Error propagation

For each charge track, we have a vector to describe it ($\vec{X}= (\phi, \frac{1}{p_{xy}}, \cot\theta)$). The errors of them have been given by reconstruction.

The relation between momentum and $\vec{X}$ is:

$$p_x = cos(\phi)P_{xy} = \frac{cos(X_1)}{X_2} \tag{1}$$

$$p_y = sin(\phi)P_{xy} = \frac{sin(X_1)}{X_2} \tag{2}$$

$$p_z = cot(\theta)P_{xy} = \frac{X_3}{X_2} \tag{3}$$

And the errors of momentum are taken from the propagation:

$$\sigma(P)^2 = D_P\sigma(X)^2D_P^T \tag{4}$$

where, D_P is propagation matrix.

$$D_P = \frac{\partial(px, py, pz)}{\partial(X_1, X_2, X_3)} = \begin{pmatrix} \frac{\partial p_x}{\partial X_1} & \frac{\partial p_x}{\partial X_2} & \frac{\partial p_x}{\partial X_3} \\ \frac{\partial p_y}{\partial X_1} & \frac{\partial p_y}{\partial X_2} & \frac{\partial p_y}{\partial X_3} \\ \frac{\partial p_z}{\partial X_1} & \frac{\partial p_z}{\partial X_2} & \frac{\partial p_z}{\partial X_3} \end{pmatrix} \quad (5)$$

We can get the T-violation amplitude for each event:

$$\mathcal{A}_i = \hat{p}_e \cdot (\hat{p}_1 \times \hat{p}_2) \quad (6)$$

$$\sigma^2 \mathcal{A}_i = T\sigma^2(P)T^T \quad (7)$$

where, T is anothe propagation matrix.

