

K short Mean Life

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Ks Mean Life Measurements($5 \cdot 10^5 Z \rightarrow qq$ events):

Formula:

$\text{FlightLength}(\text{MC Truth}) = (\text{KsVTX} - \text{KsEnd}).\text{Mag}()$

$\text{FlightLength}(\text{Reco}) = \text{RecoVTX}.\text{Mag}()$

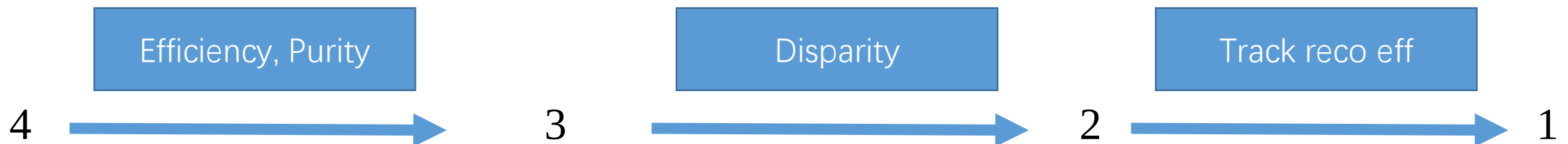
$\text{Speed} = \text{Momentum} / \text{Energy} * \text{LightSpeed}$

$\text{LifeTime} = \text{FlightLength} / \text{Speed} * \text{Mass} / \text{Energy} \rightarrow \text{Fit with exponential} \rightarrow \text{Mean life}$

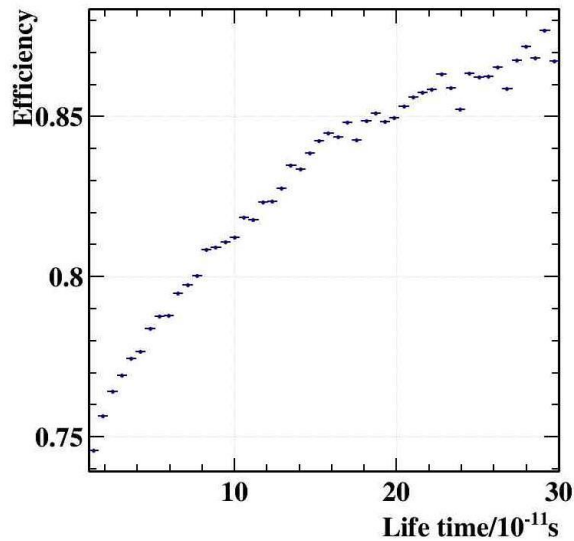
4 conditions:

	Mean life/resolution($\cdot 10^{-11}\text{s}$)
1. All Ks $\rightarrow$ pi+- MC truth($\approx 3.4 \cdot 10^5$):	8.85/0.022 *PDG value:8.954/0.004
2. Ks MC truth w/ both trk reco:	8.58/0.024
3. Known Ks daughter trks:	8.67/0.024
4. Using reconstructed Ks:	9.07/0.029

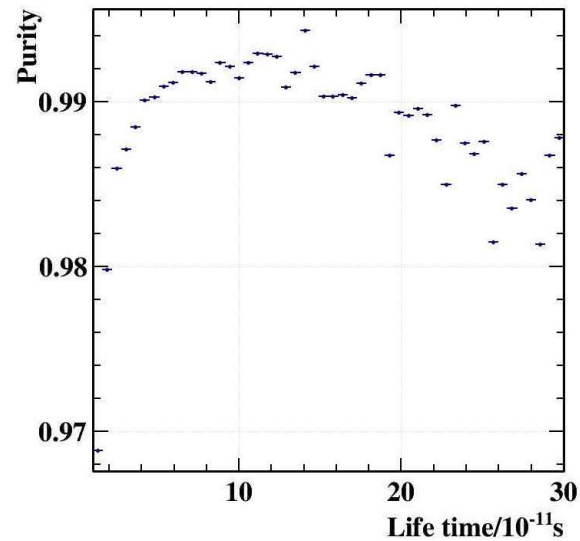
*We want to get 1 based on 4.



