

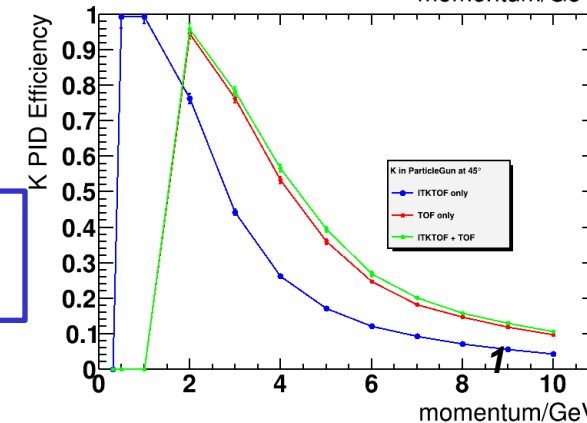
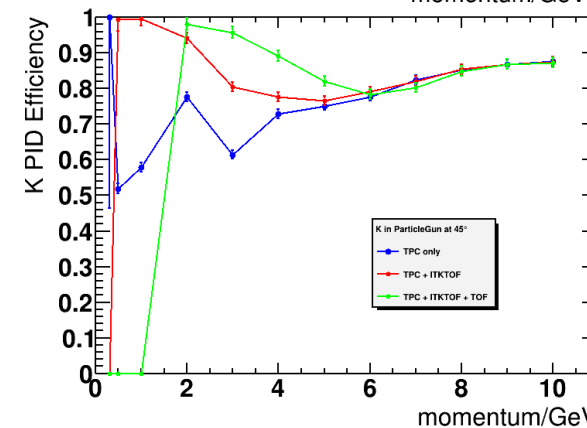
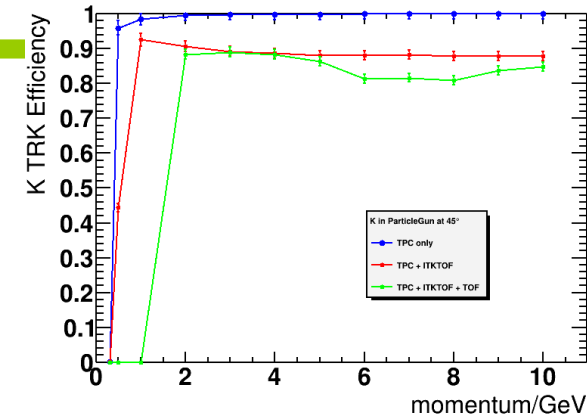
PID efficiency study -- Status

❖ Add ToF in outer layer of ITK

- Improve significantly TPC PID efficiency in low momentum (<5GeV), little in high momentum
- ITKToF PID efficiency worse than ToF's but low momentum particle can hit, combined two ToFs efficiency is normal

❖ Samples used under CEPCSW_tdr24.12.0

- ParticleGun 10000 K- events at 45/85 degree and 0.3/0.8/1/2/3/4/5/6/7/8/9/10 GeV, select K- without decay and with no more than 1 track



TRK Efficiency: efficiency of having TPC/ToF track in reco tracks
 PID Efficiency: efficiency of right PID

Backup

$$\chi_{\text{TPC}}(i) = \frac{(dN/dx)_{\text{meas}} - (dN/dx)_{\text{exp}}^i}{\sigma_{(dN/dx)_{\text{meas}}}}, i = \pi/K/p$$

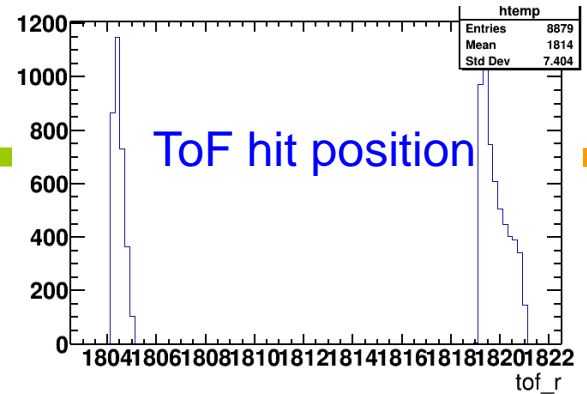
$$\chi_{\text{TOF}}(i) = \frac{t_{\text{meas}} - t_{\text{exp}}^i}{\sigma_{t_{\text{meas}}}}, \sigma_{t_{\text{meas}}} = \sqrt{0.05^2 + 0.02^2}$$

