PID study from the Bs0->DsK/Dsπ analysis

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Motivation

・ Study of the impact of the PID performance on the physics is important piece

・Channel : Bs^0 -> Dsπ/DsK, Ds->KKπ

・(behind motivation for those decay channels are)
Measurements of these decay modes are to use for the precise value of angle γ of unitarity triangle.

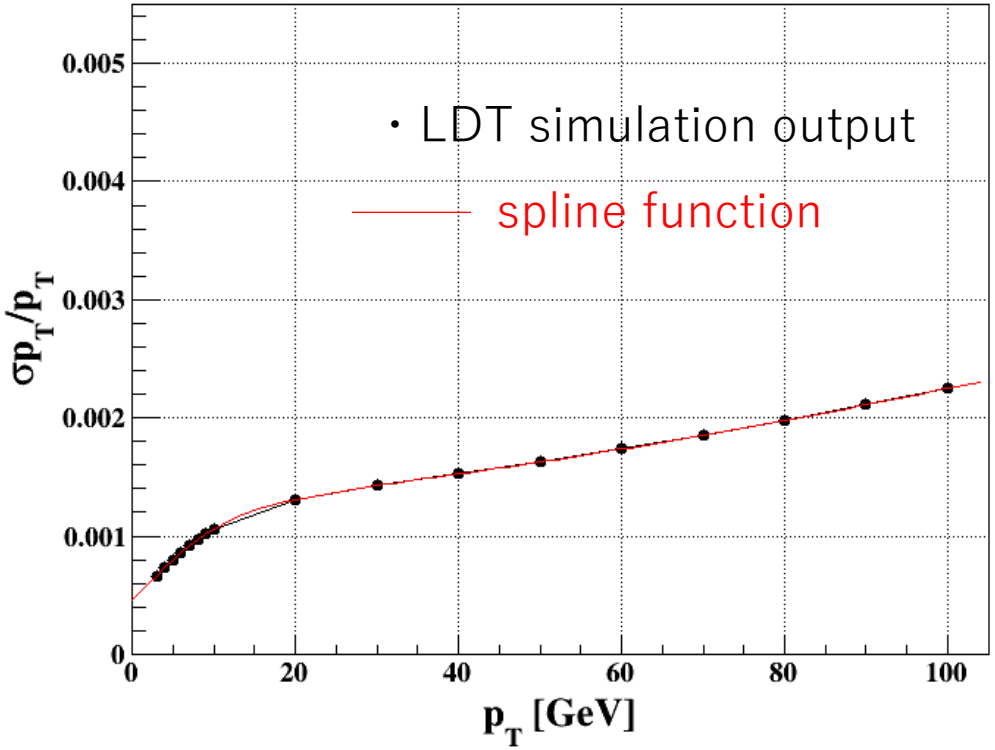
Setup

・ MC Data samples (Bs0->DsK/Dsπ, Ds->KKπ) are generated using the Pythia generator

・ To evaluate with different detector design, MC truth track is smeared and analyzed. (VXD-3SIT-DC-SET config.)

・For that purpose, the LDT simulation output is used as a reference resolution.

・3rd order spline function for the obtained output.



