Φ(1020) meson Polarisation study

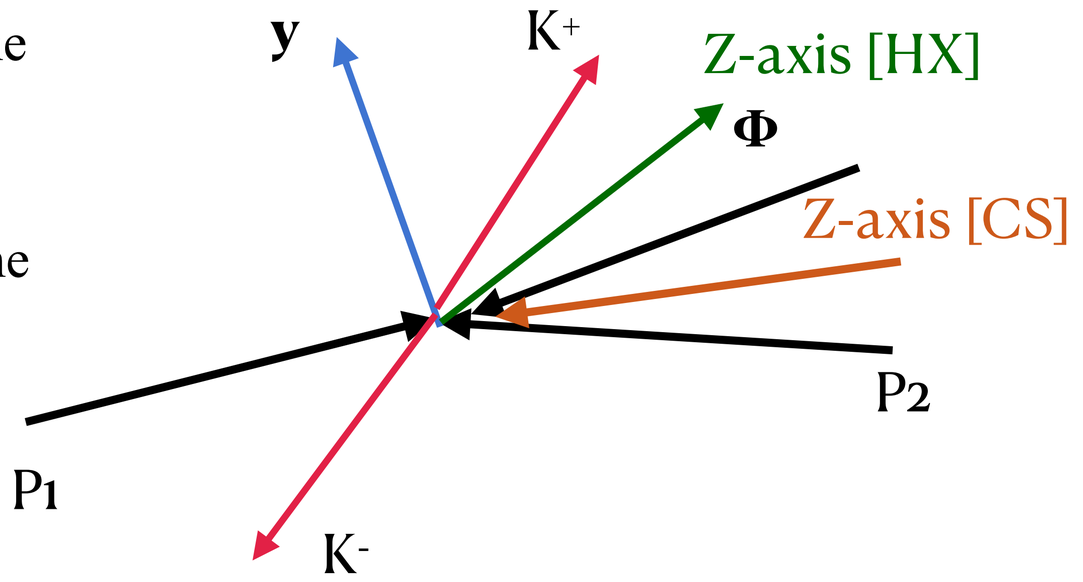
Two reference frames ⇒ depending on the z-axis definition

Helicity frame:

Fight direction of the **Φ** meson in the overall centre-of-mass frame

Collins Soper frame:

The bisector of the angle between the beam and the opposite of the other beam in **Φ** rest frame



$$W(\cos\vartheta) \propto \frac{1}{3+\lambda_\vartheta} \cdot \left[1+\lambda_\vartheta \cdot \cos^2\vartheta\right]$$

$$W(\varphi) \propto 1+\frac{2\lambda_\varphi}{3+\lambda_\vartheta} \cdot \cos 2\varphi$$

$$W(\tilde{\varphi}) \propto 1+\frac{\sqrt{2}\lambda_{\theta\varphi}}{3+\lambda_\vartheta} \cdot \cos\tilde{\varphi}\ .$$

- $(\lambda_\vartheta, \lambda_\varphi, \lambda_{\theta\varphi}) = (0,0,0,) \longrightarrow$ no polarisation at all;
- $(\lambda_\vartheta, \lambda_\varphi, \lambda_{\theta\varphi}) = (-1,0,0,) \longrightarrow$ longitudinal polarisation;
- $(\lambda_\vartheta, \lambda_\varphi, \lambda_{\theta\varphi}) = (1,0,0,) \longrightarrow$ transverse polarisation.

Two reference frames ⇒ depending on the z-axis definition

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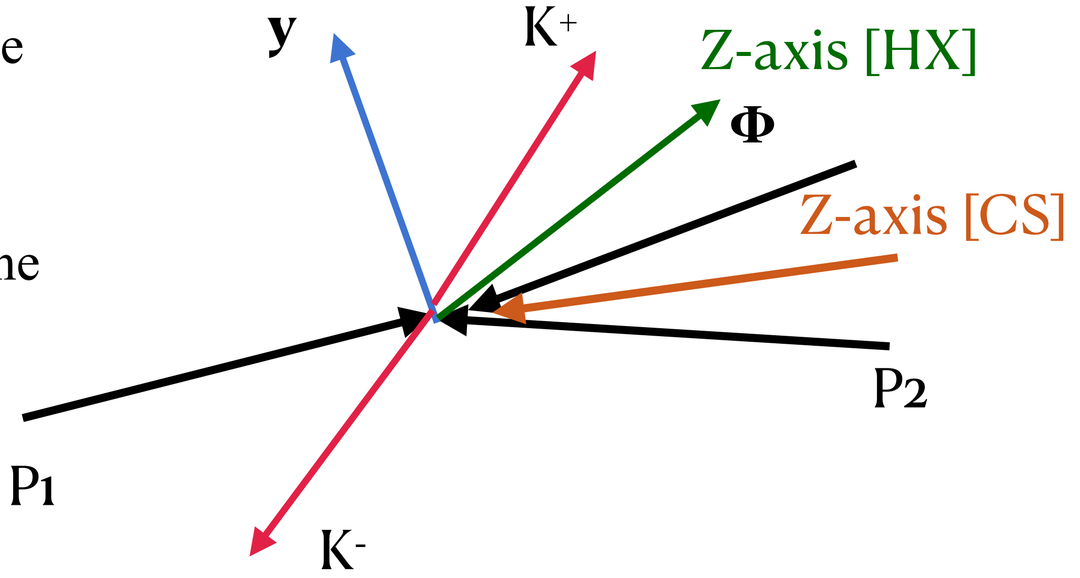
Fight direction of the **Φ** meson in the overall centre-of-mass frame

