

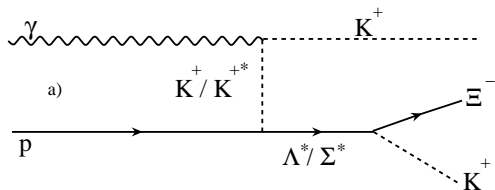
Cascade Simulations Update

Nathan Sparks

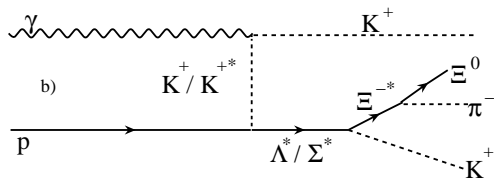
Florida State University, Tallahassee, Florida

January 6, 2012

Possible Production Mechanism



$K^+(\Xi^- K^+)$, $K^+(\Xi^0 K^0)$, $K^0(\Xi^0 K^+)$



Production of excited states via a

- 1 forward-going K^0 meson
 $\rightarrow K^0(\Xi^- \pi^+) K^+$, etc.
- 2 forward-going K^+ meson
 $\rightarrow K^+(\Xi^- \pi^+) K^0$,
 $K^+(\Xi^0 \pi^-) K^+$, etc.

Procedure

Photoproduction of Ξ^- (1320) and Ξ^0 (1315) using 9 GeV photons

- t-channel production using the genr8 program
- Reactions and decay chains
 - $\gamma p \rightarrow K^+ Y^*$ with $Y^* \rightarrow K^+ \Xi^-$, $\Xi^- \rightarrow \Lambda \pi^-$, $\Lambda \rightarrow \pi^- p$
 - $\gamma p \rightarrow K^+ Y^*$ with $Y^* \rightarrow K_S \Xi^0$, $\Xi^0 \rightarrow \Lambda \pi^0$, $\Lambda \rightarrow \pi^- p$, $K_S \rightarrow \pi^+ \pi^-$, $\pi^0 \rightarrow \gamma\gamma$
 - $\gamma p \rightarrow K_S Y^{*+}$ with $Y^* \rightarrow K^+ \Xi^0$, $\Xi^0 \rightarrow \Lambda \pi^0$, $\Lambda \rightarrow \pi^- p$, $K_S \rightarrow \pi^+ \pi^-$, $\pi^0 \rightarrow \gamma\gamma$
- Excited hyperon parameters:
 $m(Y^*) = 1960$ MeV and $\Gamma(Y^*) = 220$ MeV
from (Guo *et al.*, PRC **76**, 025208 (2007))
- t-channel slope parameter: 1.4 (GeV) $^{-2}$
- Swim particles through GlueX detectors using HDGeant
(minimal control.in file with HADR==0)

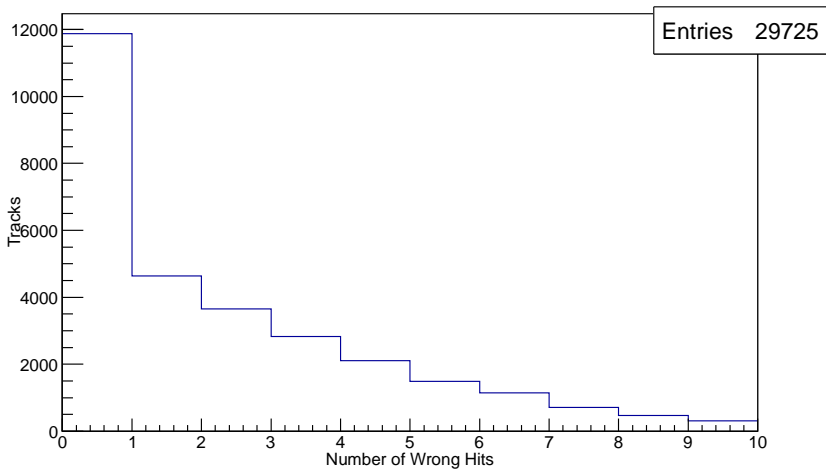
Hit Purity Study

- Many tracks have a very low χ^2 probability
- How many of these tracks have a low hit purity?

