

Kaon LT Meeting

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Offsets optimization

- Shift in missing mass observed mostly in high ϵ settings.
- Parameters for optimization:
 - `htheta_offset`, `hphi_offset`, `hdelta_offset`
 - `hpcentral_offset`, `hthetacentral_offset`, `hooptcentral_offset`

$$\begin{bmatrix} x'_{\text{tar}} \\ y_{\text{tar}} \\ y'_{\text{tar}} \\ \delta p \end{bmatrix} = \begin{bmatrix} \dots & \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots & \dots \end{bmatrix} \begin{bmatrix} x_{\text{fptar}} \\ x'_{\text{fptar}} \\ y_{\text{fptar}} \\ y'_{\text{fptar}} \\ \tilde{x}_{\text{tar}} \end{bmatrix} + \begin{bmatrix} \text{hphi_offset} + \text{hooptcentral_offset} \\ 0.0 \\ \text{htheta_offset} \\ \text{hdelta_offset} \end{bmatrix}$$

$$p_{\text{central}} = p_{\text{central}} \cdot (1 + \text{hpcentral_offset})$$

$$\theta_{\text{central}} = \theta_{\text{central}} + \text{hthetacentral_offset}$$

$$\phi_{\text{central}} = \phi_{\text{central}} + \text{hphi_offset}$$

- ok to set `htheta_offset = 0` and `hdelta_offset = 0`.

- It is correct to implement the $\delta\theta_{\text{central}}$, $\delta p_{\text{central}}$ and δE_{beam} in the input file of SIMC. However, it turns out only the SHMS `oop_central_offset` is applied in `recon_hcana.C` !
- Confirmed issue in application of `hphi_offset` in `hcana` \Rightarrow an overall oop offset should be applied to both x'_{tar} ϕ_{central} .
- oop offset should be applied to SIMC but have not found the option yet.

solution?

- redo heap with the 2018 matrix elements and fixed offsets, fit only $\delta\theta_{\text{central}}$, $\delta p_{\text{central}}$ and δE_{beam} and $\delta x'_{\text{tar}}$ (11)
- on SIMC side, add the HMS offsets back.

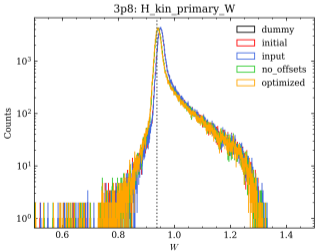
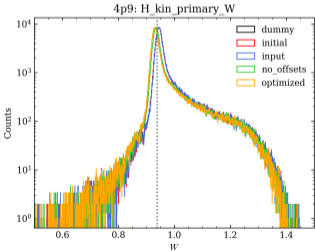
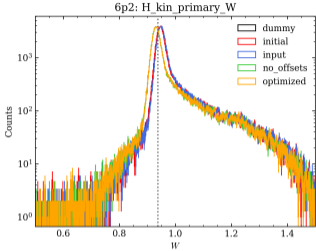
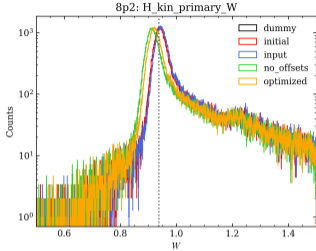
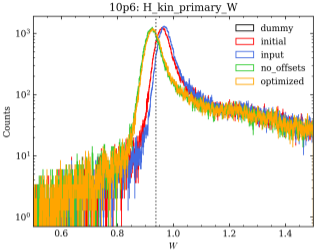
Parameters

- `htheta_offset=0`, `hphi_offset=2.8e-4`, `hdelta_offset=0`
- `dBeamE` (5)
- `hpcentral_offset`, `hthetacentral_offset`, `h_oopcentral_offset` (6)

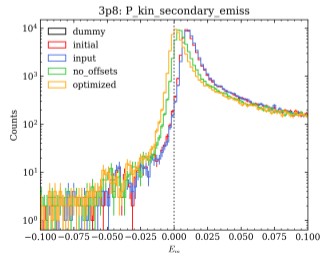
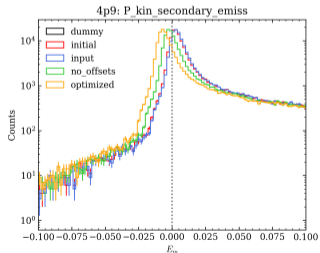
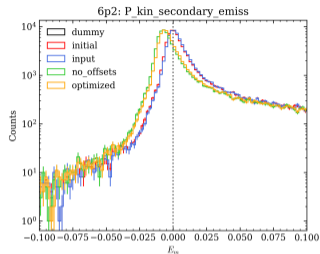
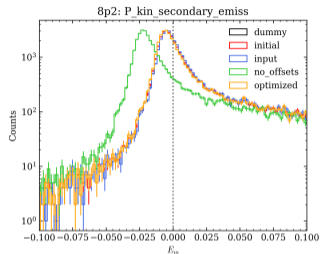
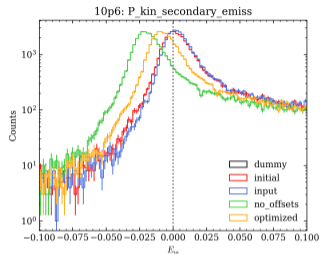
Optimization

