc. π^0 - diagonal
- $e\gamma\gamma$ one acc. γ - horizontals

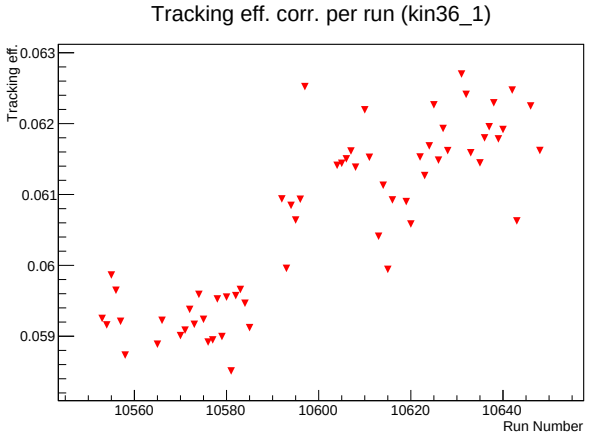
Yield stability check - kin36_1

$$\frac{N}{\eta_{track}} = \frac{N_{coinc} - N_{acc1} - N_{acc2} + N_{acc3}}{LT \cdot Charge}$$

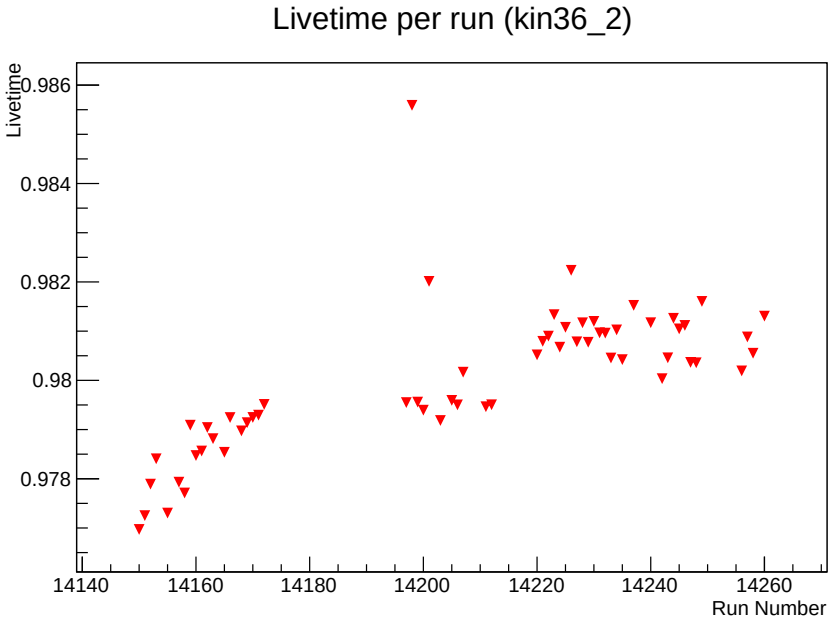
$$\eta_{track} = tracking\ efficiency\ - H.Rashad. \quad (2)$$