Collins Soper frame:

The bisector of the angle between the beam and the opposite of the other beam in **Φ** rest frame



$$W(\cos\vartheta) \propto \frac{1}{3+\lambda_\vartheta} \cdot \left[1+\lambda_\vartheta \cdot \cos^2\vartheta\right] \text{ ✅}$$

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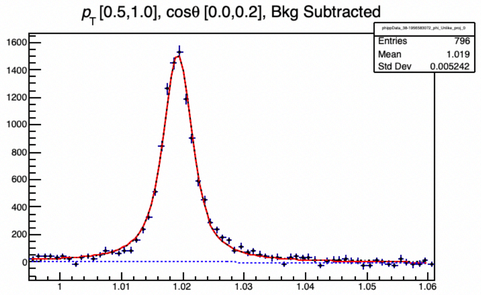
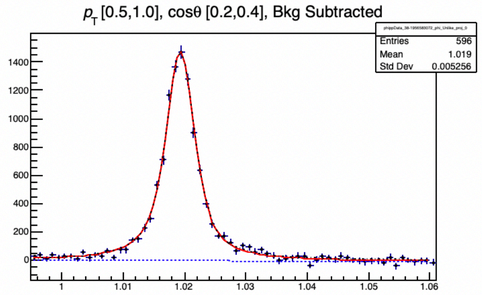
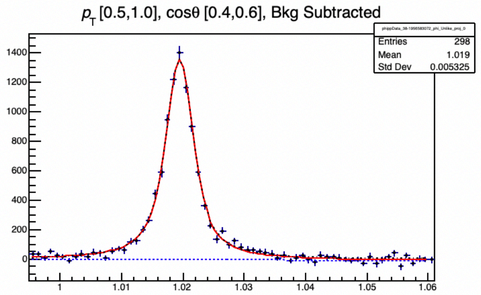
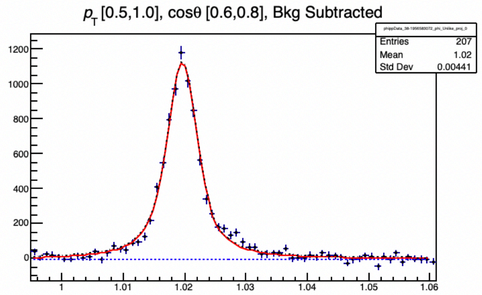
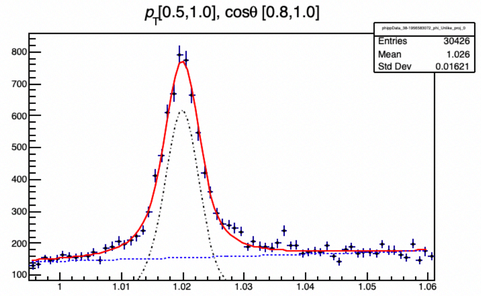
Invariant mass distribution of K+K- pairs