$$T = \frac{\partial \mathcal{A}}{\partial(px, py, pz)} \quad (8)$$

FIGURES

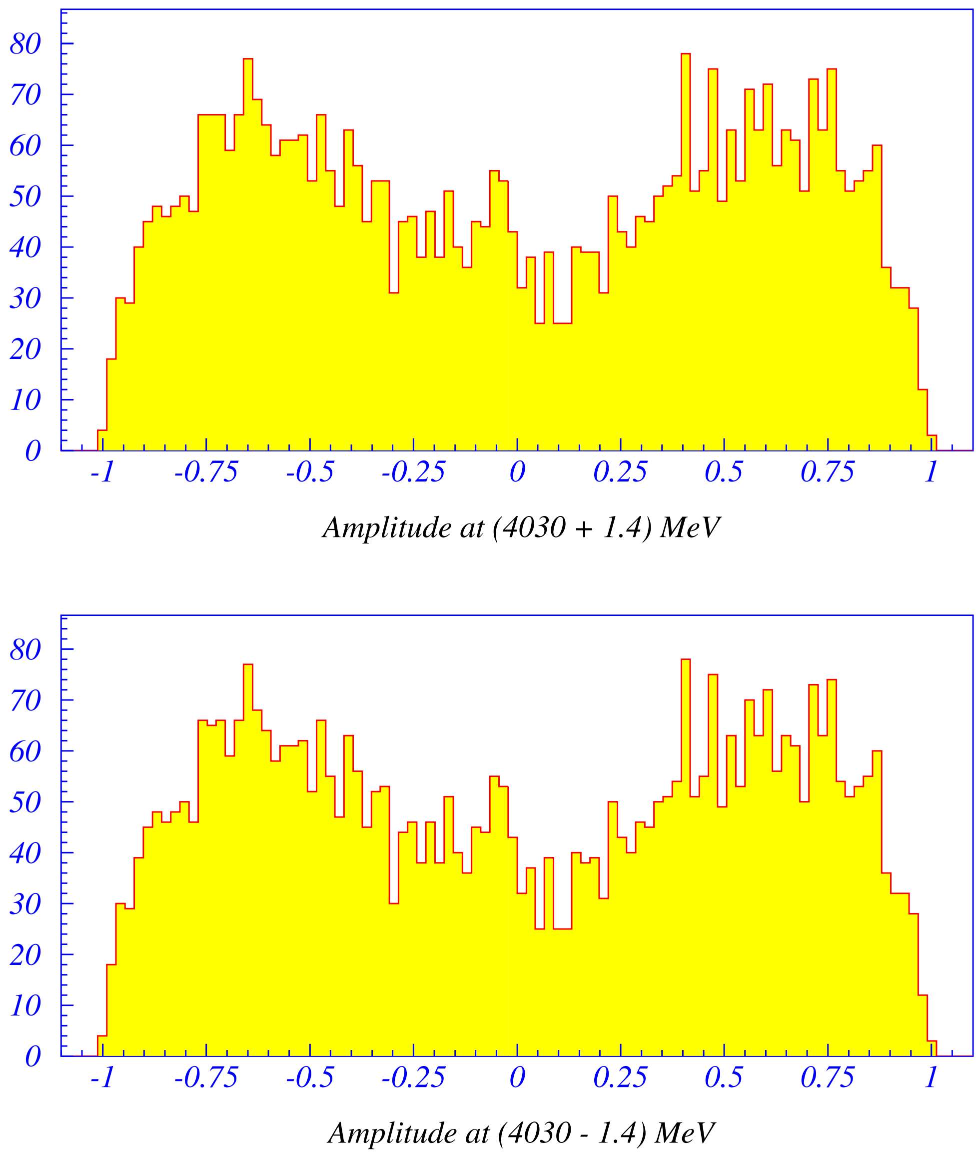
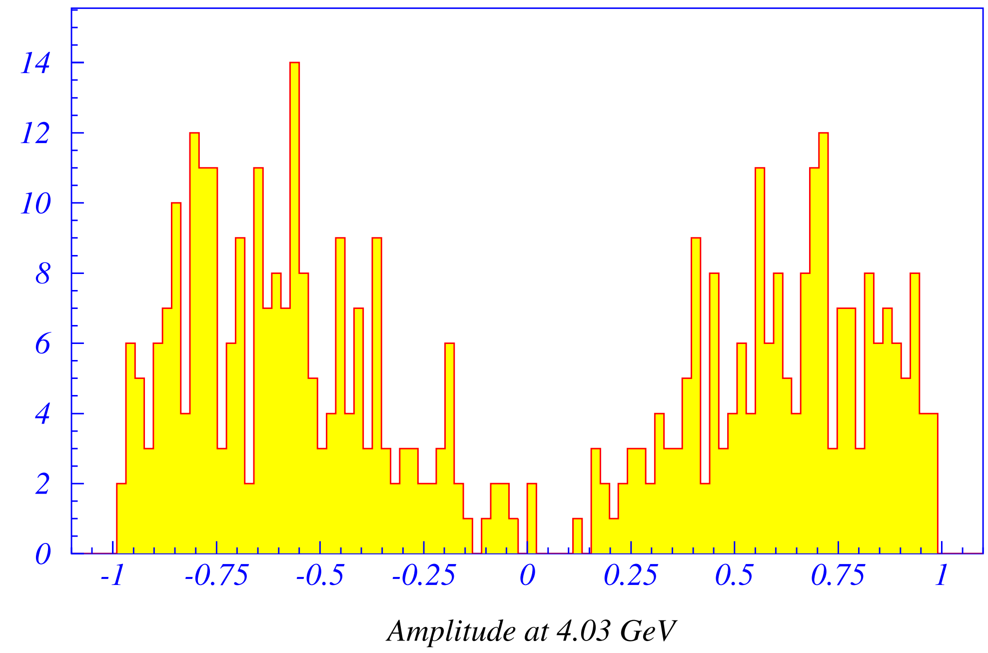