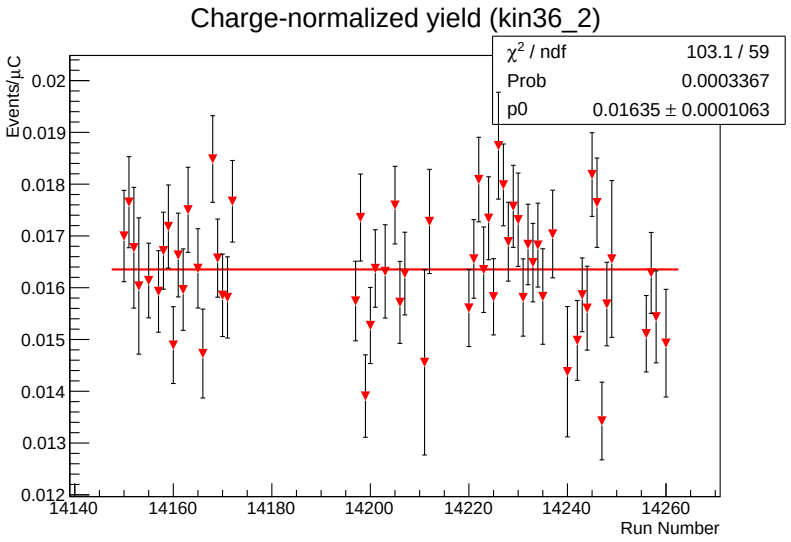


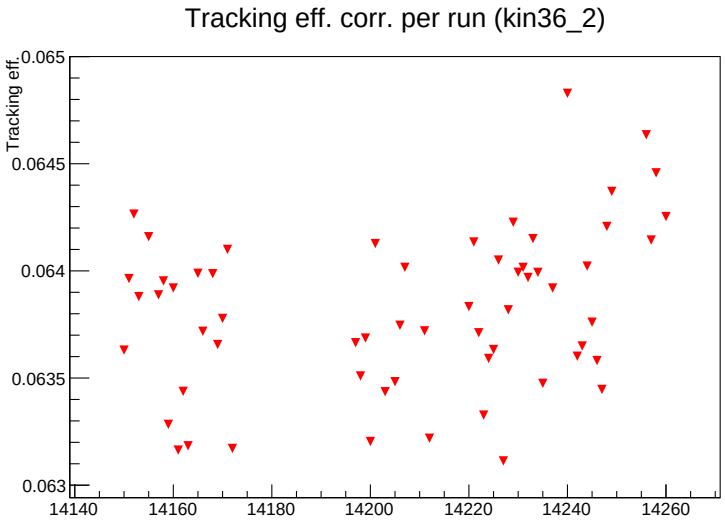




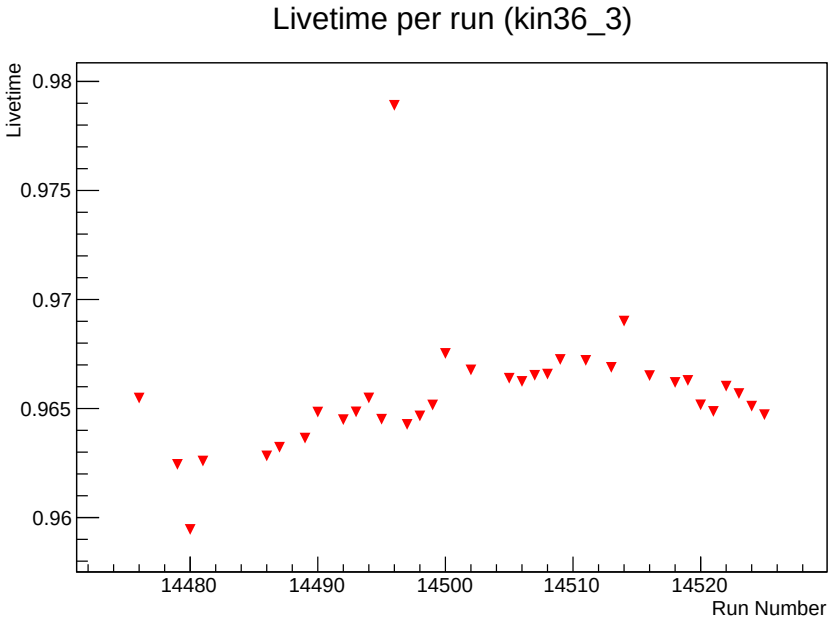
Yield stability check - kin36_2

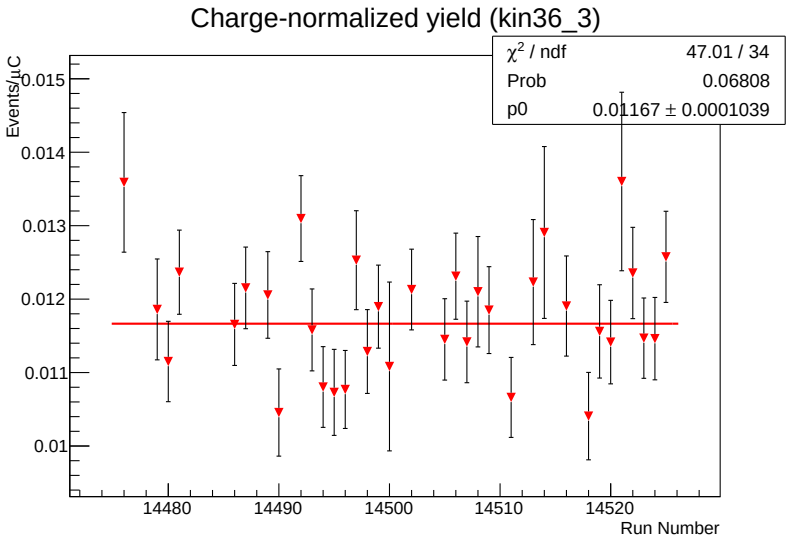


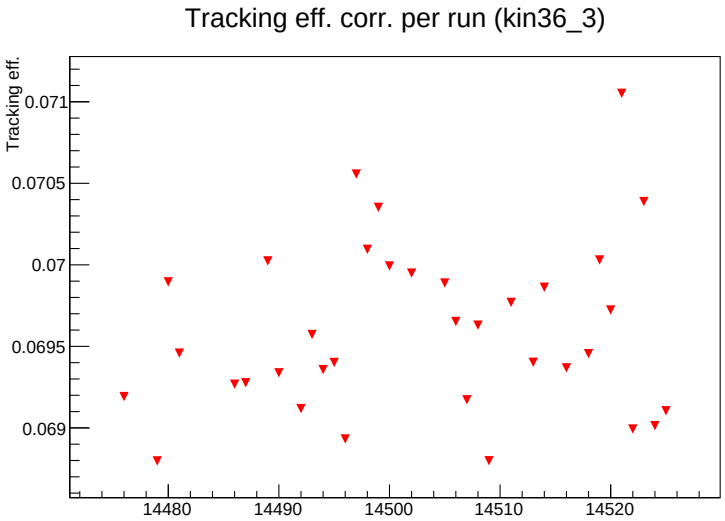




Yield stability check - kin36_3



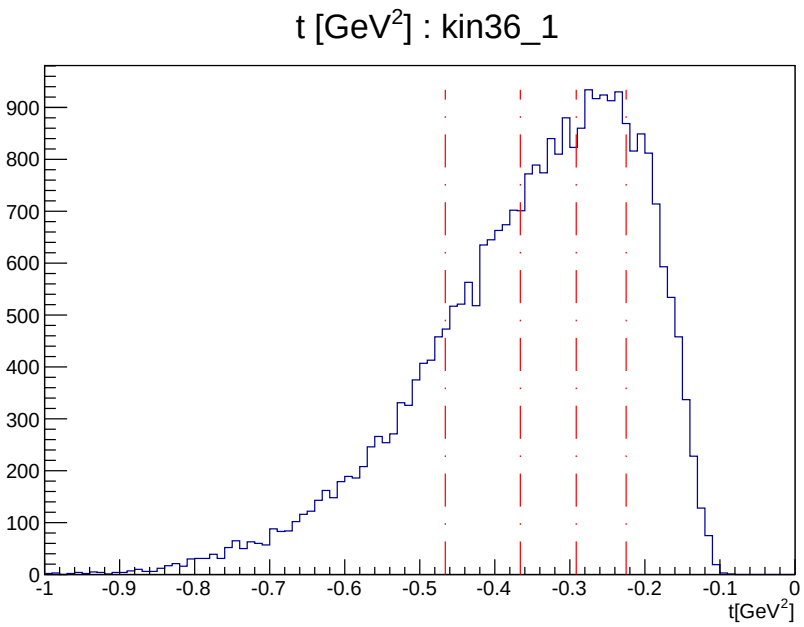


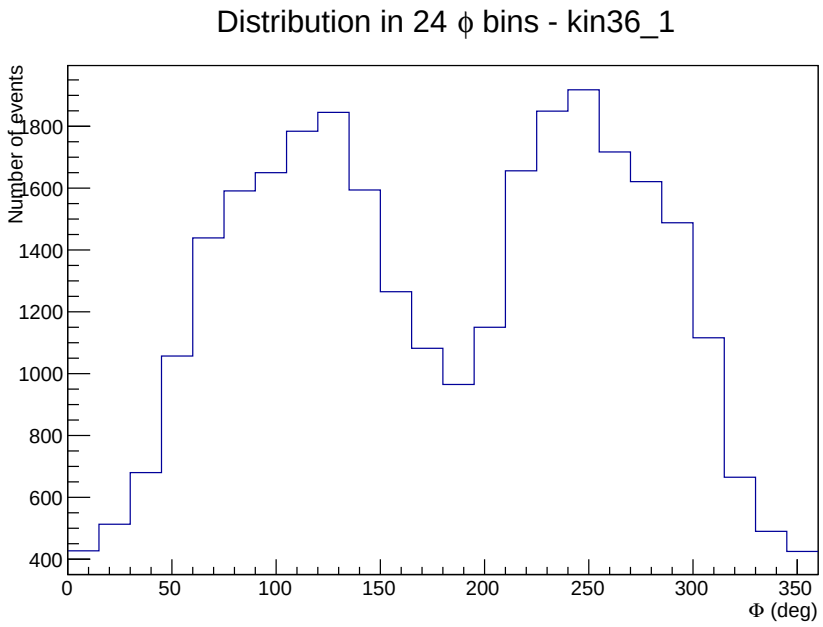


Data sample kin36_1

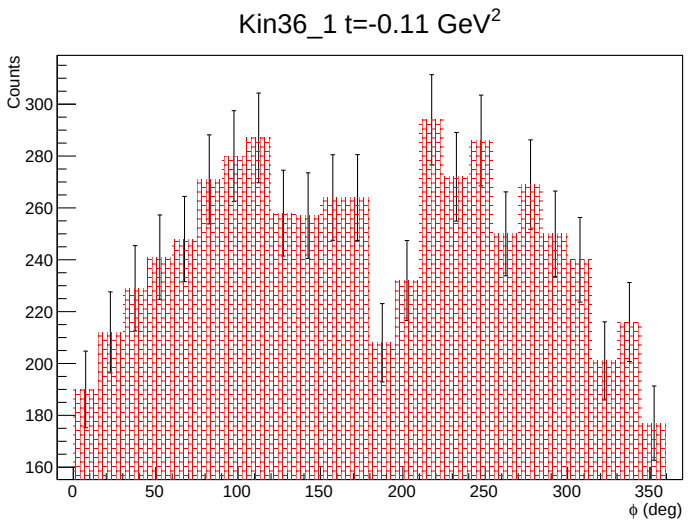
5 bins in t.