$$\chi^2(i) = \chi_{\text{TOF}}^2(i) + \chi_{\text{TPC}}^2(i)$$

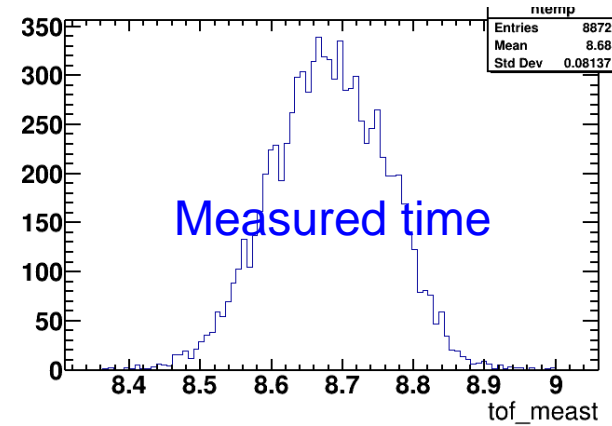
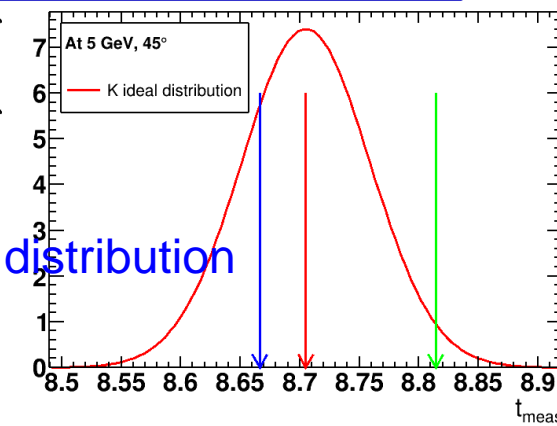
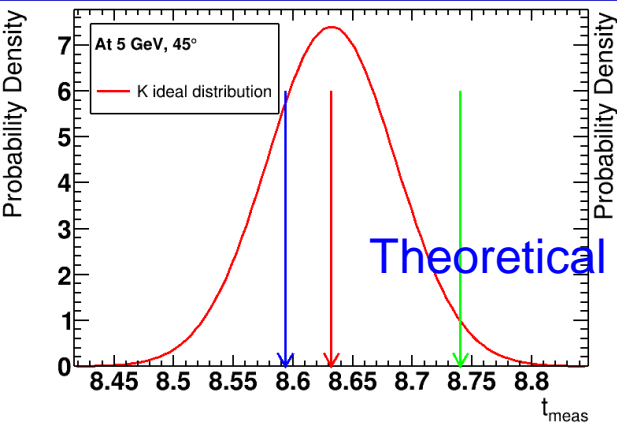
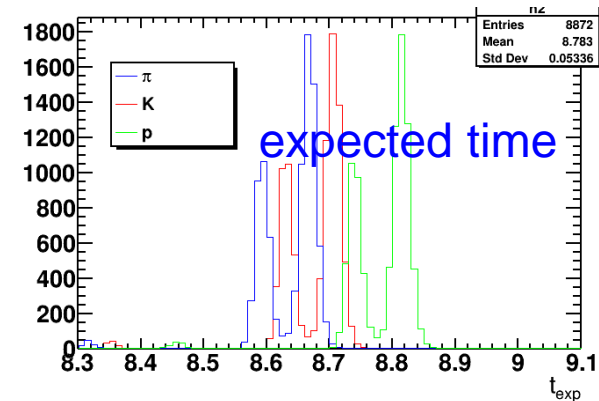
$$\text{Efficiency}_{\text{trk}}(\text{TPC}) = \frac{N_{\text{trk}}^{\text{TPC}}}{N_{\text{trk}}^{\text{reco}}}$$

$$\text{Efficiency}_{\text{PID}}(i) = \frac{N_{\text{trk}}^{\text{TPC}}(\chi^2(i) < \chi^2(j))}{N_{\text{trk}}^{\text{TPC}}(i)} (j \neq i)$$