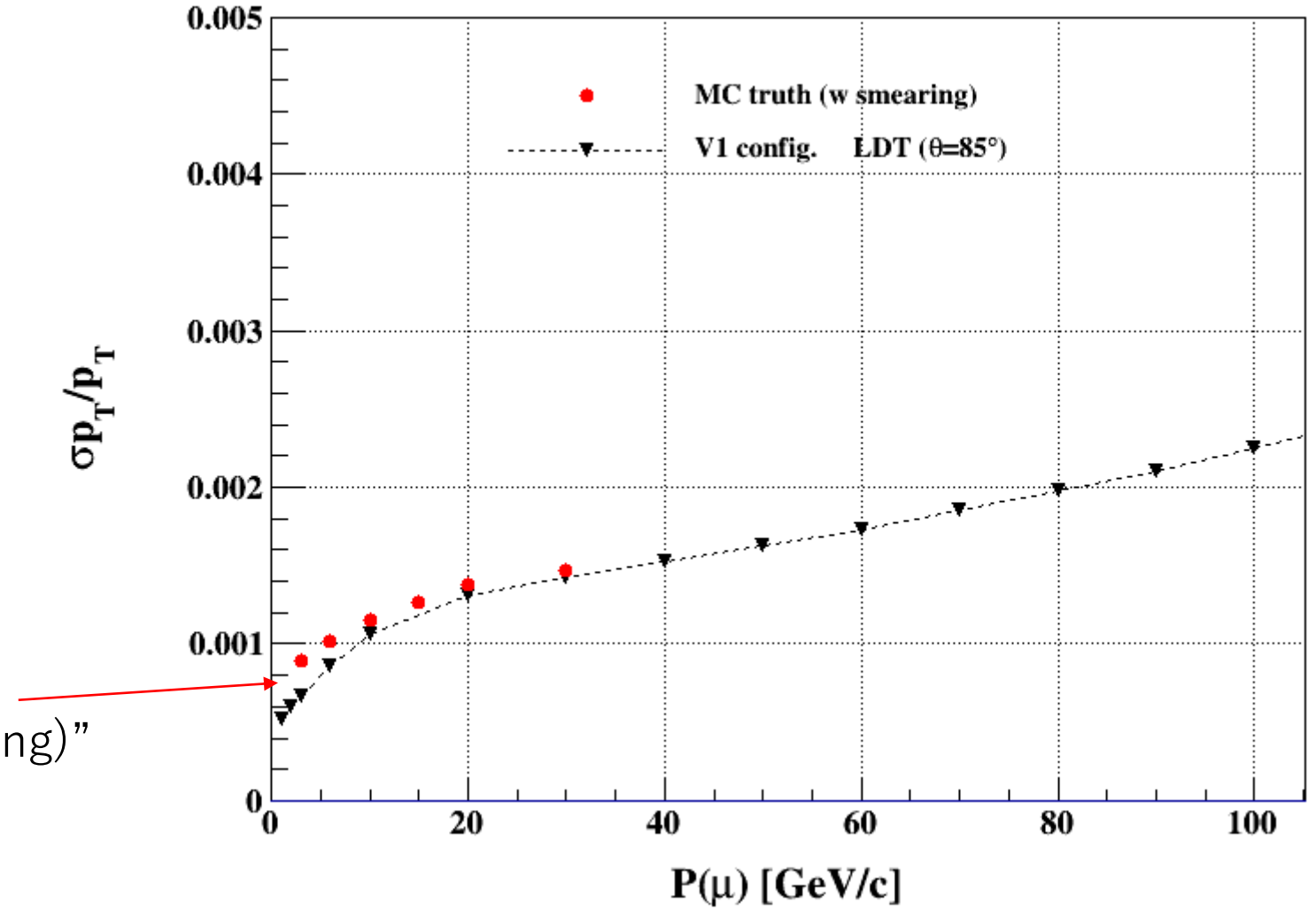
Momentum resolution for smeared MC track

・Run LDT simulation for θ=90, 85, 80, … 20, 15 degree

- to cover polar angle dependence, approximately

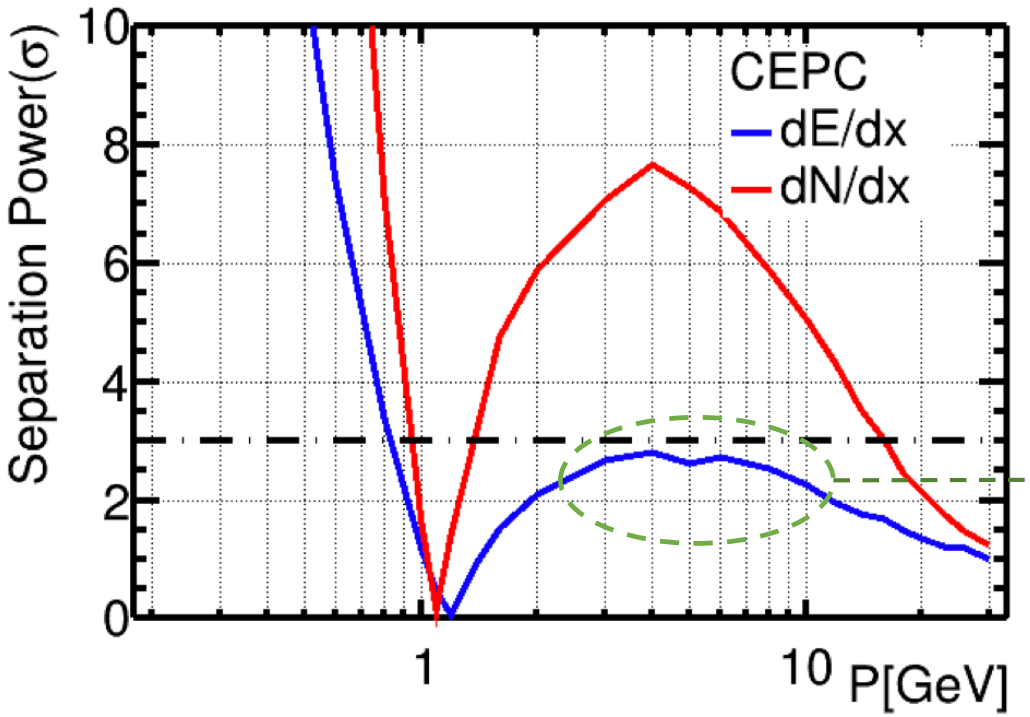
- apply the momentum resolution for MC truth information (i.e. if MC truth track has θ=87deg., the function for θ=85deg. is applied for the track)