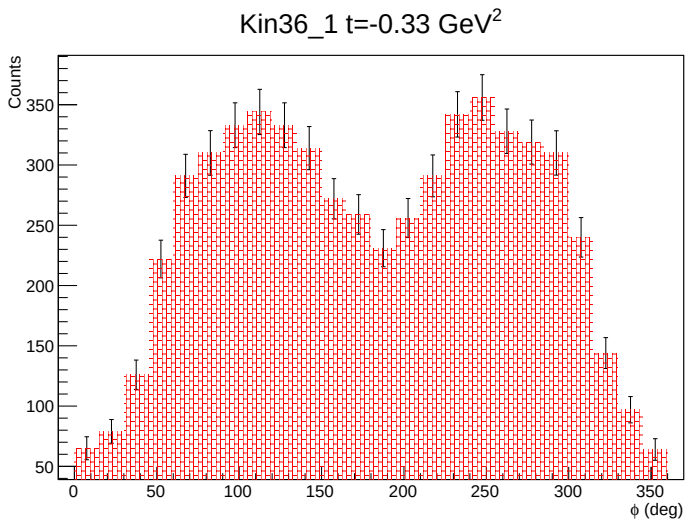
24 ϕ bins.

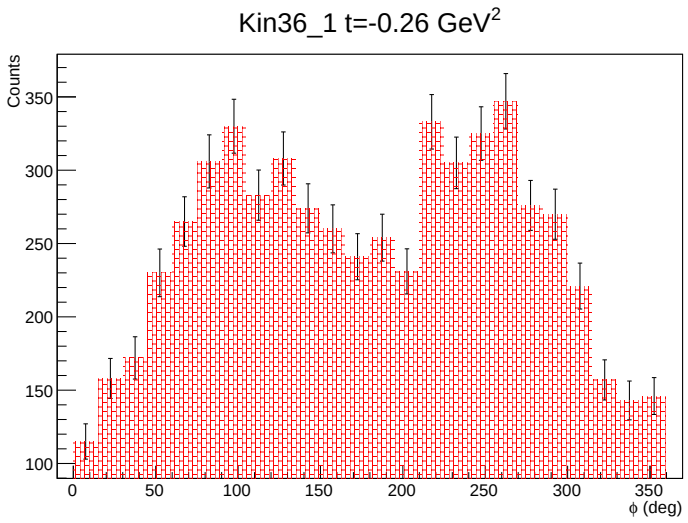


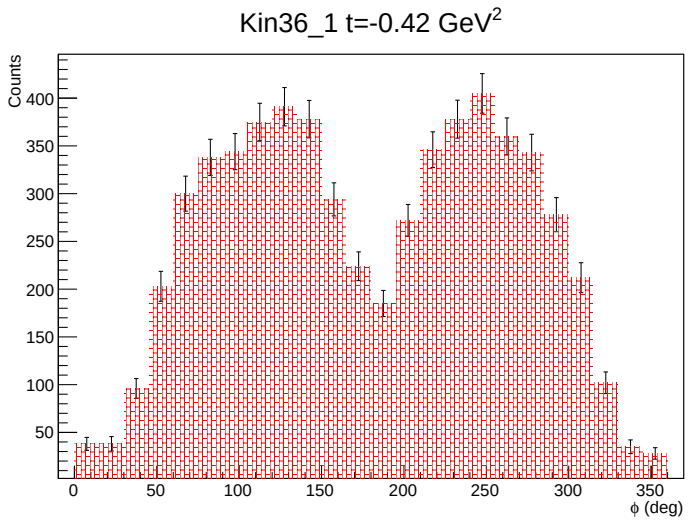


Data sample kin36_1

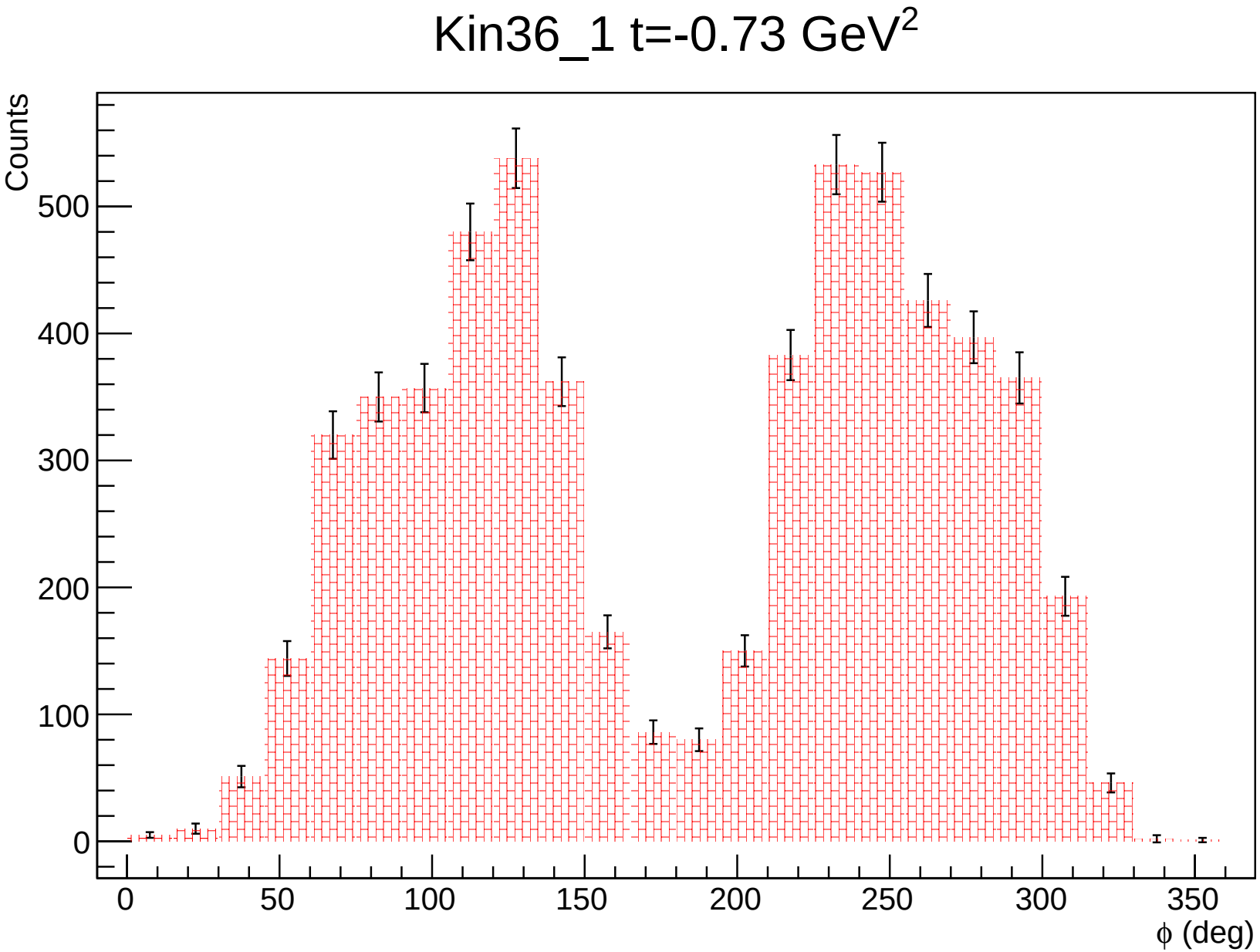




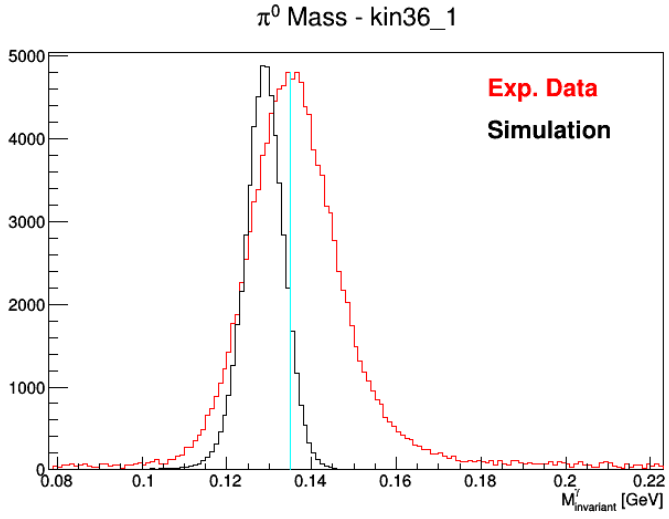


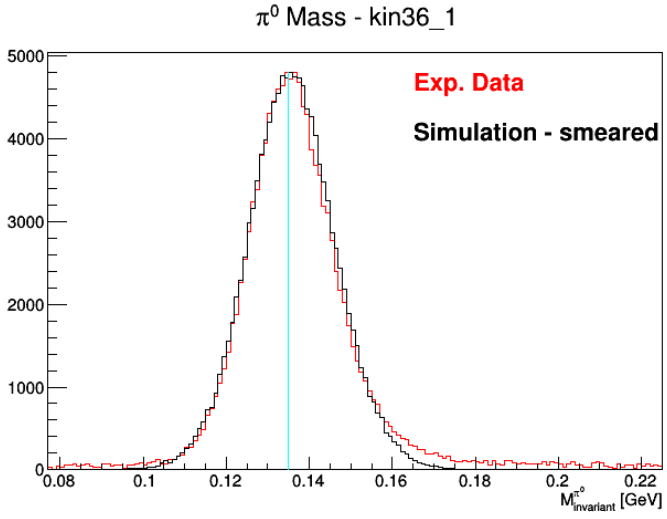


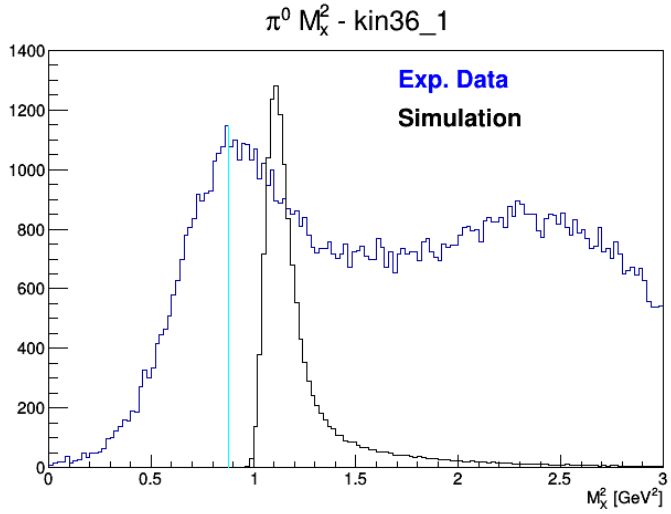