- $E_{\text{miss}} \approx 0$
- $\mathbf{p}_{\text{miss}} \approx 0$
- $W \approx M_p$

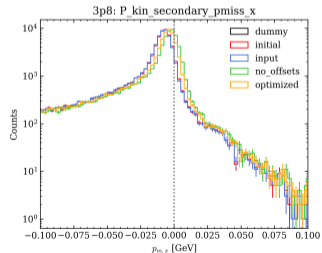
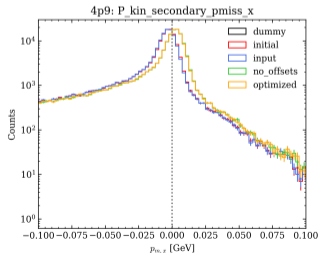
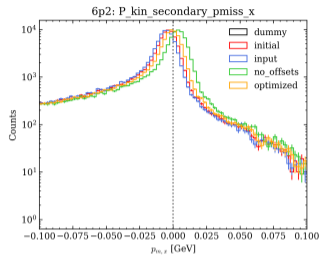
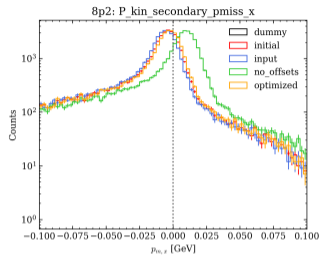
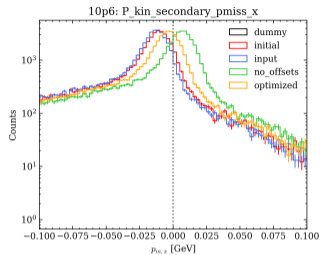
results so far : W



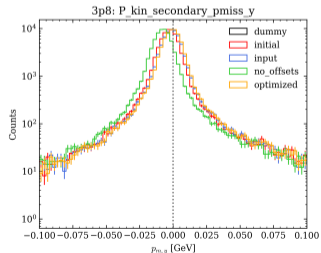
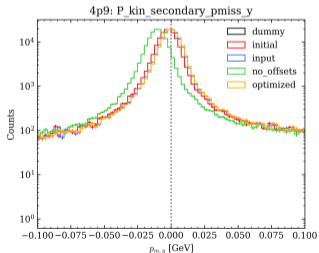
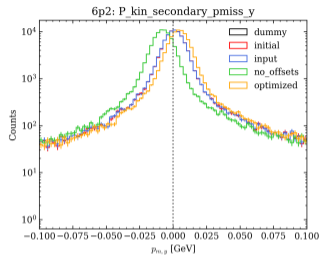
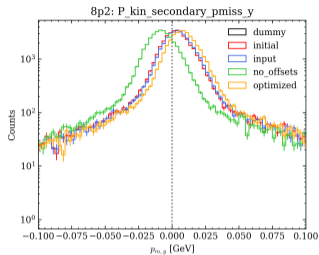
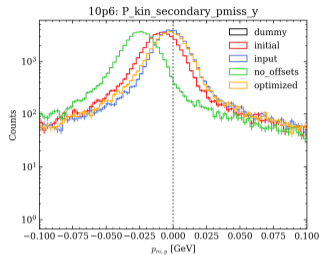
results so far : E_X



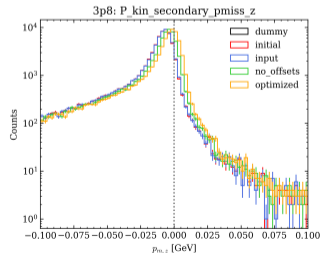
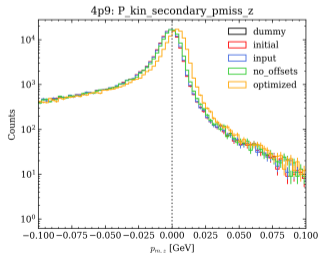
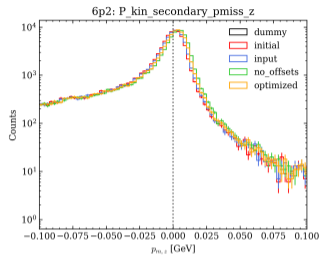
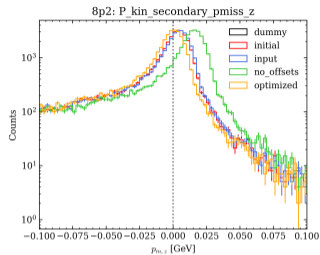
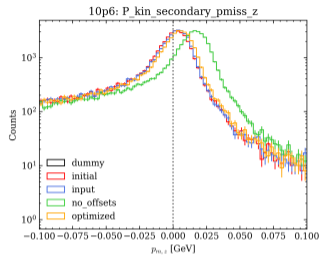
results so far : $p_{\text{miss},x}$



results so far : $p_{\text{miss},y}$



results so far : $p_{\text{miss},z}$



- Correct / Physical approach is to fix 0-th order matrix element, but since mathematically those offsets can be absorbed into the heap-determined offsets, we can fix those offsets to 0.
- following Tanja's note to obtain effective oop offsets (using Heap and ME).
- heap optimize the rest.