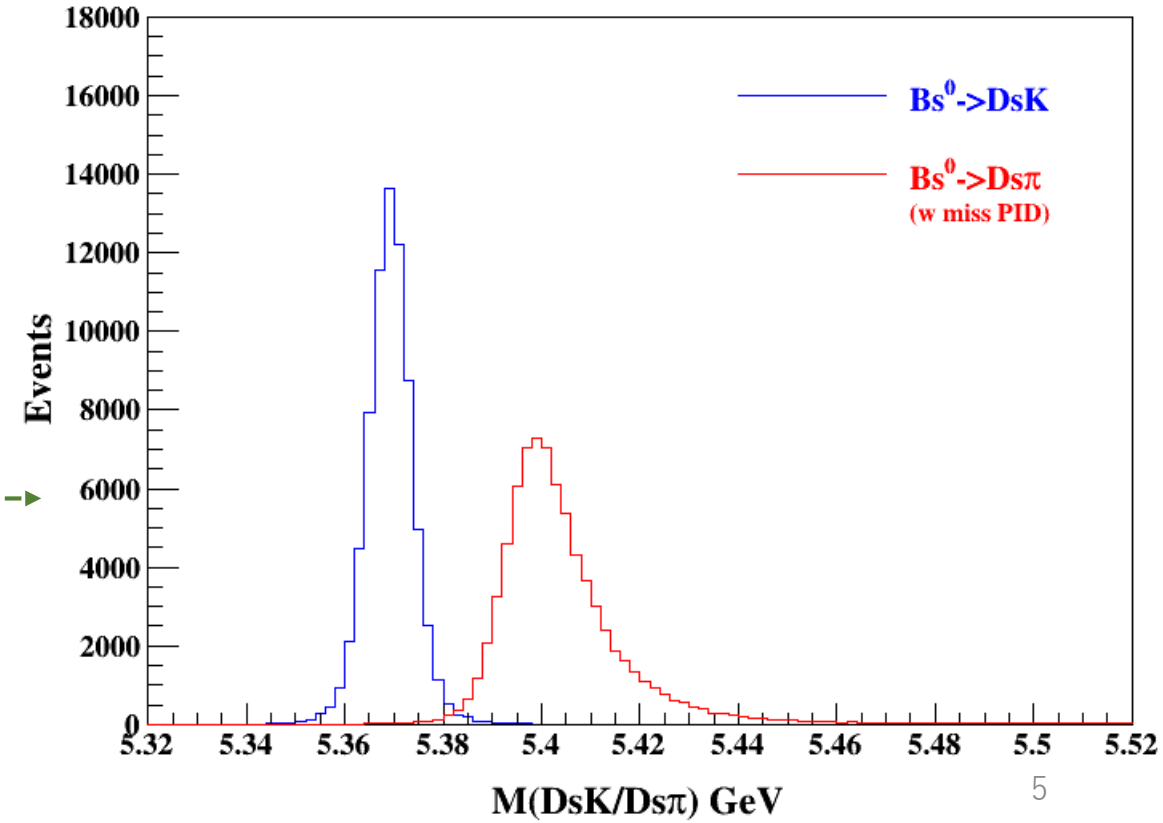
・As a consistency check, using pion from Bs^0 -> Dsπ
and compare the sigma of
"Pt(Mctruth)-Pt(Mctruth_after_smearing)"
with the LDT results.