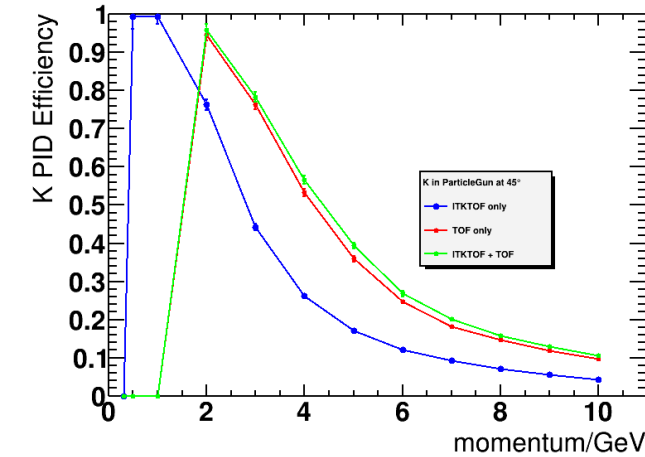
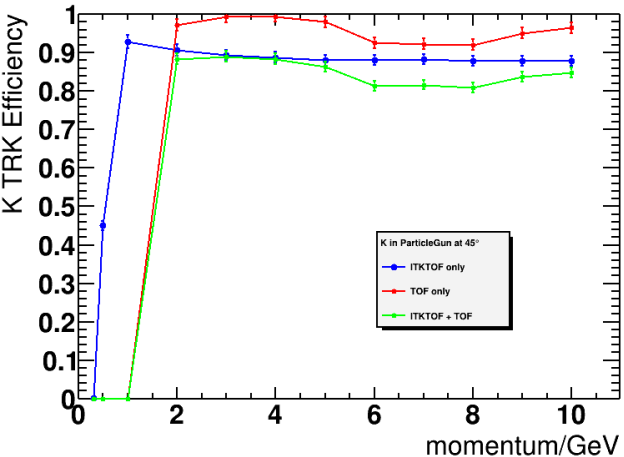
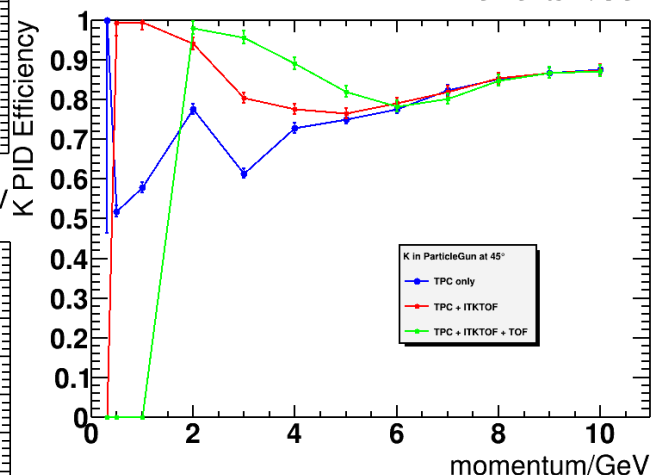
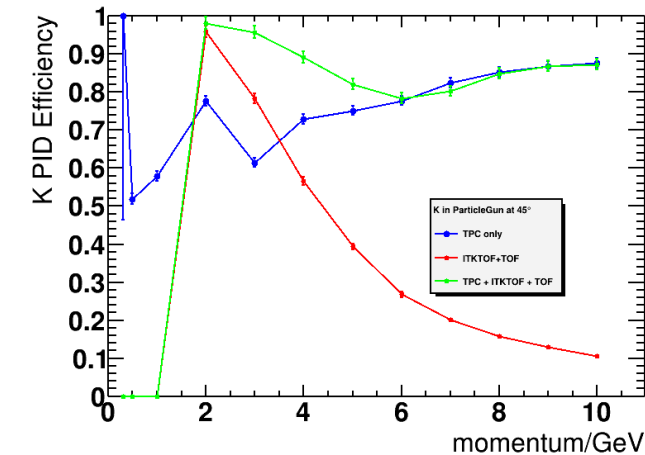
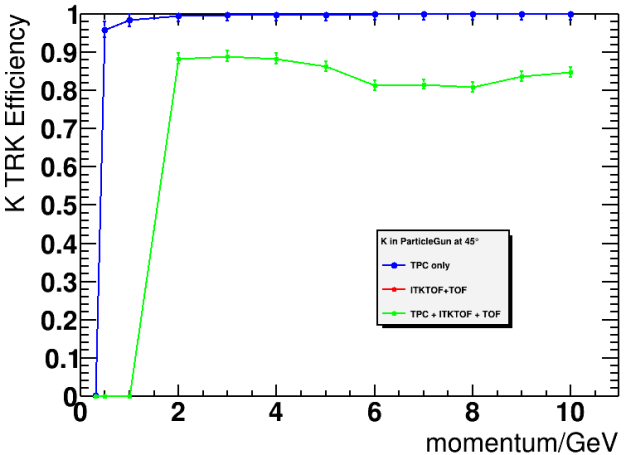
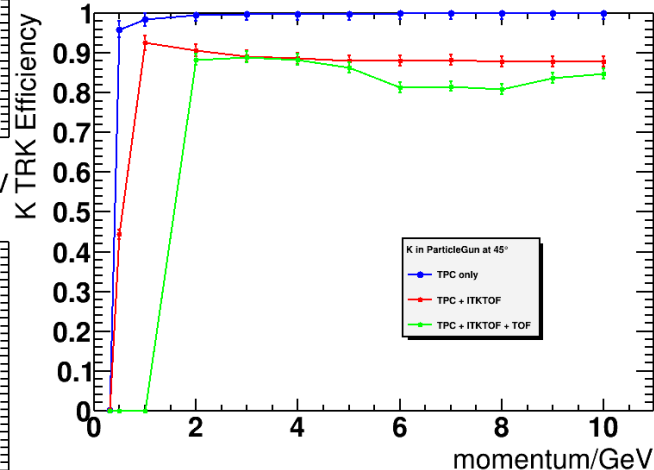