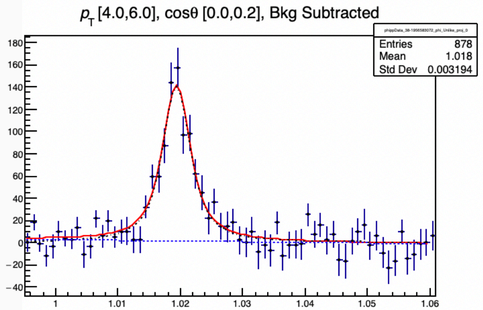


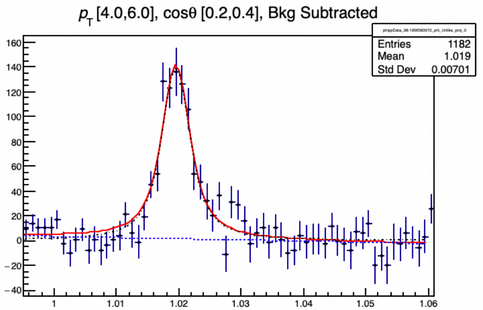


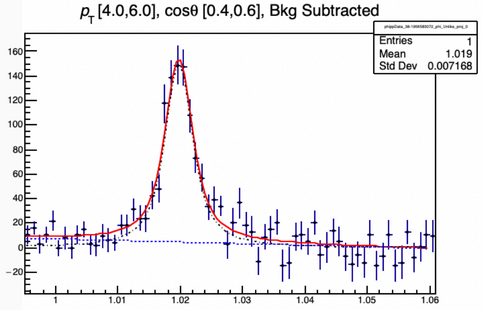


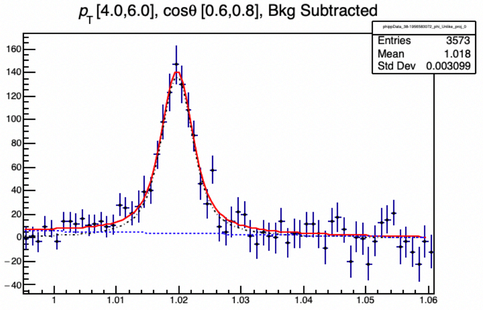


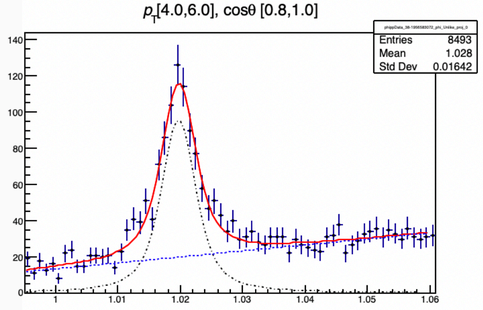




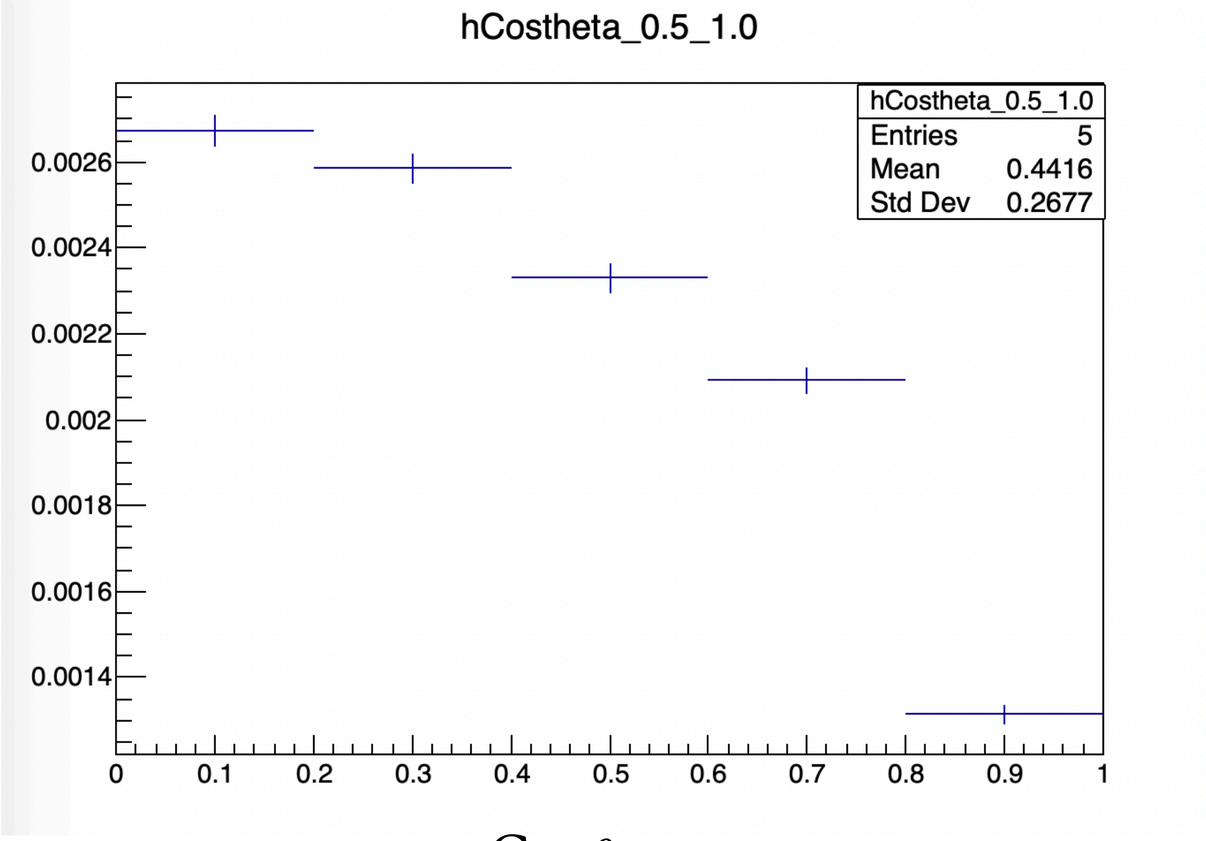




