Elimination of Λ^0 from Σ^* Decays in $s\bar{s}$ Spin Correlation Studies

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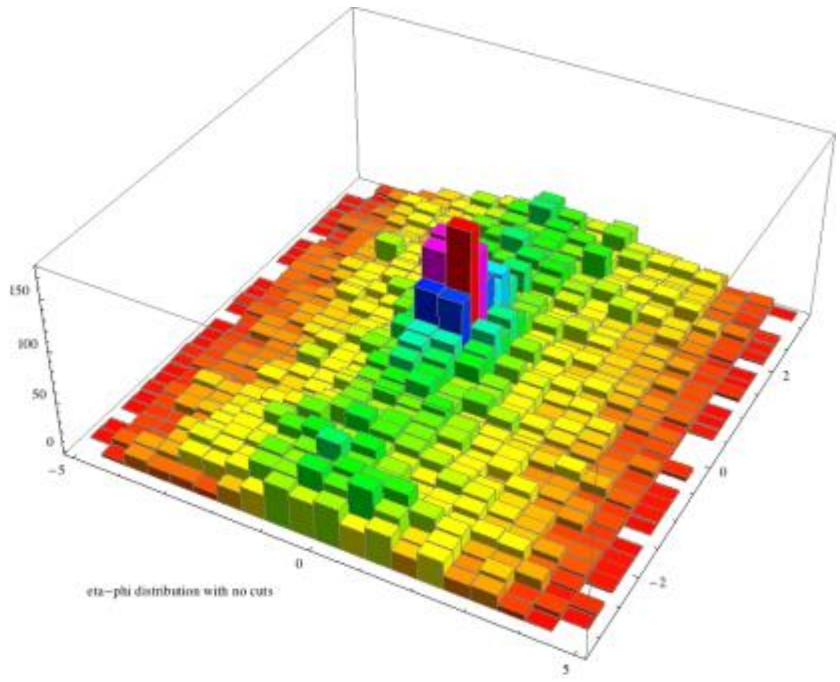
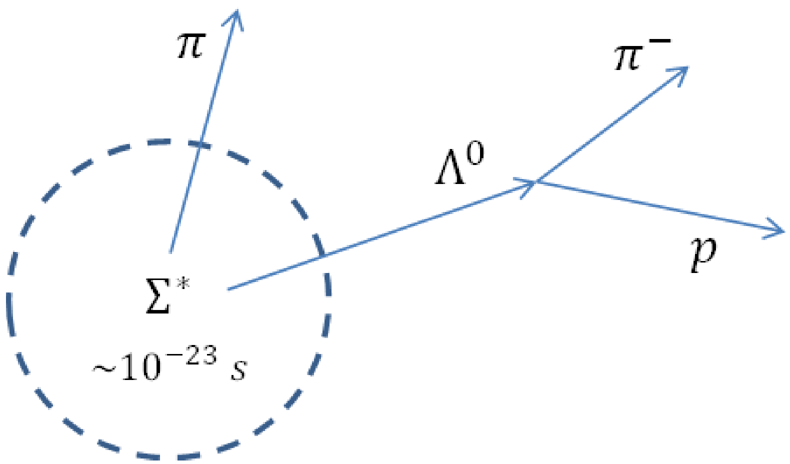
ATLAS

Motivation



- $q\bar{q}$ pair production poorly understood
- Are spins correlated? $\propto 1 \pm a^2 \cos\theta_1^* \cos\theta_2^*$
- $\Lambda\bar{\Lambda}$ more common than $\Lambda\Lambda$, $\bar{\Lambda}\bar{\Lambda}$
- $\Lambda\bar{\Lambda}$ pairs show η ϕ spatial correlation

