

Prompt-D0 and non-prompt D0 DCA distribution

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Purdue University

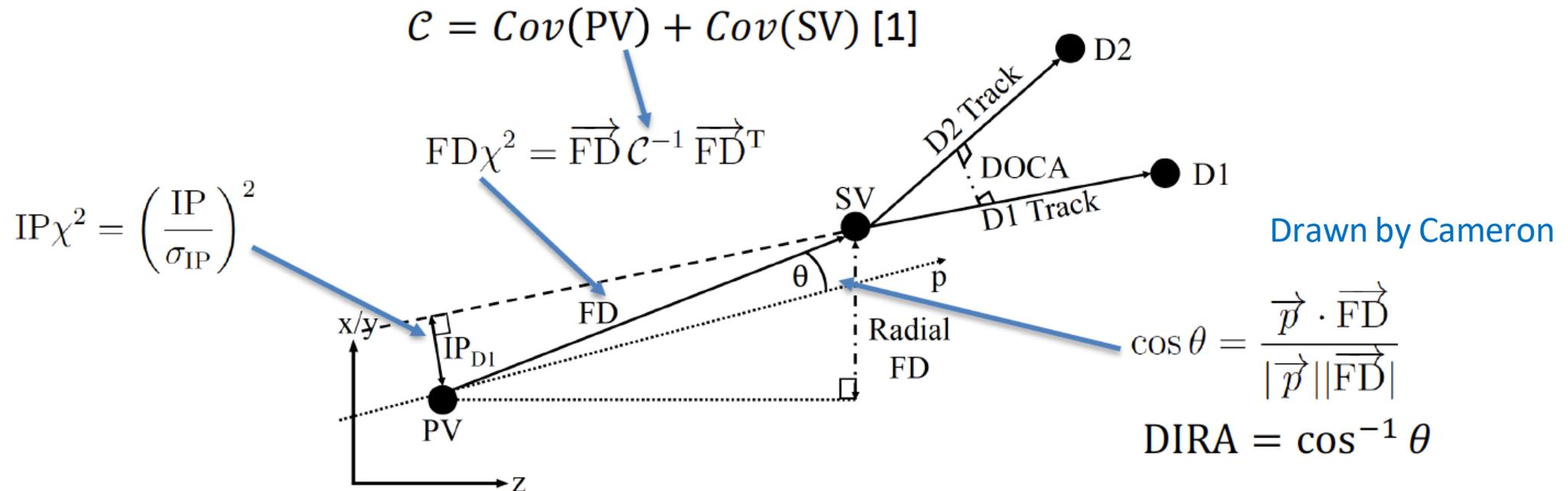
Han-Sheng Li



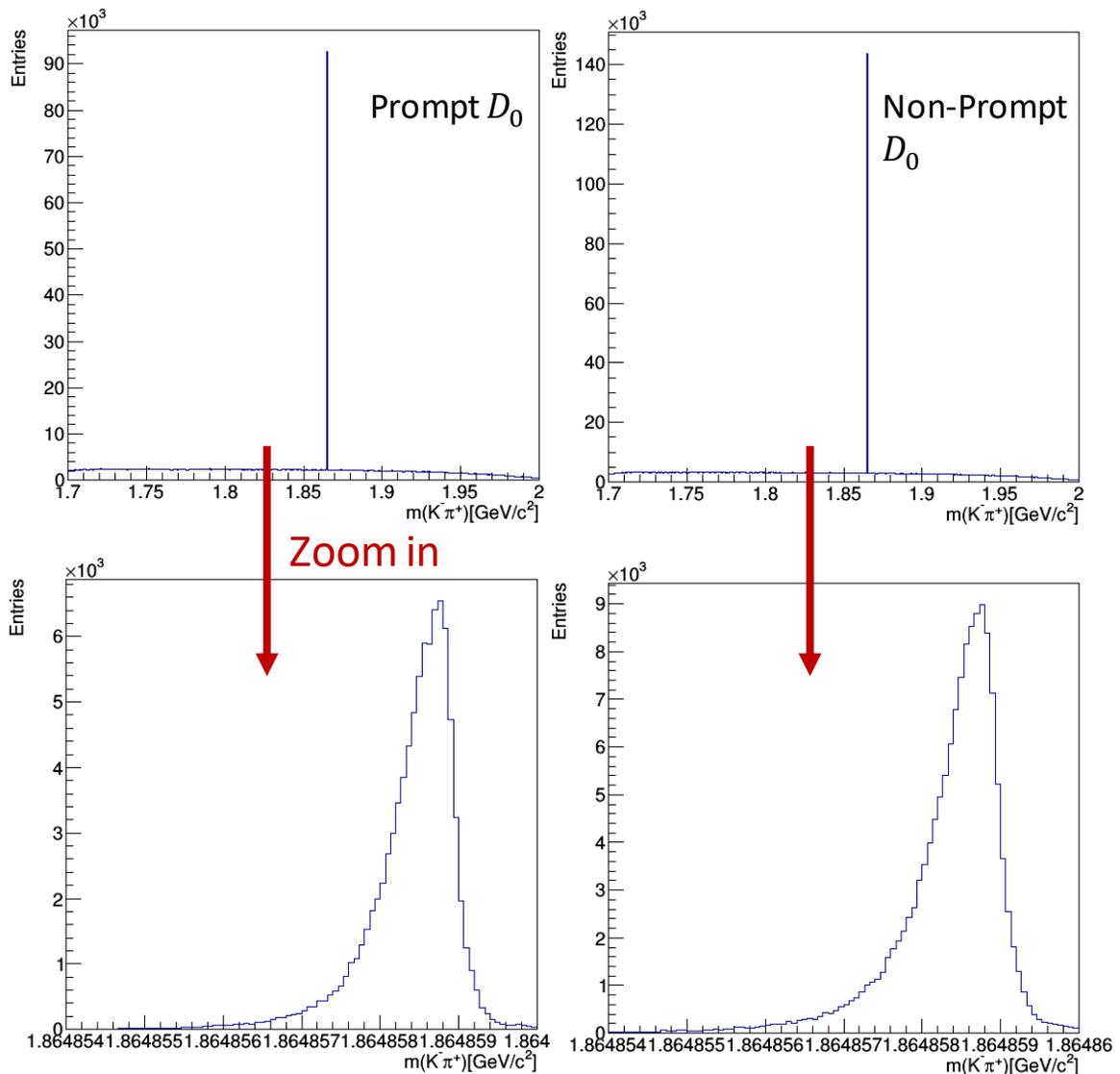
Data sample

MC sample:

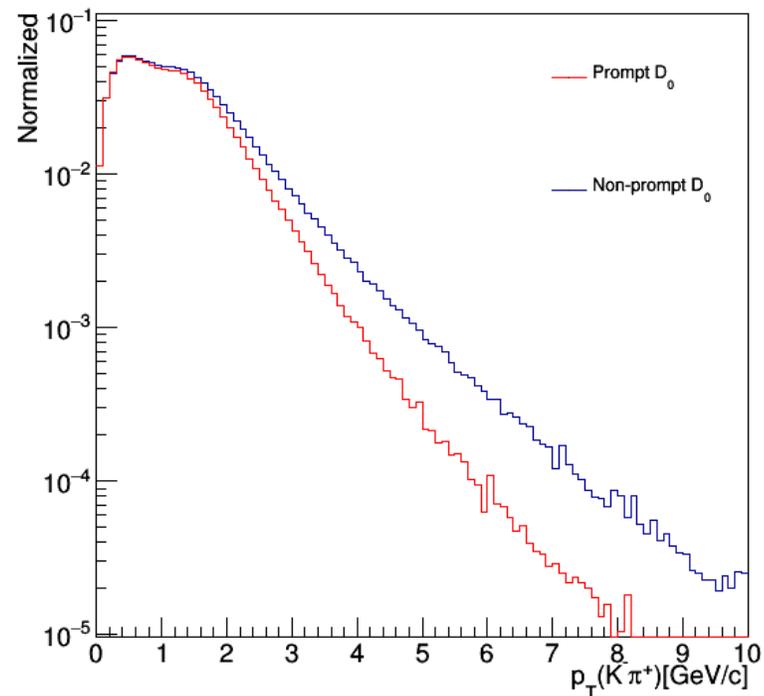
- $c\bar{c} \rightarrow \text{prompt } D_0 \rightarrow K^- \pi^+$ (DST_HF_CHARM_pythia8-0000000001)
- $b\bar{b} \rightarrow \text{non-prompt } D_0 \rightarrow K^- \pi^+$ (DST_HF_BOTTOM_pythia8-0000000001)
/sphenix/sim/sim01/sphnxpro/MDC1/HF_pp200_signal/data