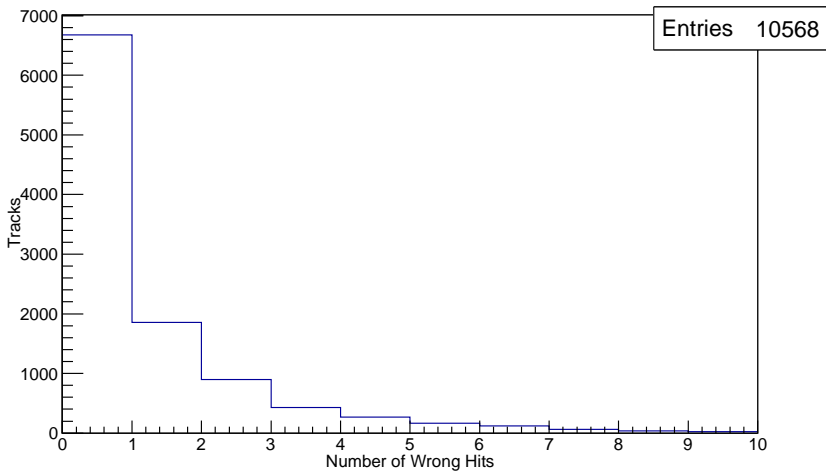
Procedure

- Use MC truth hit information to extract the number of wrong hits
- Study its relationship to tracking χ^2 probability
- Use cut to separate tracks into two groups:
 - Accepted match a MC truth track well
 - Rejected do not
- Cut requires hit and parameter matching techniques to yield same result and parameter matching χ^2 to be less than 100

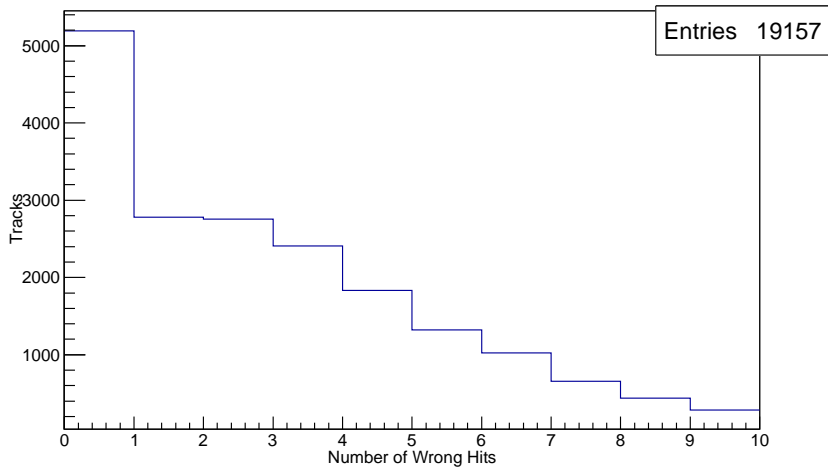
Number of Wrong Hits for all Tracks



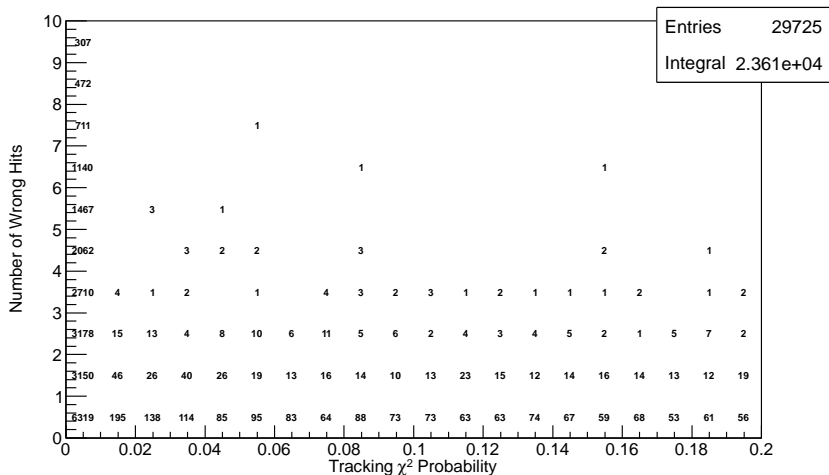
Number of Wrong Hits for Accepted Tracks



