Search for $B^+ \longrightarrow \rho^0 K^*(892)^+$ decay

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Overview

1. The analysis with signal MC
   - Checking the self cross feed (SCF)
2. Skim Criteria
3. Summary and next plan

The analysis with signal MC: SCF

- As verified by the MC truth table(genHep matching), SCF occurs when a kaon or pion used to reconstruct a ρ^0 and/or $K^{*\pm}$ meson is selected from the generic decay.
- SCF ratio table(ratio = # of candidates/total candidates)

Channel	Longitudinal MC	Transverse MC
$K^{*+} \rightarrow \pi^+ K^0_S$	7.77%	4.44%
$K^{*+} \rightarrow \pi^0 K^+$	7.91%	5.22 %

- There are many events of the random combination and missing PID in reconstructed events.
- $\rightarrow$ We need to study the PID and $q\bar{q}$.
- After the studies, we will estimate the SCF and WC.

Skim Criteria

- $K^{*+} \rightarrow \pi^+ K_S^0$:
  - it should be existed mdst_vee2 and kind == 1
  - K_S^0 mass; $M(\pi^+\pi^-) \in (0.468, 0.527)\mathrm{GeV/c^2}$
- $K^{*+} \rightarrow \pi^0 K^+$:
  - π^0 mass; $M(\gamma\gamma) \in (0.08, 0.18)\mathrm{GeV/c^2}$
  - γ energy;$> 0.05\mathrm{GeV}$
  - π^0 lab momentum > $0.2\mathrm{GeV}/c$
- ρ mass; $M(\pi^+\pi^-) < 1.9\mathrm{GeV/c^2}$
- K^{*+} mass; $M(\pi^+ K_S^0) < 1.9\mathrm{GeV/c^2}$
- $\Delta E \in (-0.3, 0.3)\mathrm{GeV}$, $M_{bc} > 5.2\mathrm{GeV/c^2}$

- skimming ratio for the generic MC

Channel	uds	charm	mixed	charged
$K^{*+} \rightarrow \pi^+ K_S^0$	4.8%	5.1%	1.0%	1.2%
$K^{*+} \rightarrow \pi^0 K^+$	8.5%	7.0 %	1.1%	1.8%
both channel	13.1%	11.8%	2.0%	3.0%

Summary and Next step

- For signal MC study
  - Self cross feed(SCF) in signal MC: done but redo after study of PID and continuum supression
  - Finding the peaking decays: after cut optimization
- For skimming
  - Determined to the skim criteria : done
  - Skimming for $q\bar{q}$ background MC : done
  - Skimming for $b \rightarrow c$ background MC : will do
  - Applying for particle identification: will do