Data sample kin36_1

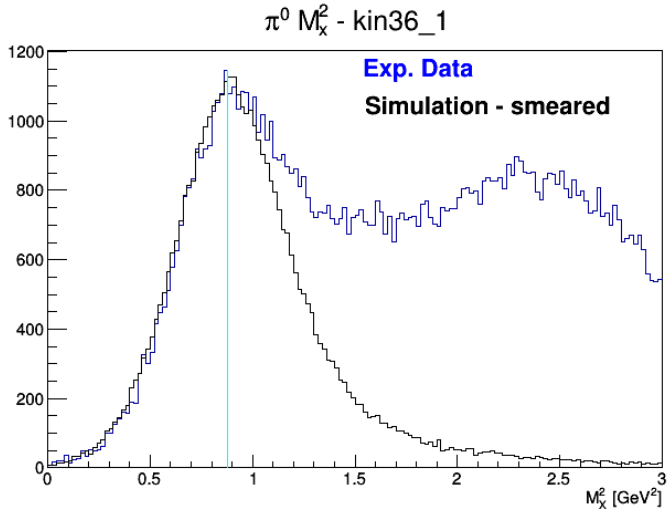


Simulation: Calibration and smearing kin36_1





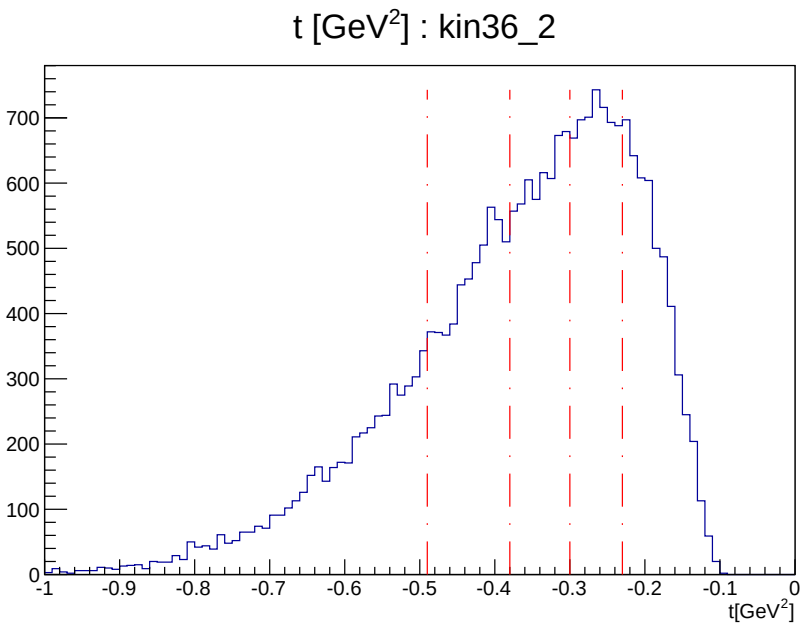


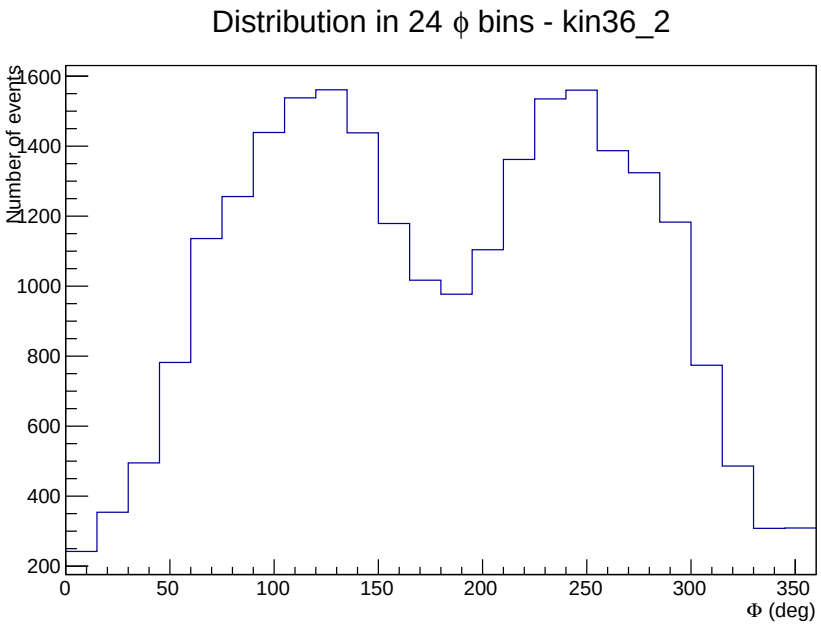


Data sample kin36_2

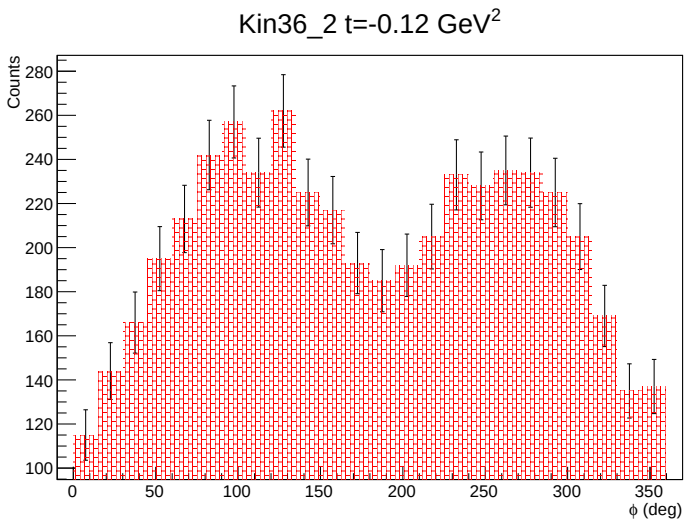
5 bins in t.

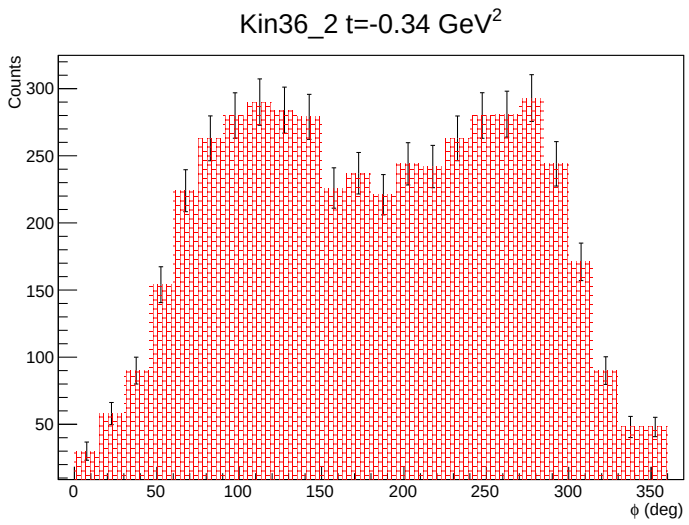
24 ϕ bins.