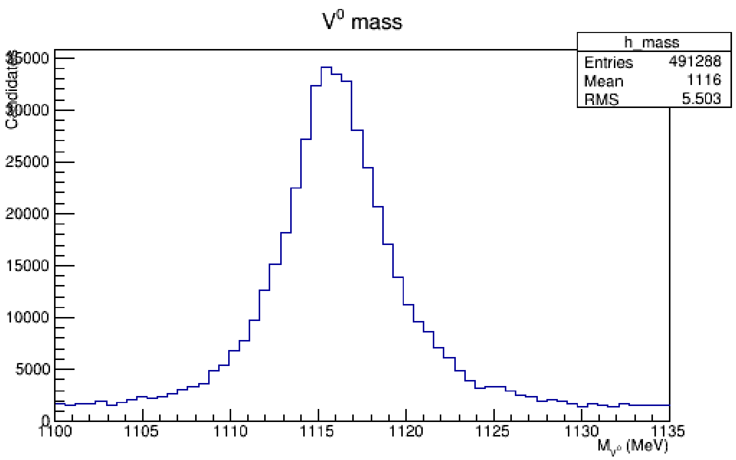
My role



- Confirm presence of Σ^* in data
- Eliminate Λ^0 originating from Σ^*

Σ^* dominant source of Λ^0