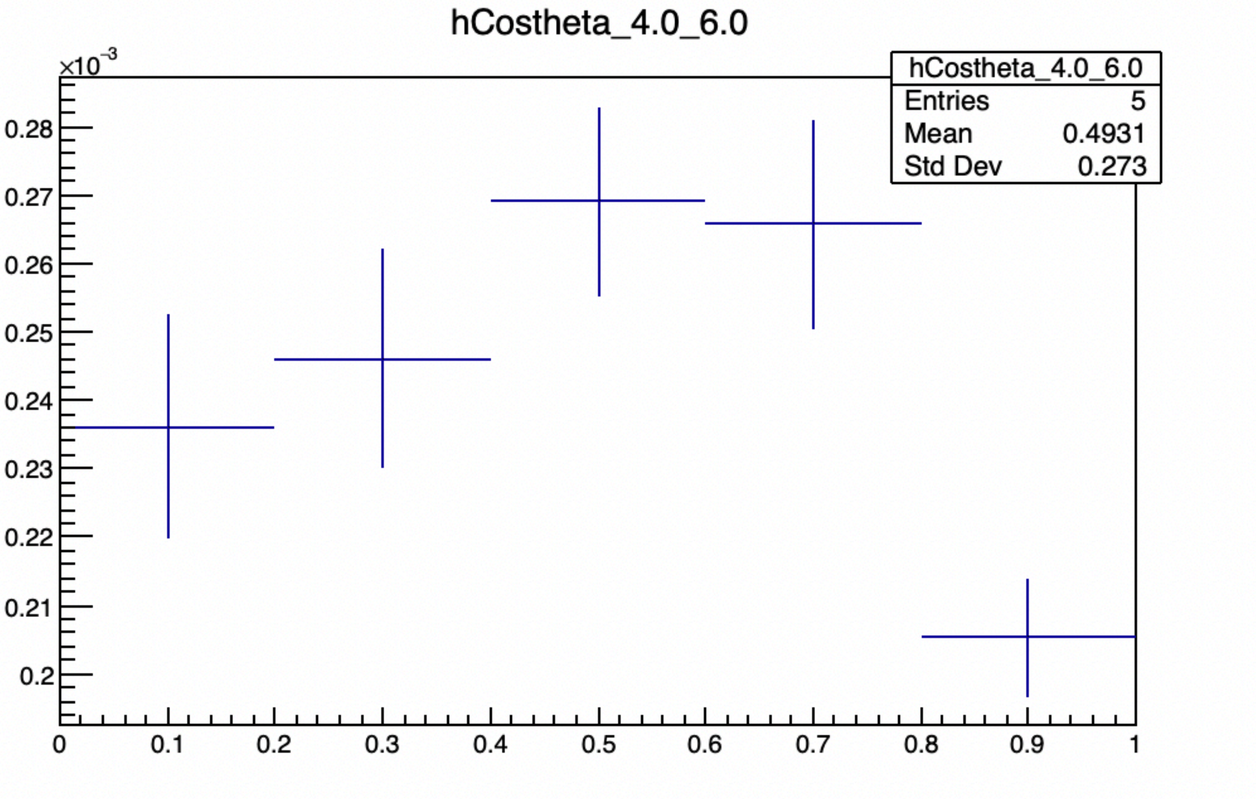




Raw distribution in Cosθ bin

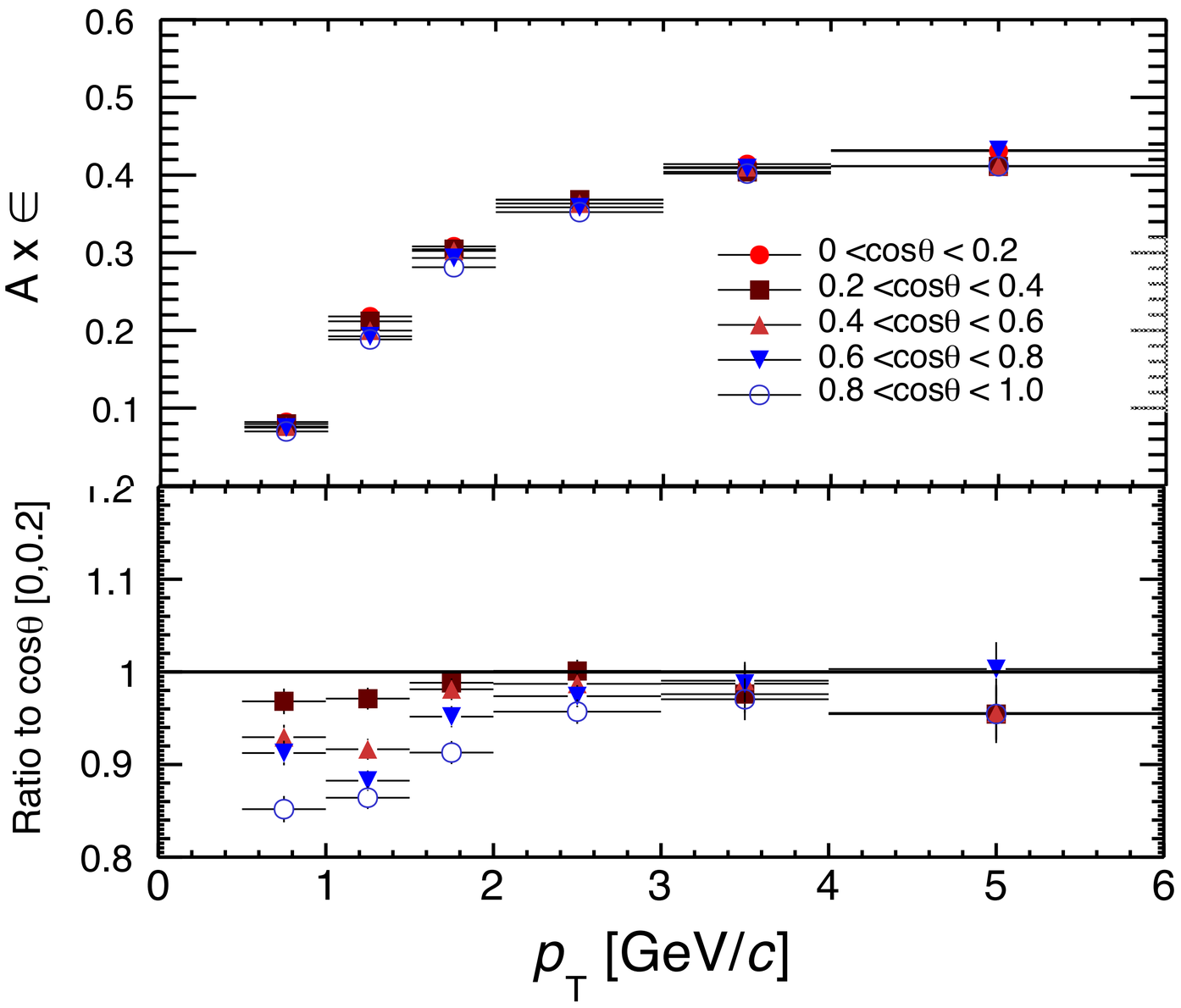


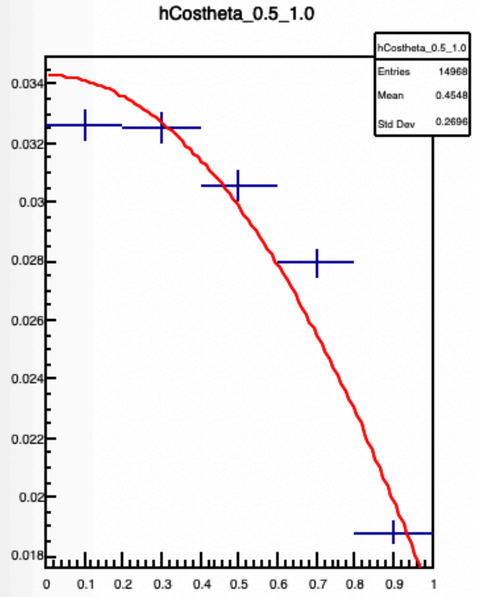
Cosθ

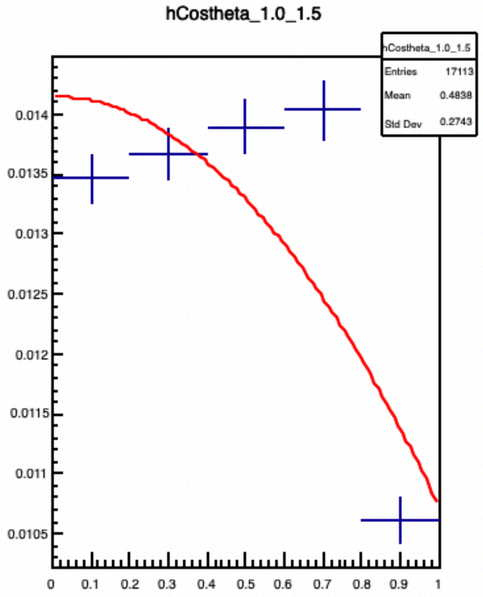


