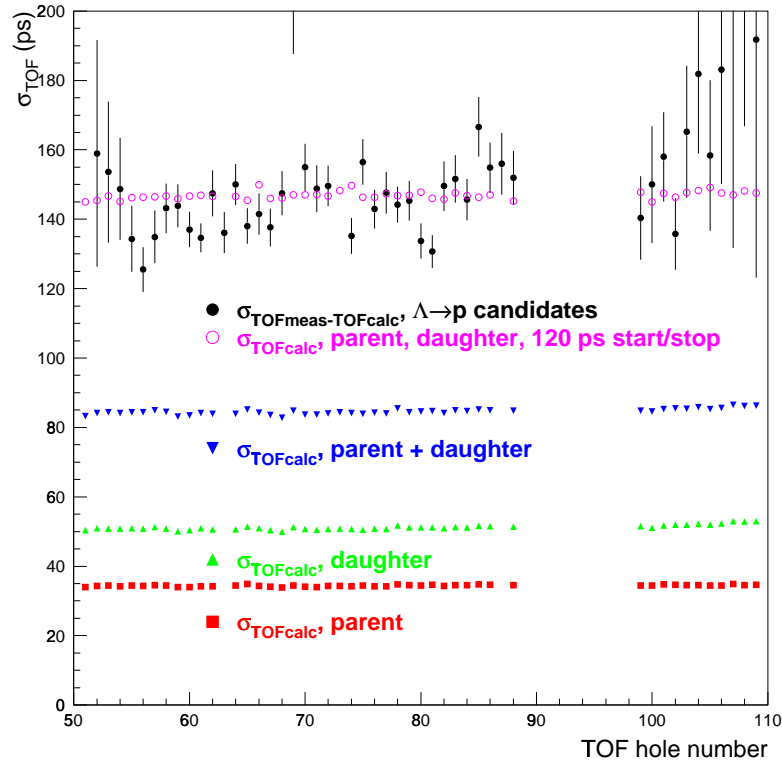


# E896 TOF Measurement Resolution

To obtain timing resolution of TOF system,

start with  $\sigma_{(measTOF-calcTOF)}$  for  $\Lambda \rightarrow p$  candidates



$\sigma_{(measTOF-calcTOF)} \sim 145$  ps across all slats

$$t_{calc} = t_{parent} + t_{daughter}; \quad t = \frac{d}{c} \sqrt{1 + \frac{m^2}{p^2}}$$

Typical values for  $\Lambda \rightarrow p$  paths, times:

$$d_{parent} = 134.3 \text{ cm}; \quad p_{parent} = 8.47 \text{ GeV}/c$$

$$d_{daughter} = 479.2 \text{ cm}; \quad p_{daughter} = 7.79 \text{ GeV}/c$$

Assumed uncertainties:

$$\sigma_{d_{parent}} = 1 \text{ cm (vertex position res.)}$$

$$\sigma_{p_{parent}}/p_{parent} = 1 \% \text{ (mom'n res.)}$$

$$\sigma_{d_{daughter}} = 1.5 \text{ cm (path length calc.)}$$

$$\sigma_{p_{daughter}}/p_{daughter} = 2 \% \text{ (mom'n res.)}$$

After smearing effects included:

$$\sigma_{t_{parent+t_{daughter}}} \approx 85 \text{ ps} = \sigma_{calcTOF} \text{ (contrib. from tracking, exp't geom.)}$$

→ hence, E896 TOF “start/stop” resolution:

$$\sigma_{measTOF} \approx \sqrt{\sigma_{measTOF-calcTOF}^2 - \sigma_{calcTOF}^2} \approx 120 \text{ ps}$$