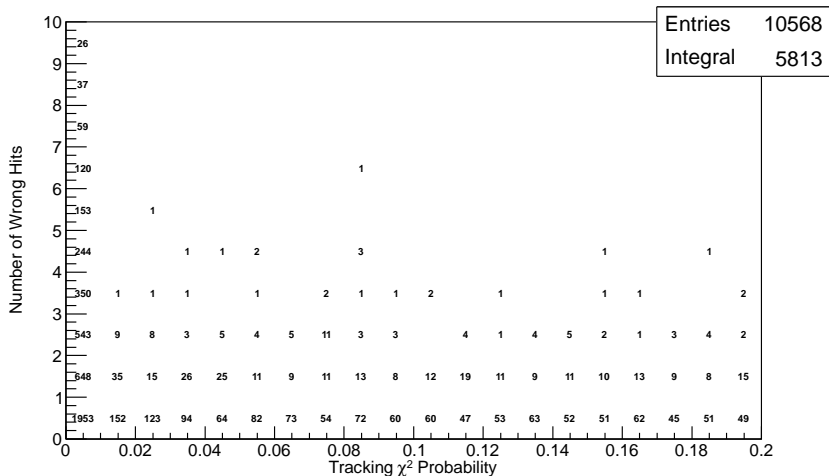
Number of Wrong Hits for Rejected Tracks



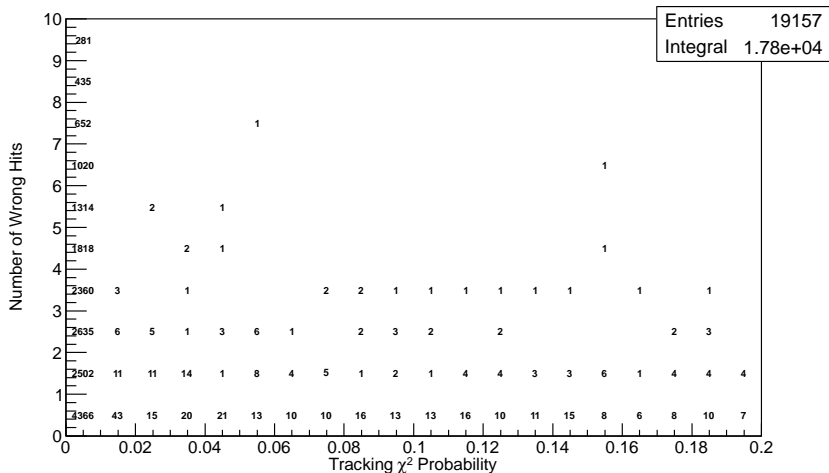
Number of Wrong Hits versus track FOM for all Tracks



Number of Wrong Hits versus FOM for Accepted



Number of Wrong Hits versus FOM for Rejected



Statistics

Percentage of Tracks with χ^2 probability < 0.01

- all Tracks: 22003/29725 → 74%
- Accepted Tracks (36%): 4159/10568 → 39%
- Rejected Tracks (64%): 17844/19157 → 93%

Percentage of Tracks with no wrong hits

- all Tracks: 11874/29725 → 40%
- Accepted Tracks (36%): 6680/10568 → 63%
- Rejected Tracks (64%): 5194/19157 → 27%

Percentage of χ^2 probability < 0.01 Tracks with no wrong hits

- all Tracks: 6319/22003 → 29%
- Accepted Tracks (36%): 1953/4159 → 47%
- Rejected Tracks (64%): 4366/17844 → 25%