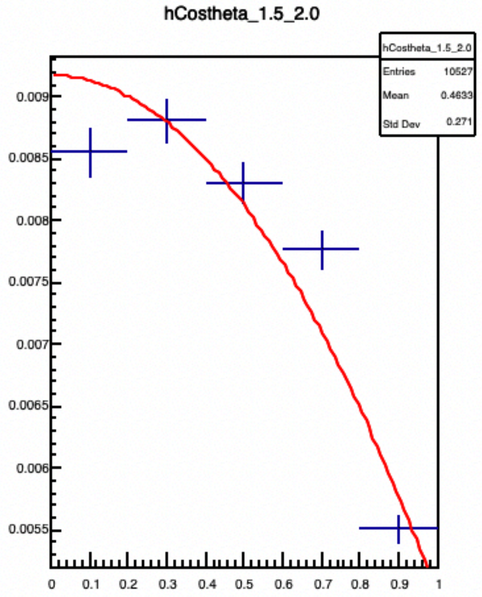
Cosθ

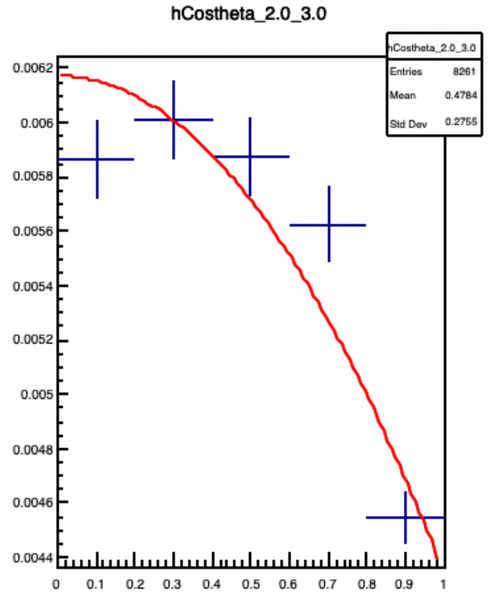
Efficiency X acceptance

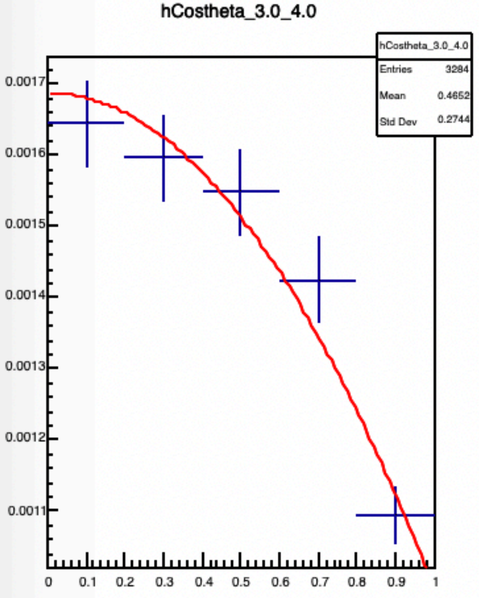


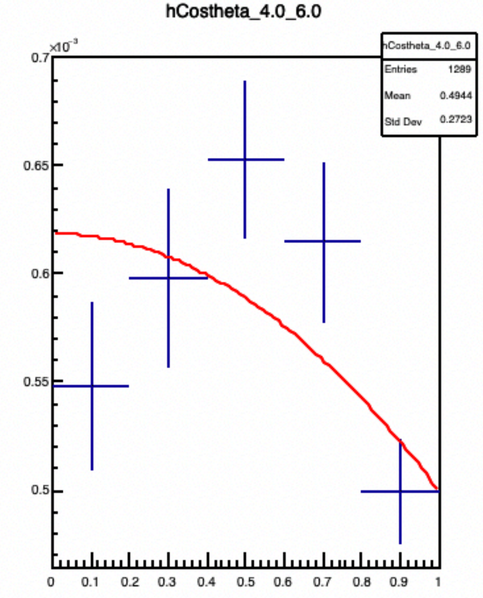




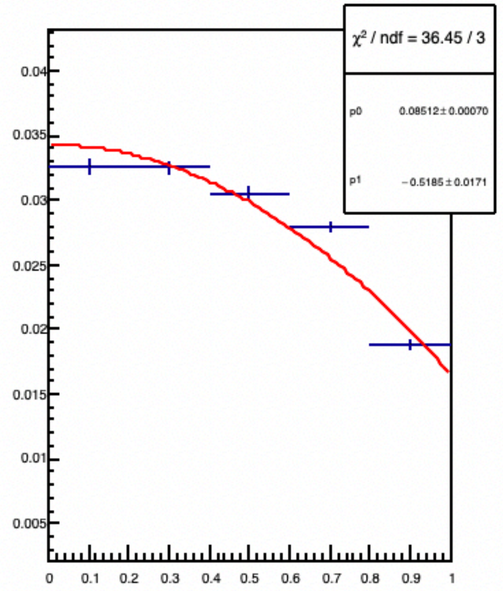