FIG. 1. systematic error of $\mathcal{A}$ from uncertainty of Energy of beam



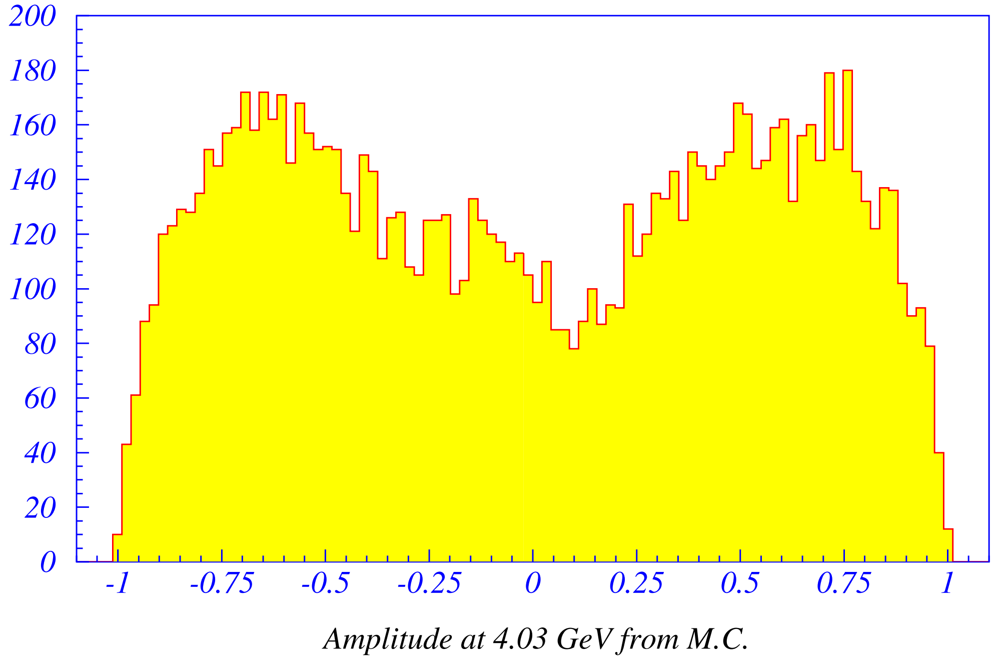


FIG. 2. $\mathcal{A}$ distribution from 432 events and M.C.

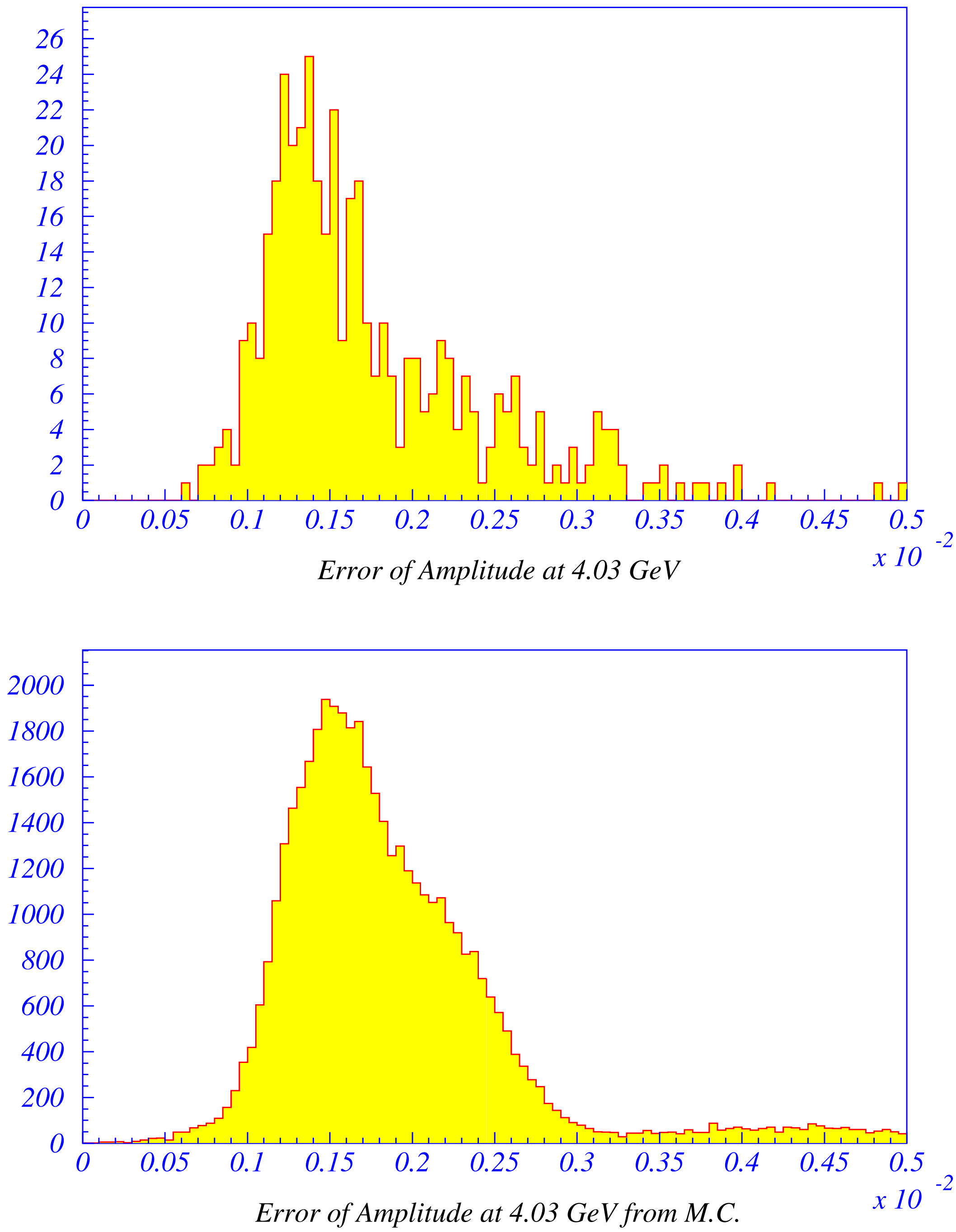
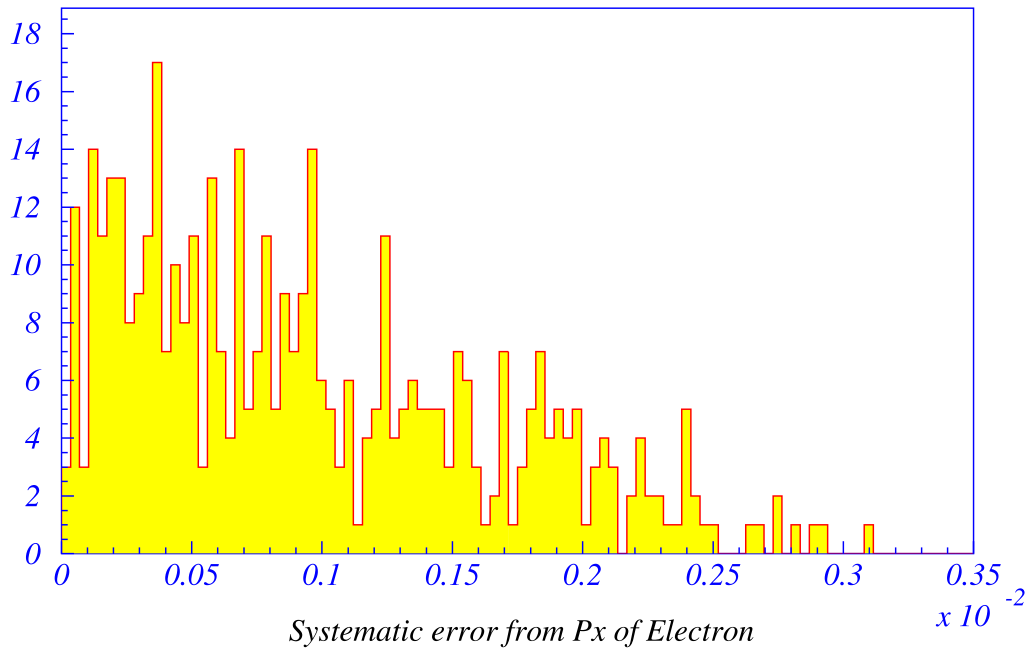