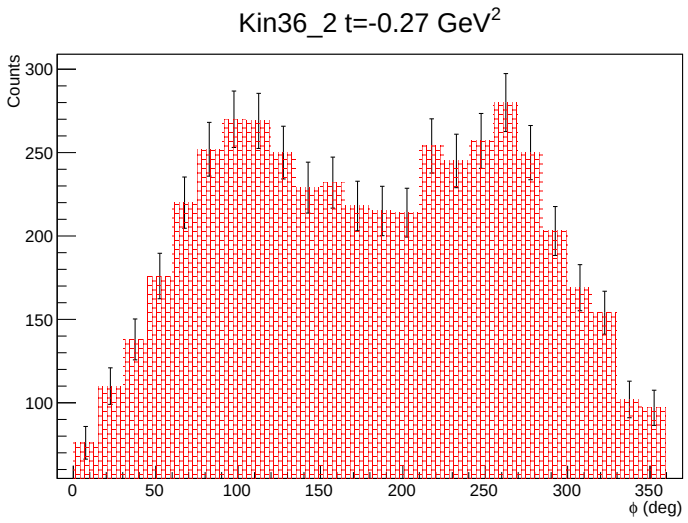


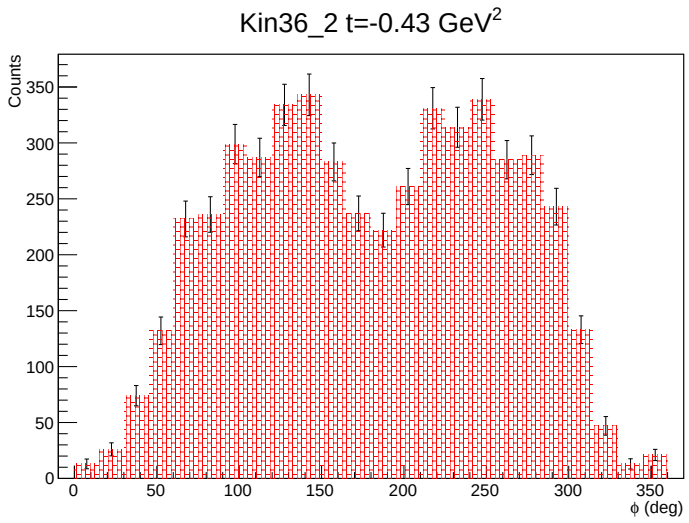


Data sample kin36_2

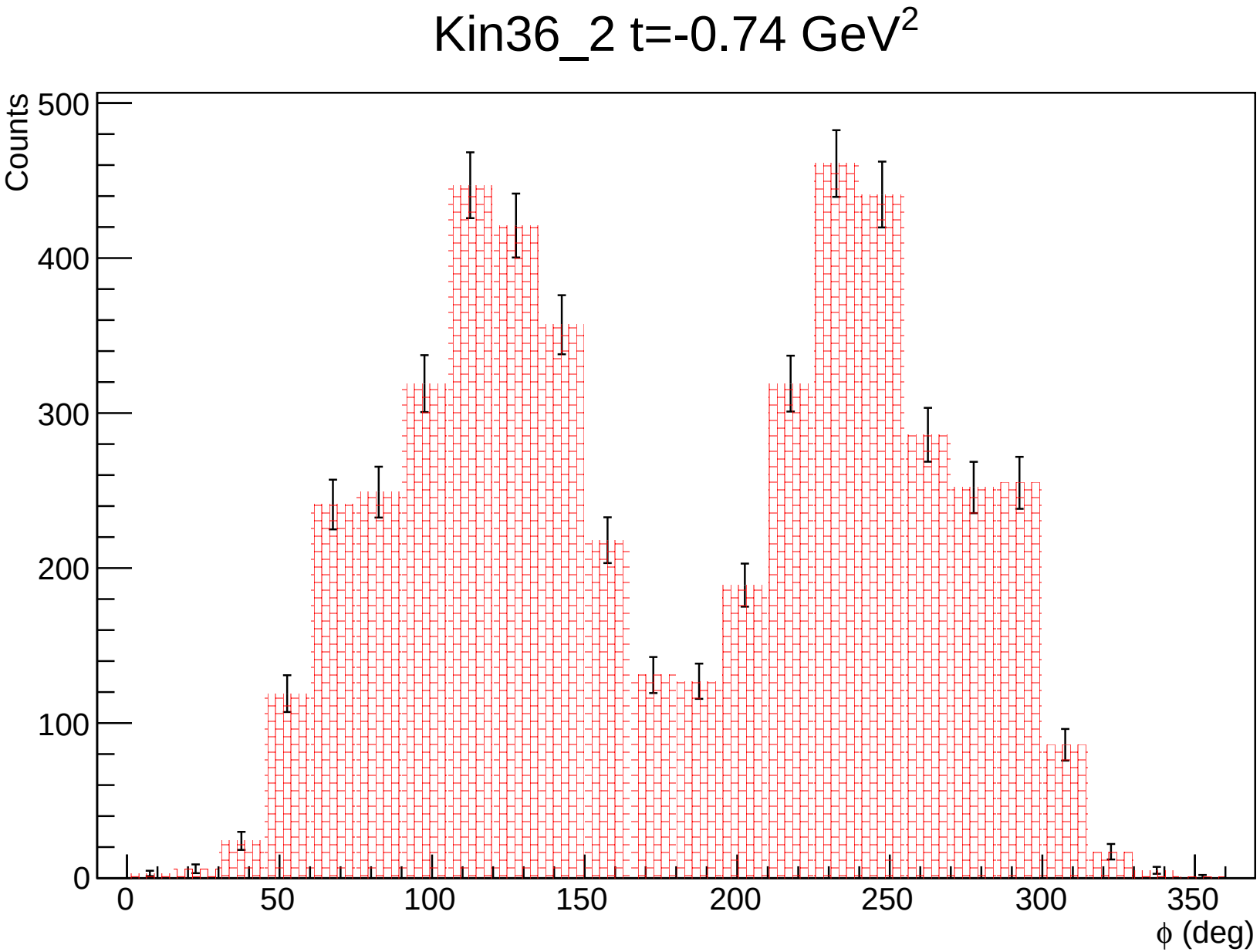








Data sample kin36_1



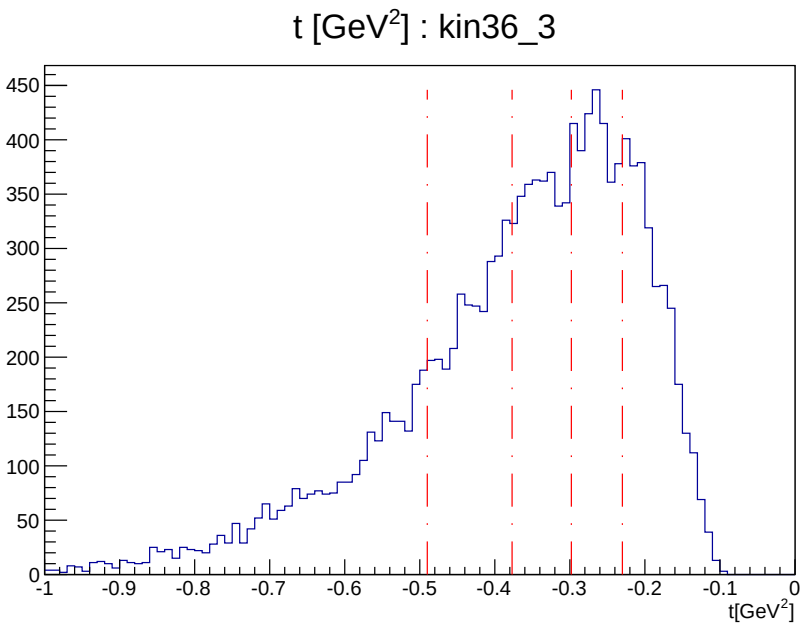
Simulation: Calibration and smearing kin36_2

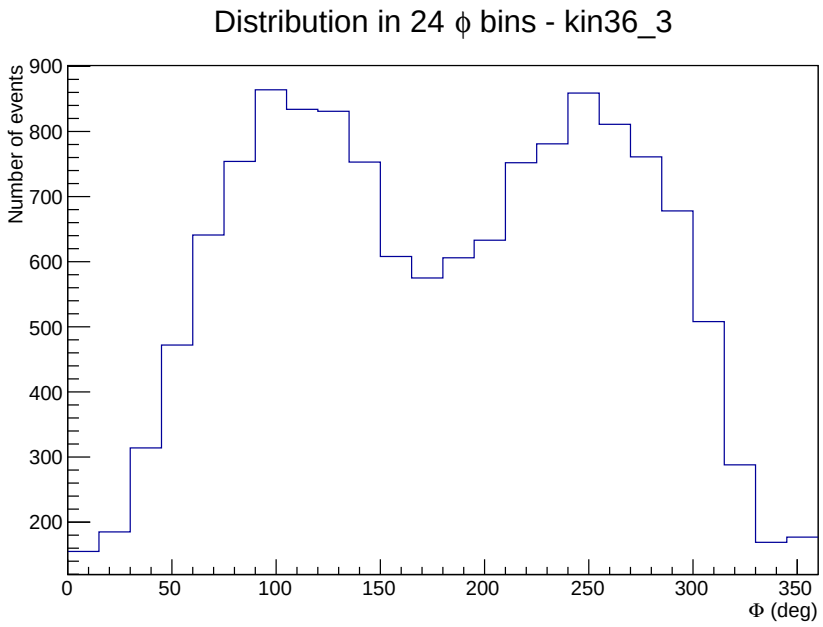
Smearing still terrible for kin36_2!!!