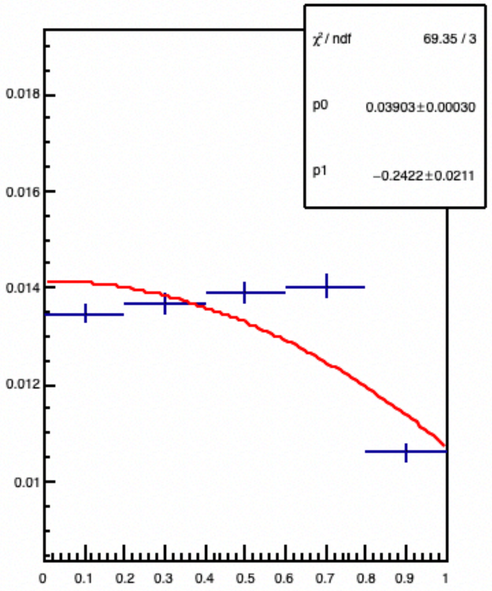


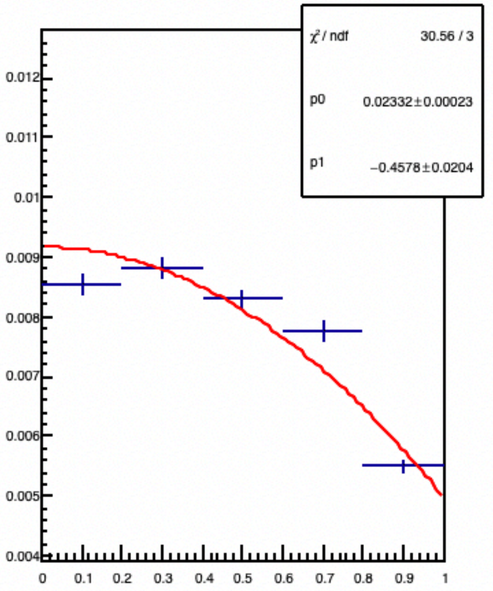


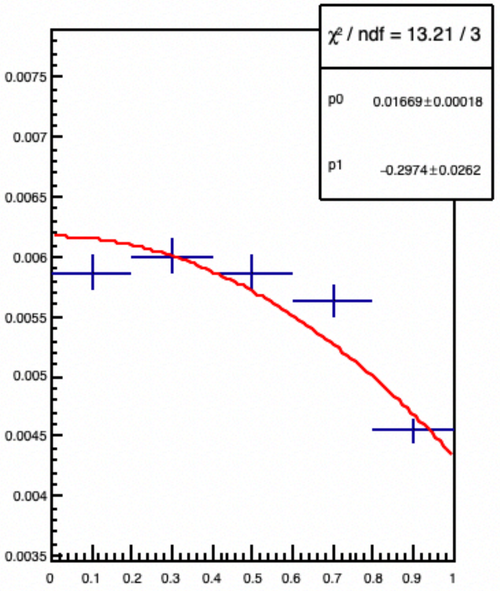


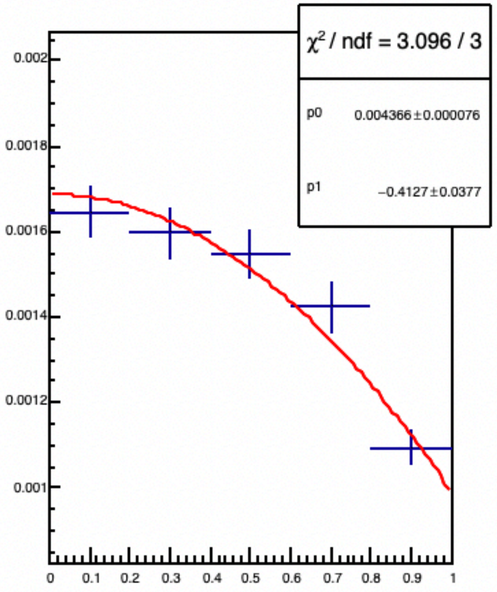
Efficiency corrected dN/dcosθ

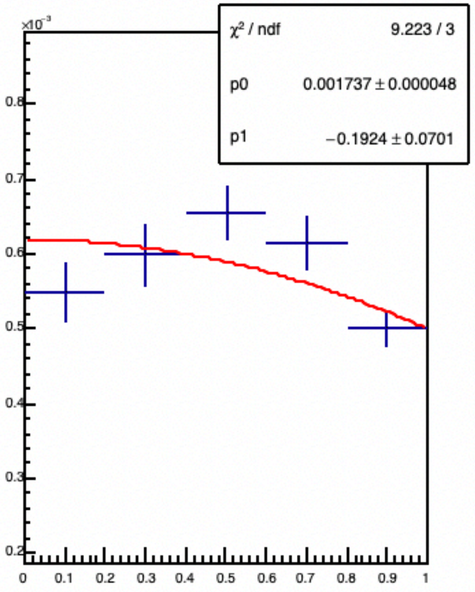

χ² / ndf = 36.45 / 3
