New parametrization to utilize K_S events

Millepede requires $\dfrac{\partial \mathrm{residual}(\mathbf{p}, \mathbf{q})}{\partial(\mathbf{p}, \mathbf{q})}$ to minimize $\chi^2(\mathbf{p}, \mathbf{q}) = \sum \left(\dfrac{\mathrm{residual}(\mathbf{p}, \mathbf{q})}{\mathrm{error}} \right)^2.$

alignment parameters **track parameters**

5 parameters for 1 track (10 for 2 tracks)

New

8 parameters for 2 tracks ($K_S \to \pi^+\pi^-$)

8 = 3 (K_S momentum p)
+ 3 (decay vertex v)
+ 2 (decay angles in K_S rest frame, θ, φ)

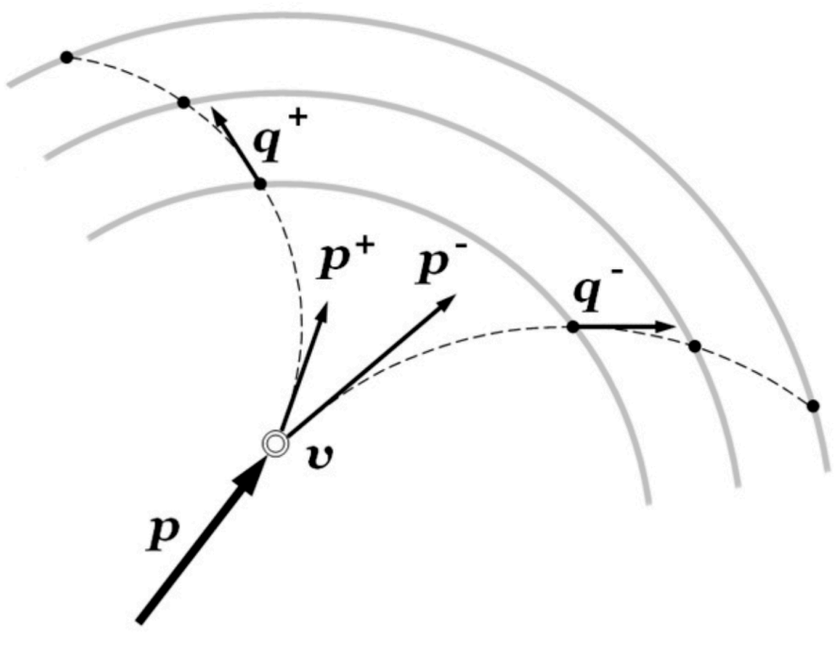
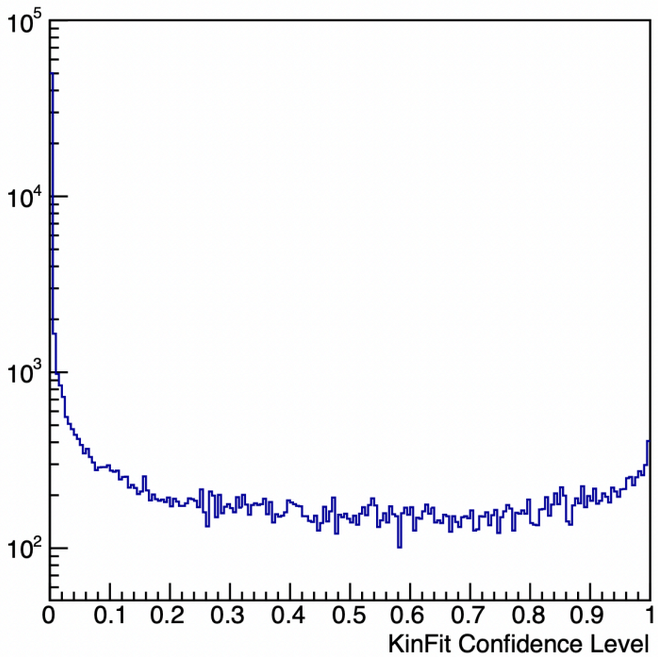
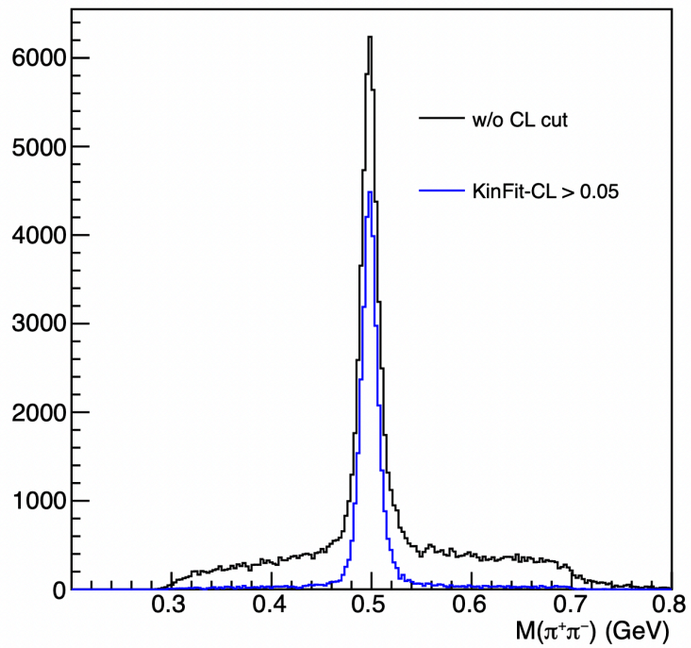