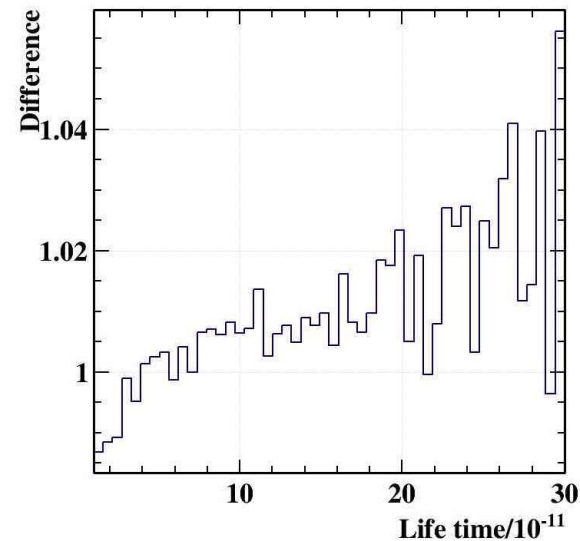
Use 2×10^6 $Z \rightarrow qq$ samples to get dependency of efficiency, purity and disparity on life time & use it to reverse life time distribution in condition 4 $\rightarrow$ condition 1 on a new sample.



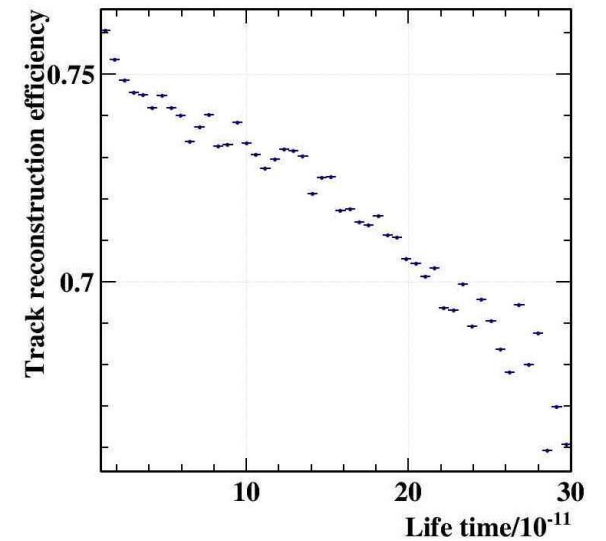
Ks reco efficiency



Ks reco purity



Disparity



Efficiency of both
Ks $\pi^{\pm}$ daughters
reconstructed

Ks Mean Life Measurements:

4 conditions:

1. All Ks MC truth:

2. Ks MC truth w/ both trk reco:

3. Known Ks daughter trks:

4. Using reconstructed Ks:

Mean life/resolution($\times 10^{-11}$,original) w/adjustments

8.85/0.022

8.80/0.021

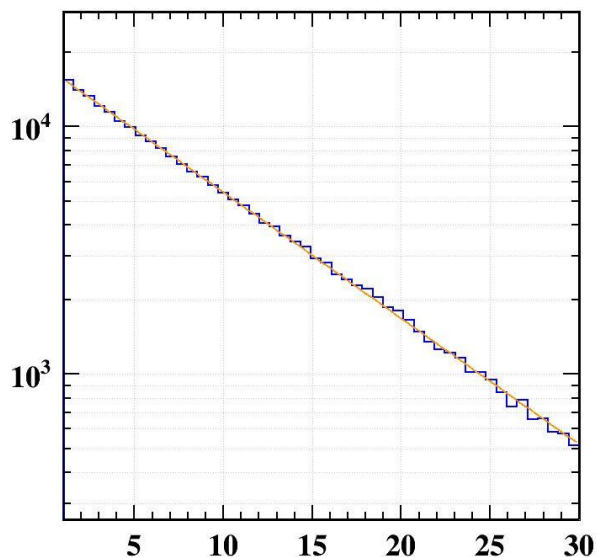
8.58/0.024

8.53/0.024

8.67/0.024

8.62/0.024

9.07/0.029



Life time distribution and fit