Data sample kin36_3

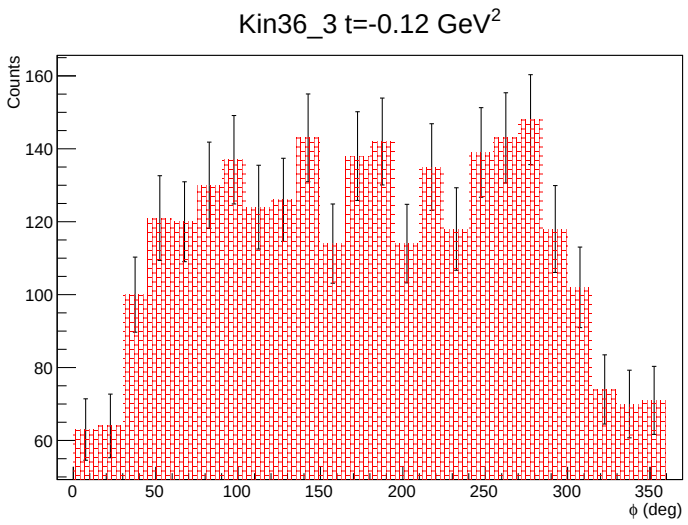
5 bins in t.

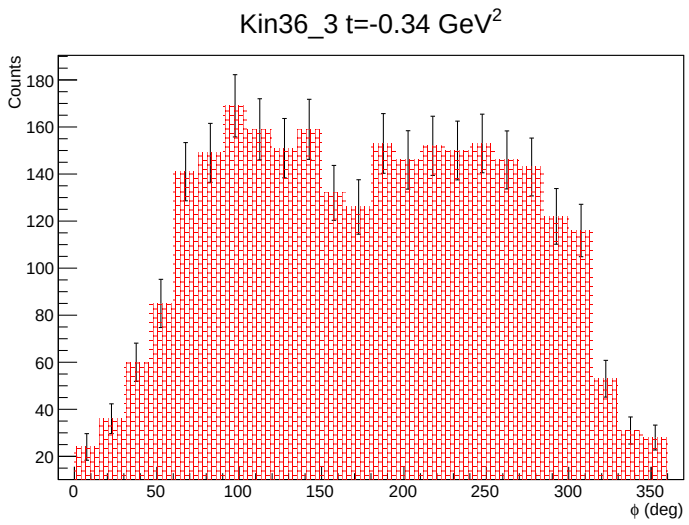
24 ϕ bins.