FIG. 3. systematic error of $\mathcal{A}$ from Momentum resolution



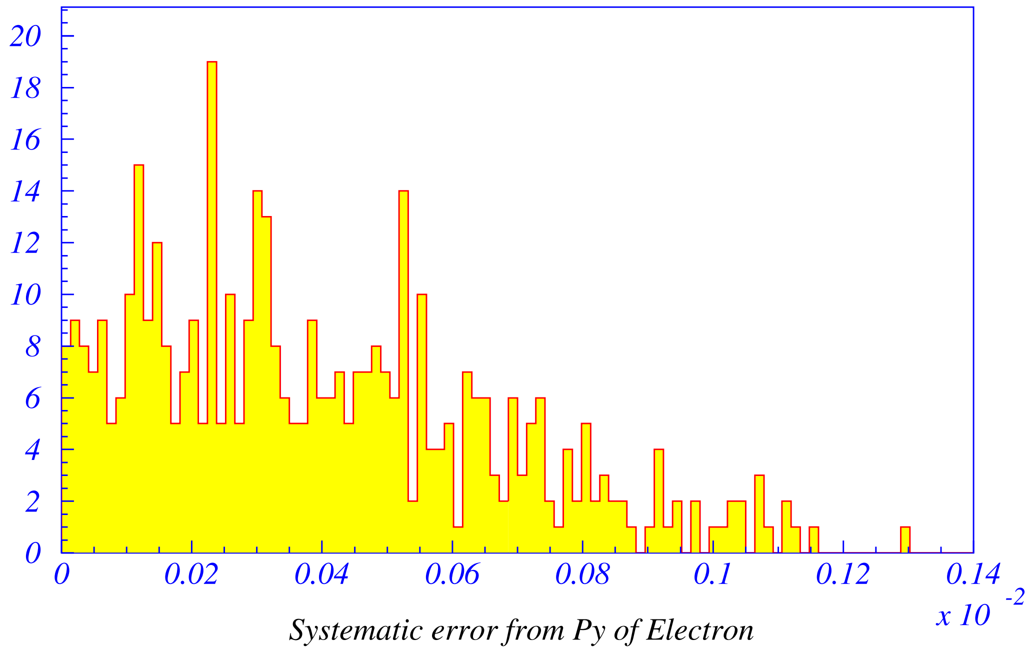


FIG. 4. systematic error of $\mathcal{A}$ from uncertainty of p_x of electron and positron of beam