No simple correlation

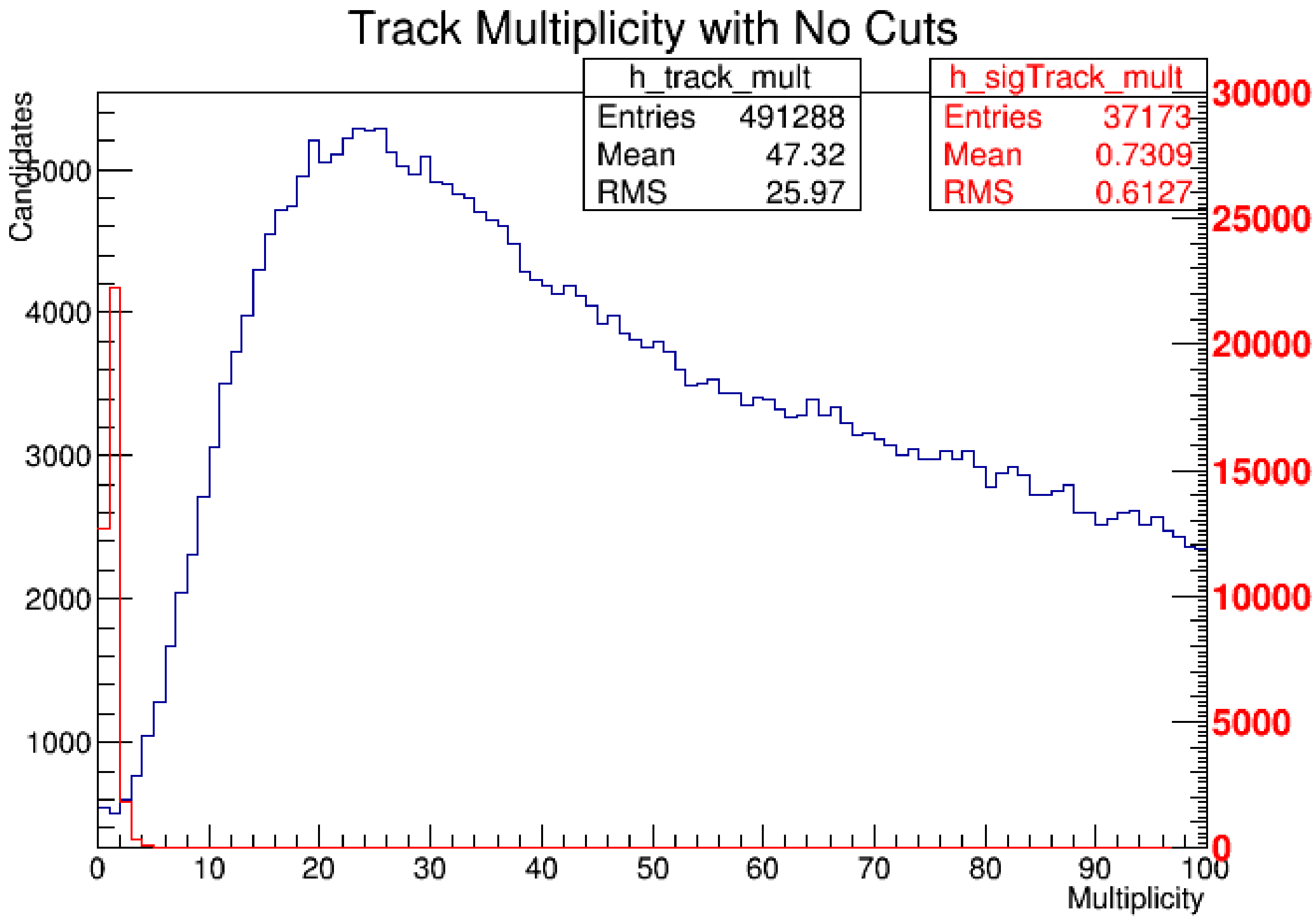
Method



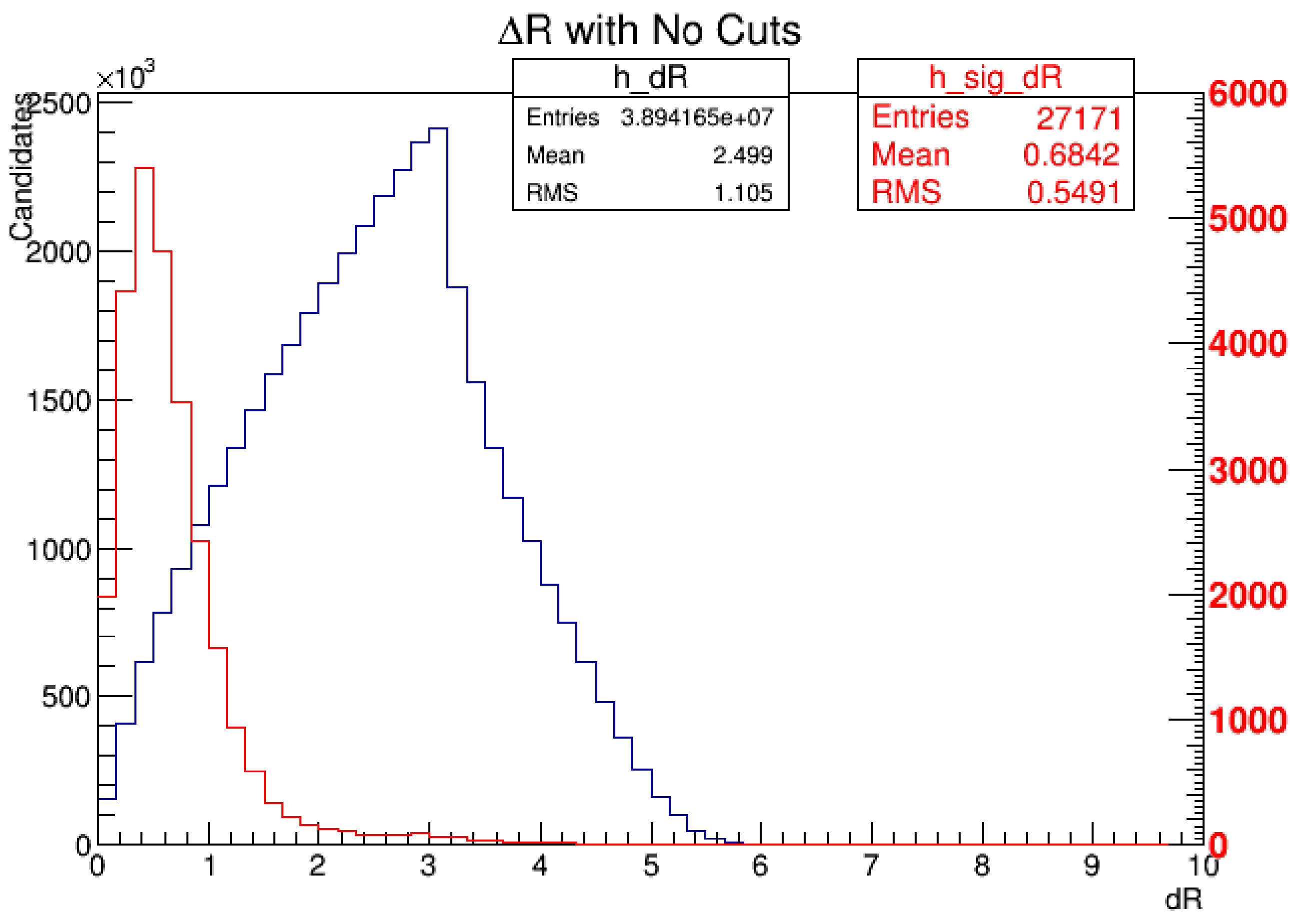
54,000 MinBias inclusive $\Lambda\bar{\Lambda}$ events