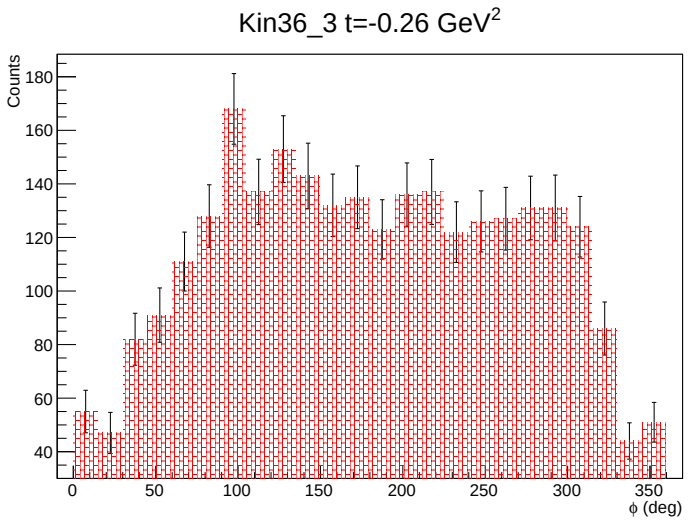


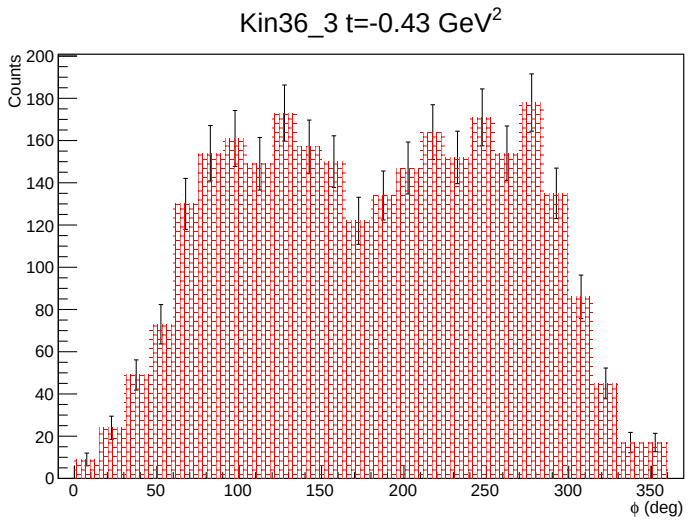


Data sample kin36_3

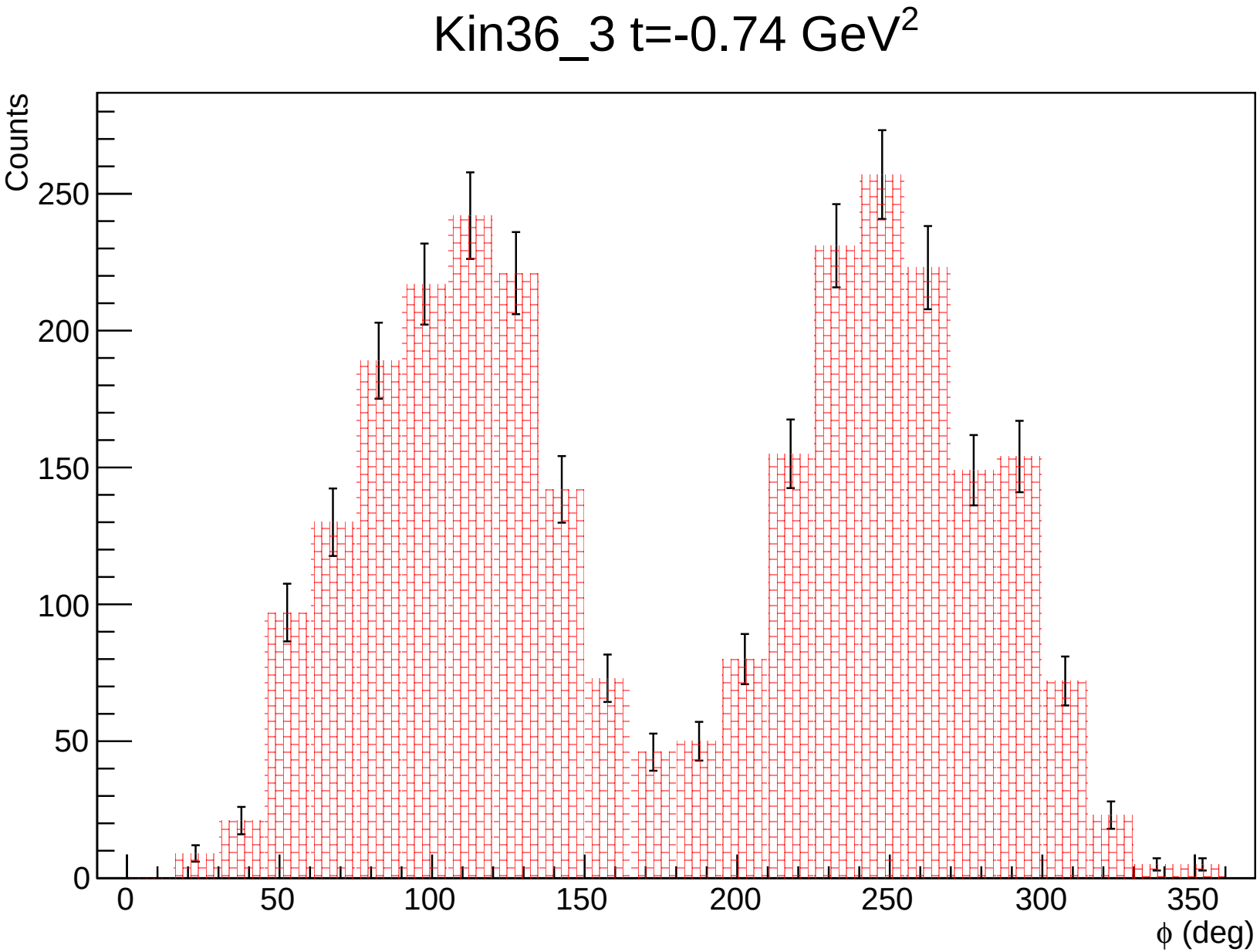




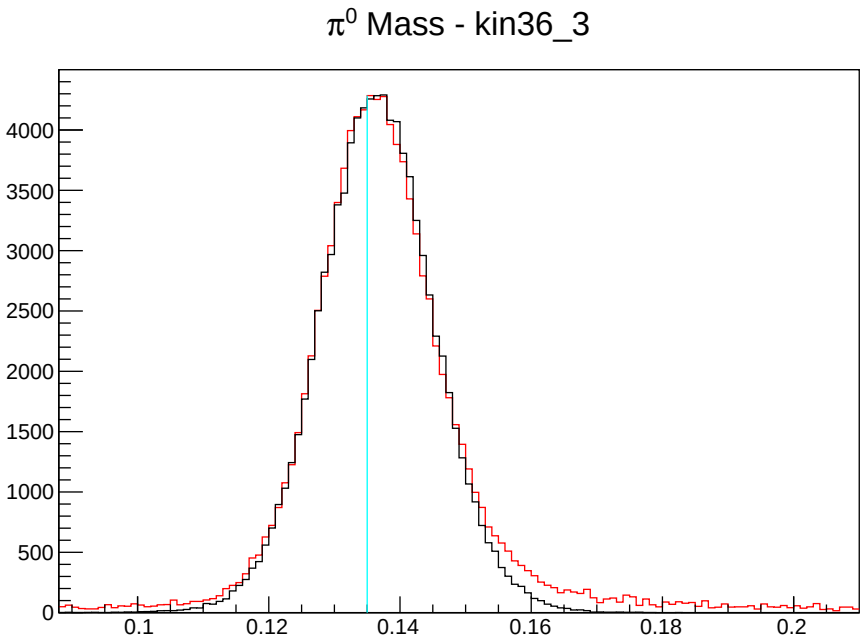


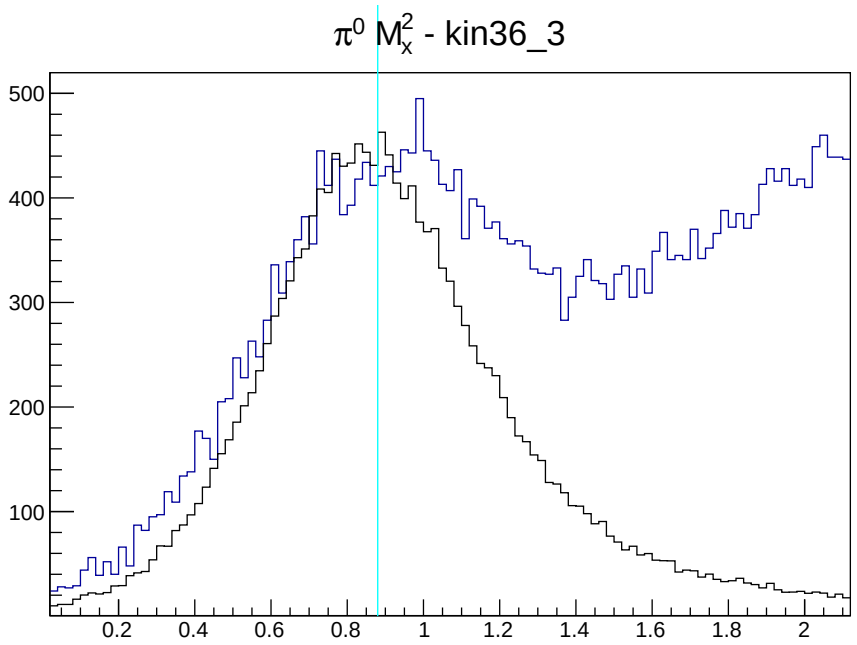


Data sample kin36_3