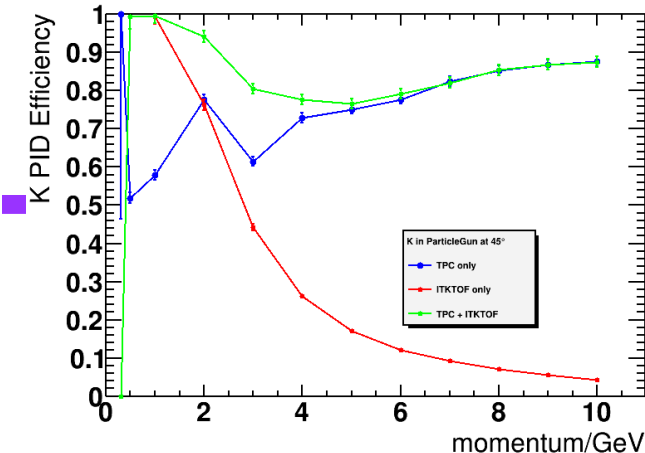
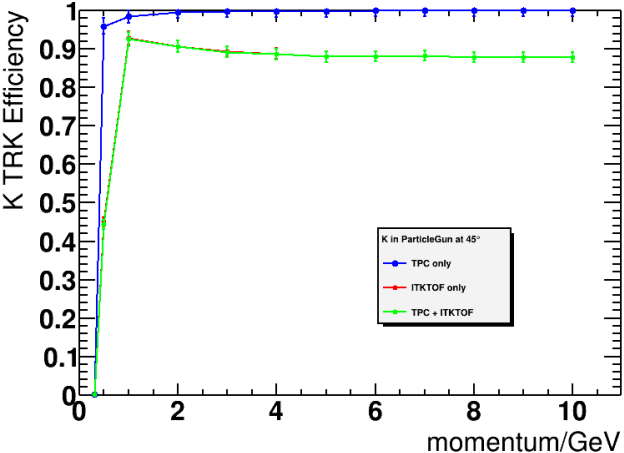
$$\text{purity}(K) = \frac{N_{K \rightarrow K}}{N_{K \rightarrow K} + N_{\pi \rightarrow K} + N_{p \rightarrow K}}$$



ParticleGun K- at 5 GeV, 45 degree
Nfulltrk==1&&no decay



45 degree



85 degree