- Select for Σ^* decays with Monte Carlo info
- Distinguish Σ^* tracks from others
- Confirm presence of Σ^* in reconstructed MC
- Apply cuts to real data

Too many junk tracks

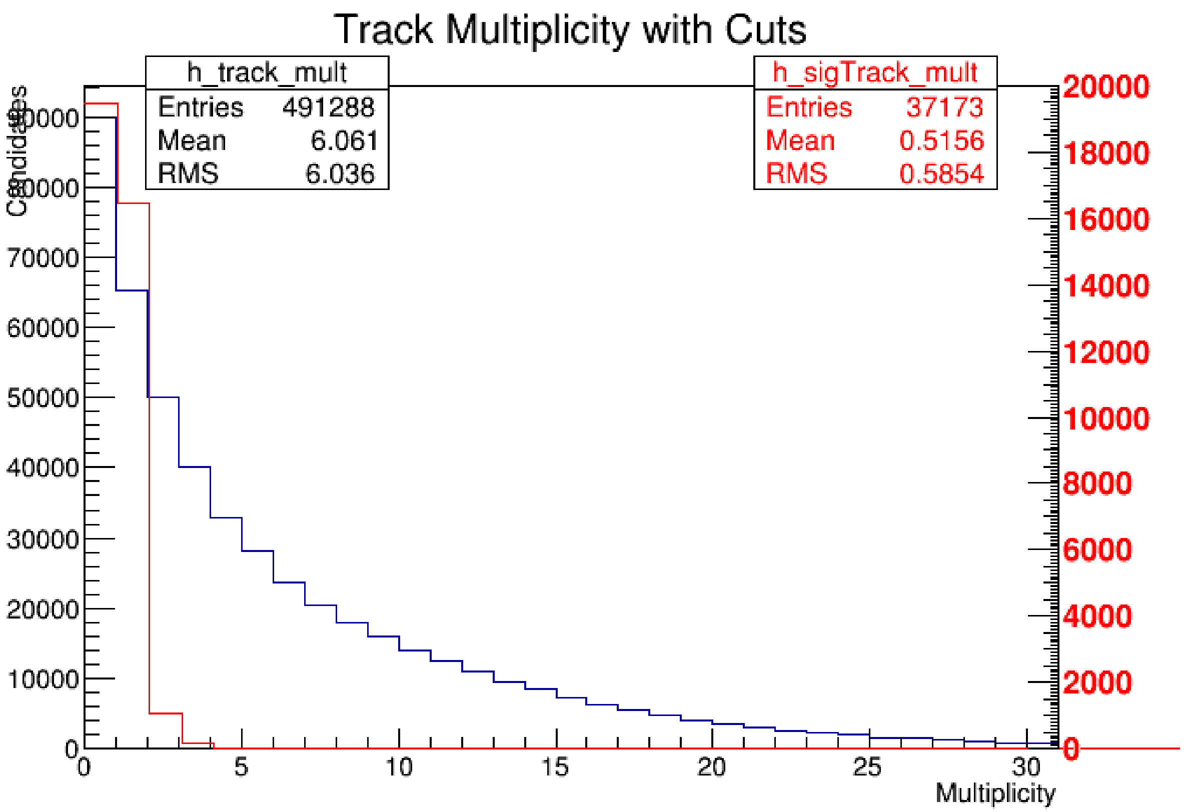


What to cut



$$\Delta R = \sqrt{(\Delta\eta)^2 + (\Delta\phi)^2}$$

Reducing excess tracks



Cuts:

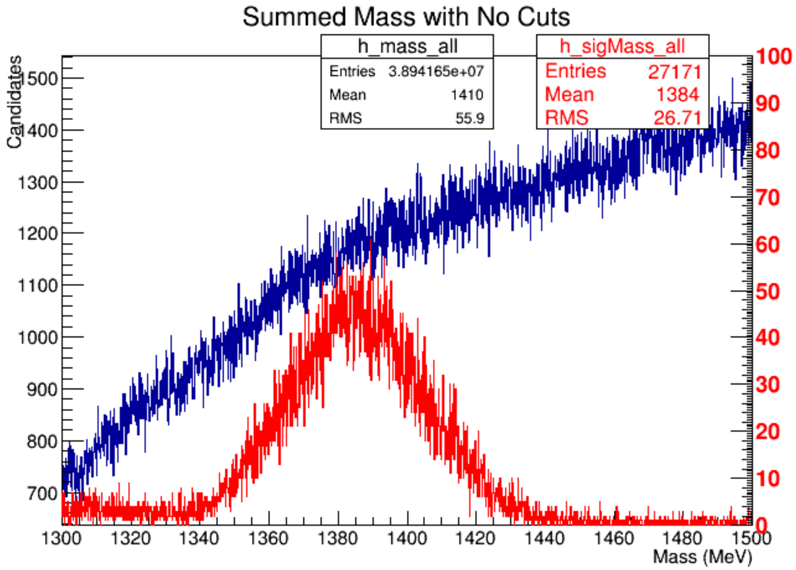
$$\Delta R < 1$$

$$\Delta p_t > 500$$

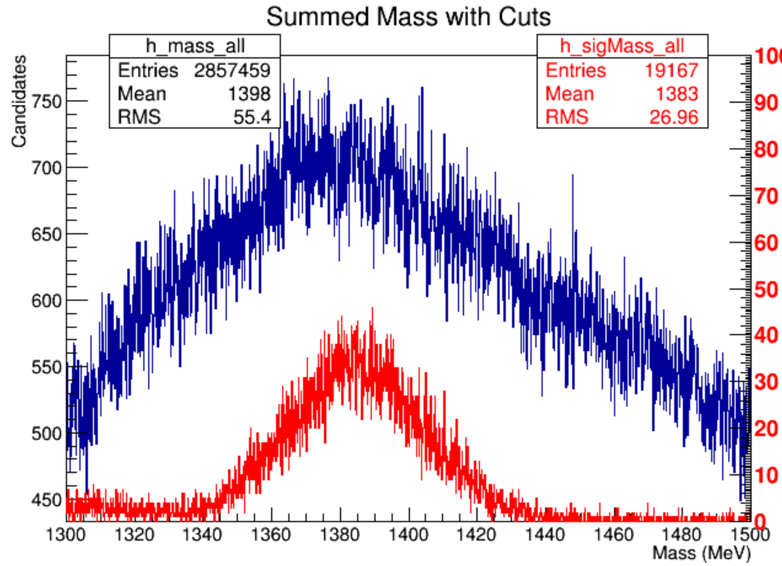
$$p_t\ sum > 1500$$

Approaching the Σ^* mass

Before cut



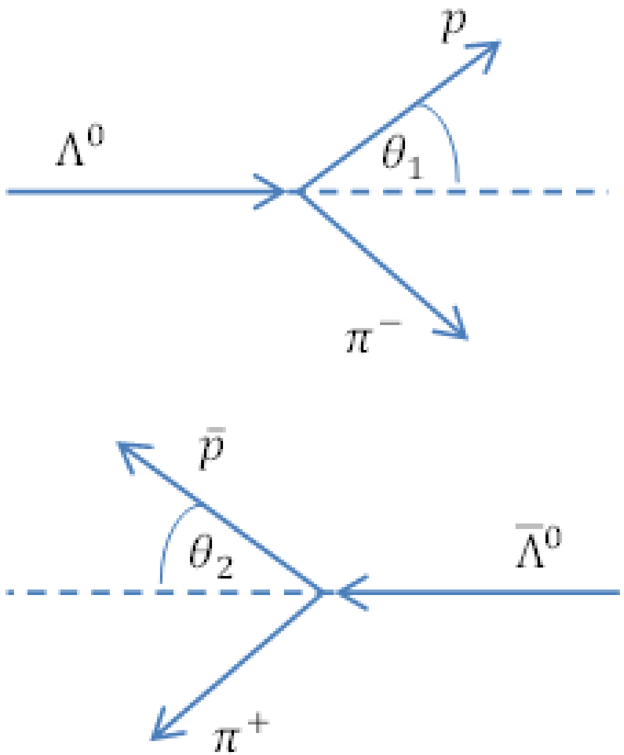
After cuts



Retain ~70% of Σ^* tracks, cut ~93% of total

Remaining work

- Further reduce background
- Apply effective cuts to real data
- Look for spin correlation



What I learned

- Using C++, ROOT
- Applying Monte Carlo info
- Increasing signal-to-background
- Identifying particles
- Measuring spin
- Avoiding tuna in R1

Favorite part of program