Figure 1: Schematic view of the decay. The dashed lines represent the trajectories, the detector layers are sketched by bold grey lines.

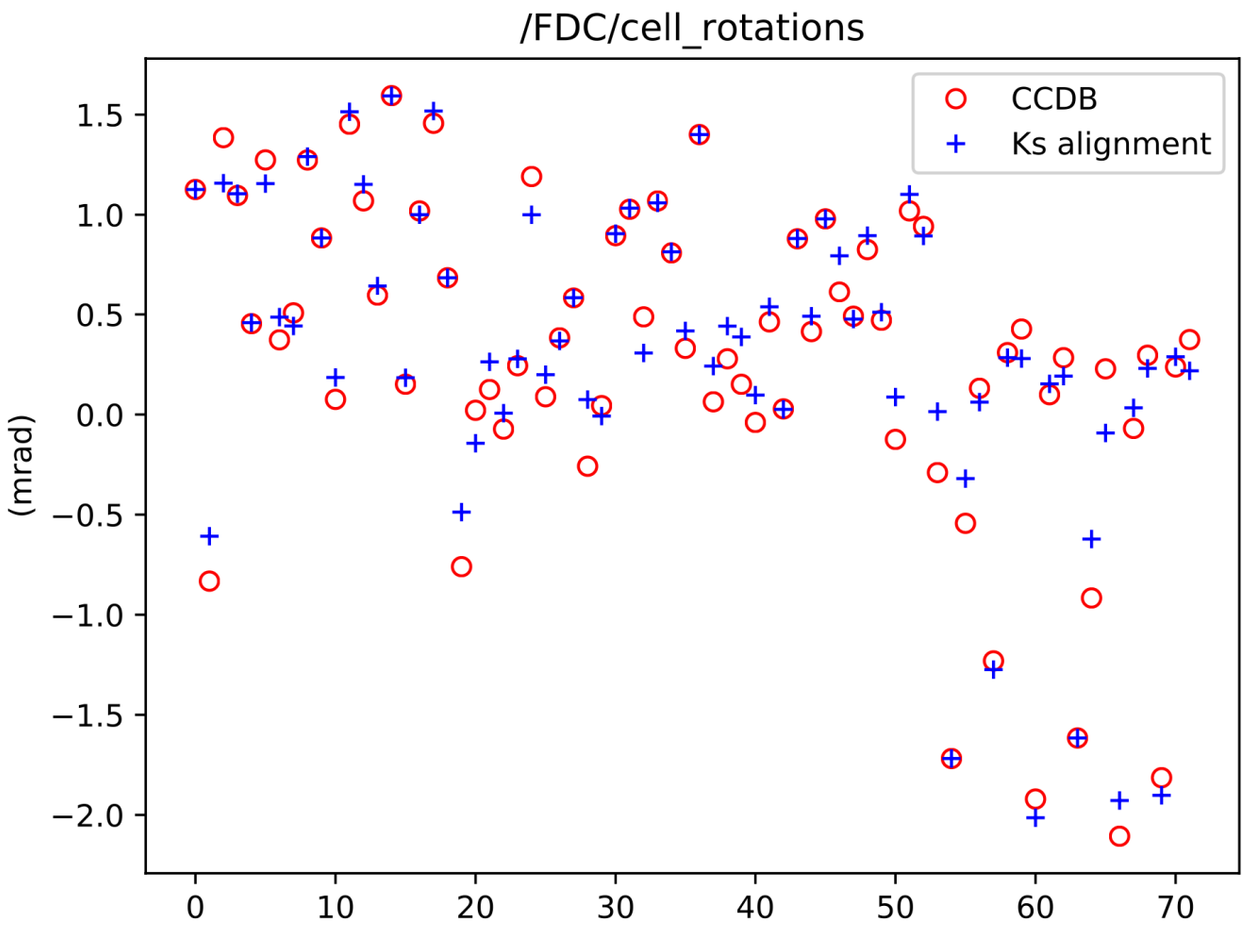
By using this parametrization, we can naturally leverage the information of K_S mass and common vertex.

Results and issues





K_S events are cleanly selected.



Issue:
If more than one alignment parameters are varied during the fit, the Millepede minimization process does not converge.