Generator-level invariant mass



- Truth vertex positions matching
 - (track 1 true vertex position = track 2 true vertex position)
- Track true ID matching track PDG ID
 - (track true ID = track PDG ID)

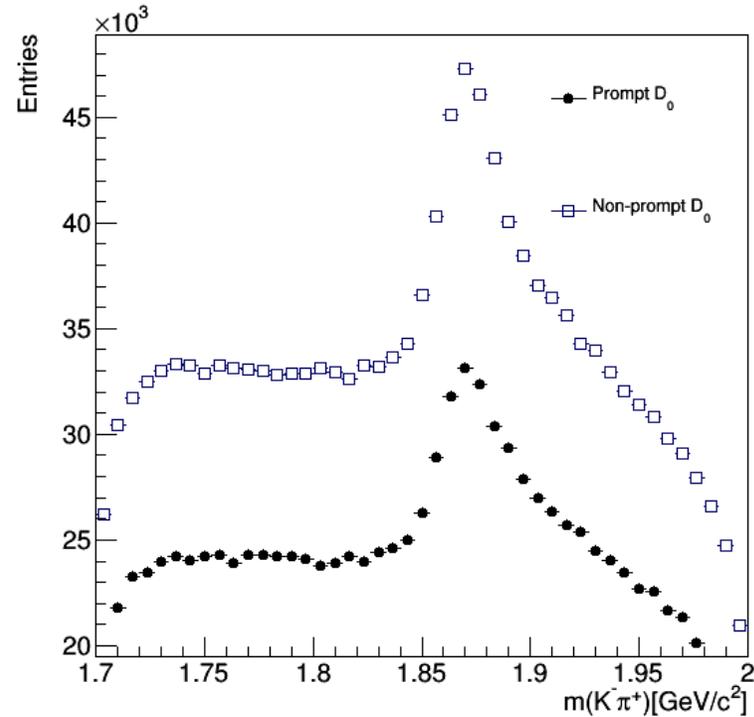


Using the Gen mass window, this is the way of getting purified signal.

Reconstructed invariant mass

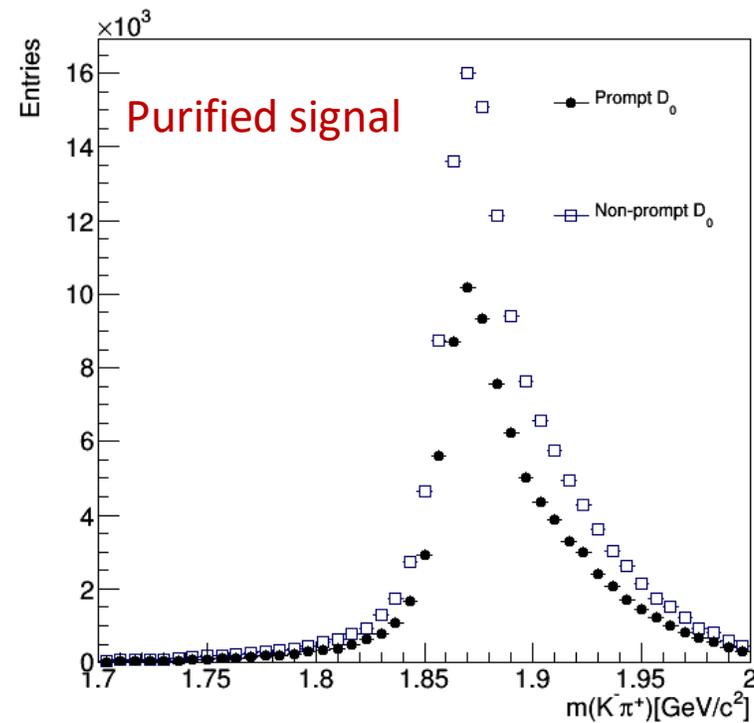
■ Truth matching cuts:

- Truth vertex positions matching
- Track truth ID matching track PDG ID

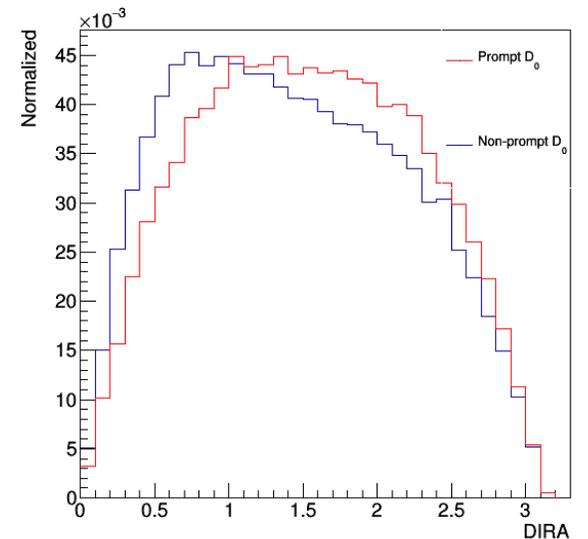
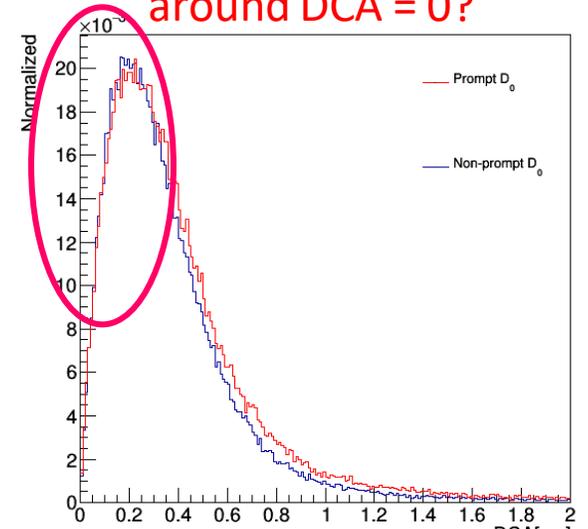


■ Truth matching and Gen mass cuts:

- Truth vertex positions matching
- Track truth ID matching track PDG ID
- $1.864854 < \text{Gen mass} < 1.864860$



There is no prompt D_0 around $\text{DCA} = 0$?



DCA distributions

■ Truth matching and Gen mass cuts:

- Truth vertex positions matching
- Track truth ID matching track PDG ID
- $1.864854 < \text{Gen mass} < 1.864860$

■ Topological cuts:

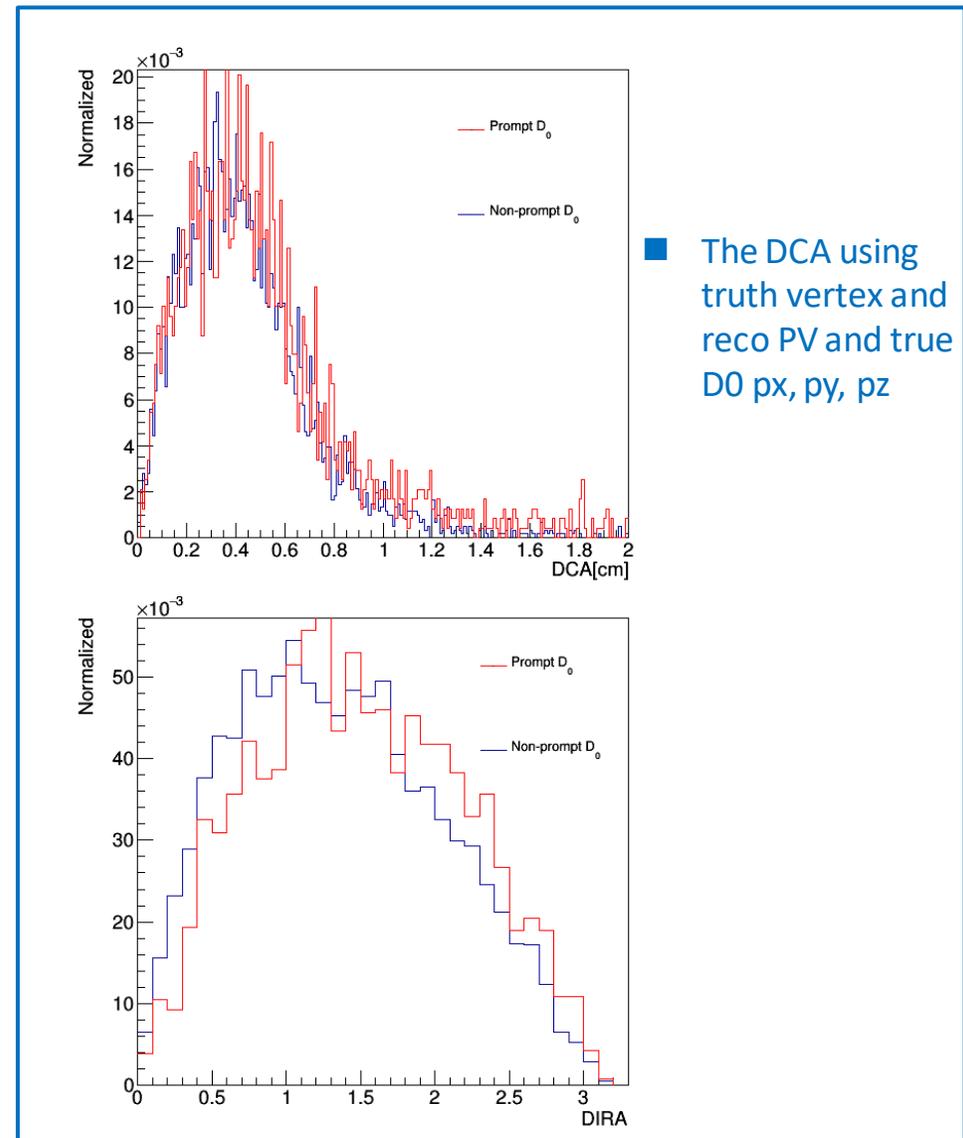
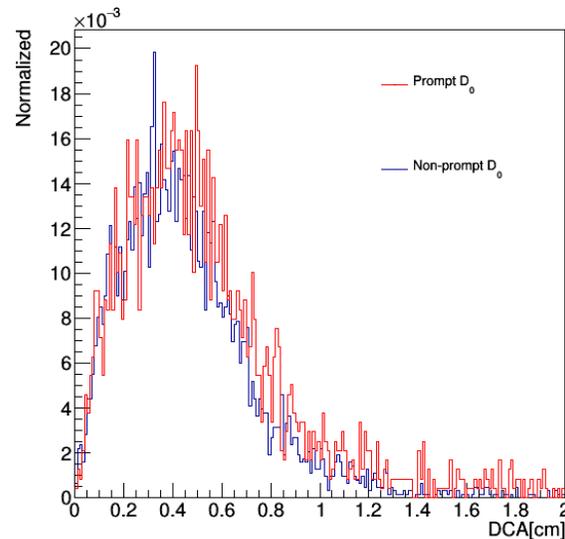
- $\text{trk. } \chi^2 < 4$
- $\text{trkIP } \chi^2 > 1$
- $\chi_D^2 < 2$
- $\text{FD } \chi^2 > 80$
- Daughter DCA < 0.03

■ DCA distributions of prompt and non-prompt D_0 are similar (the topological cuts not improving the situation).

■ Could be a bug from my side or poor PV resolution?

■ Next Step: using gen-level PV and secondary vertex to get gen-level DCA as a sanitary check

- DCA (prompt $D_0 = 0$)



■ The DCA using truth vertex and reco PV and true D_0 px, py, pz