p0 0.08512 ± 0.00070
p1 −0.5185 ± 0.0171

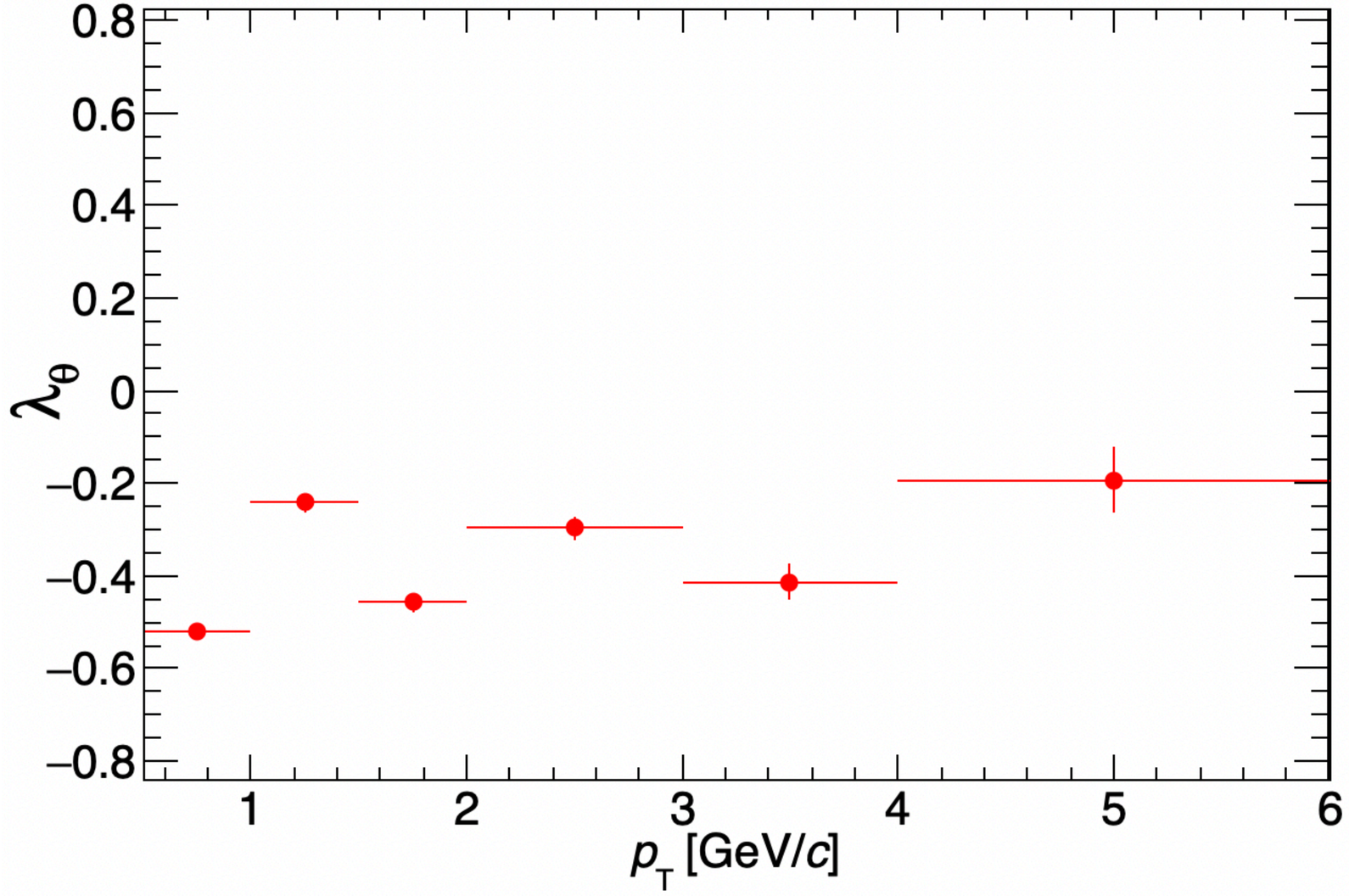

χ² / ndf 69.35 / 3
p0 0.03903 ± 0.00030
p1 −0.2422 ± 0.0211


χ² / ndf 30.56 / 3
p0 0.02332 ± 0.00023
p1 −0.4578 ± 0.0204


χ² / ndf = 13.21 / 3
p0 0.01669 ± 0.00018
p1 −0.2974 ± 0.0262


χ² / ndf = 3.096 / 3
p0 0.004366 ± 0.000076
p1 −0.4127 ± 0.0377


χ² / ndf 9.223 / 3
p0 0.001737 ± 0.000048
p1 −0.1924 ± 0.0701


0.8
0.6
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
λ_θ
1
2
3
4
5
6
p_T [GeV/c]