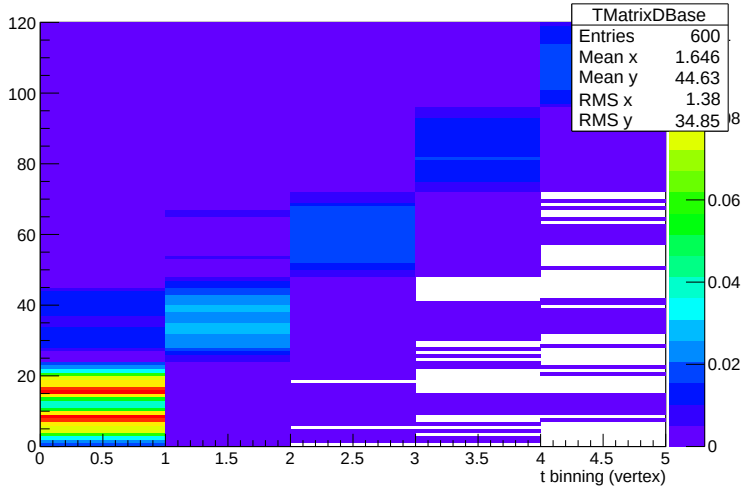
Simulation: Calibration and smearing kin36_3

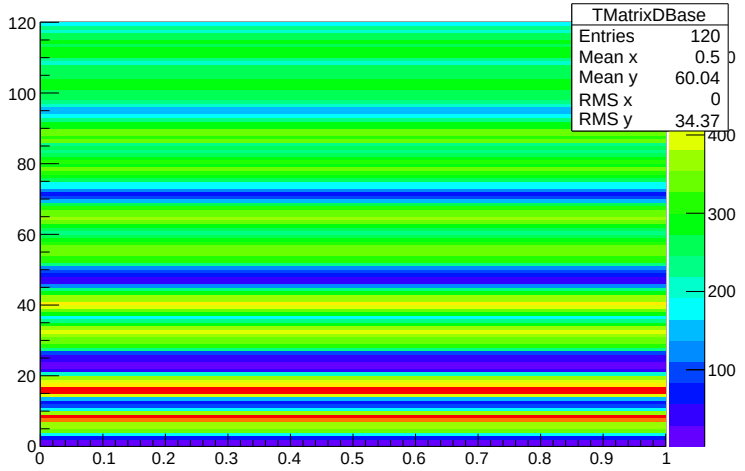




Going forward.....

- Resolve kin36_2 smearing - meeting Maxime
- Implement minimization technique and extract parameters.





The End, Thank you