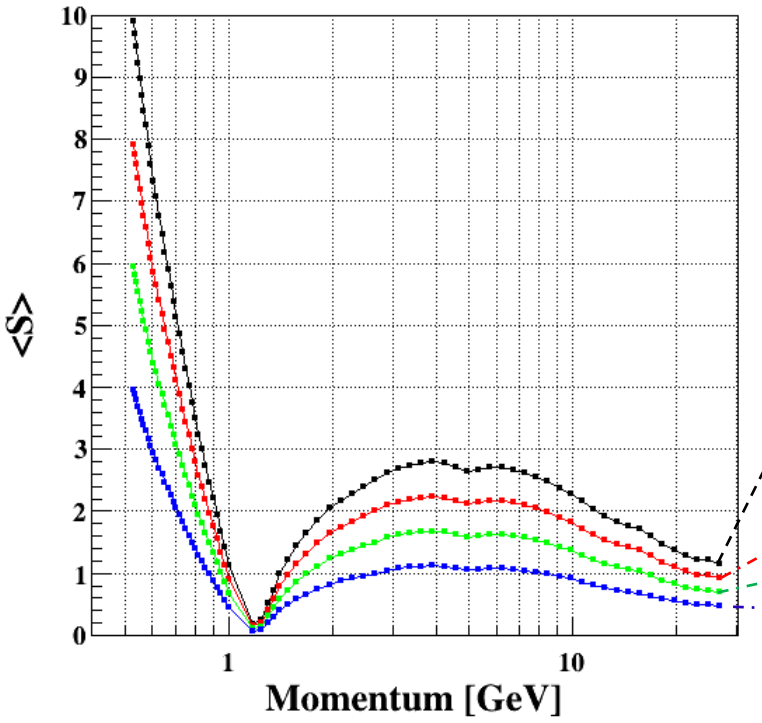
DsK/Dsπ overlap

- Number of analyzed events : N(Bs^0->Dsπ) : N(Bs^0->DsK) ~ BR (Bs^0->Dsπ) : BR(Bs^0->DsK)
  (= 13.21 : 1)
- PID of the bachelor pion (Bs^0->Dsπ) is flipped according to the π/K misidentification rate
- Assuming dE/dx π/K separation power

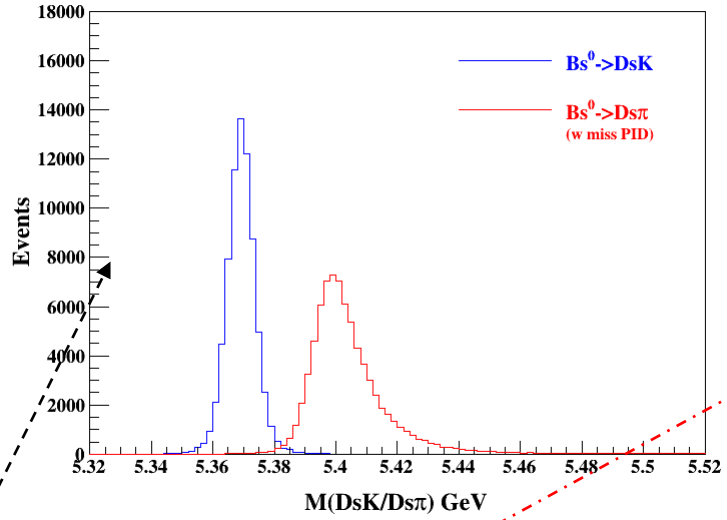




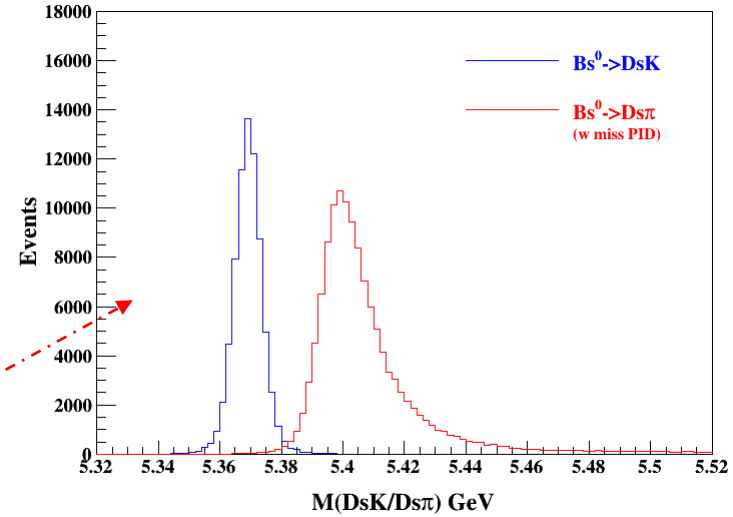
With different PID separation power



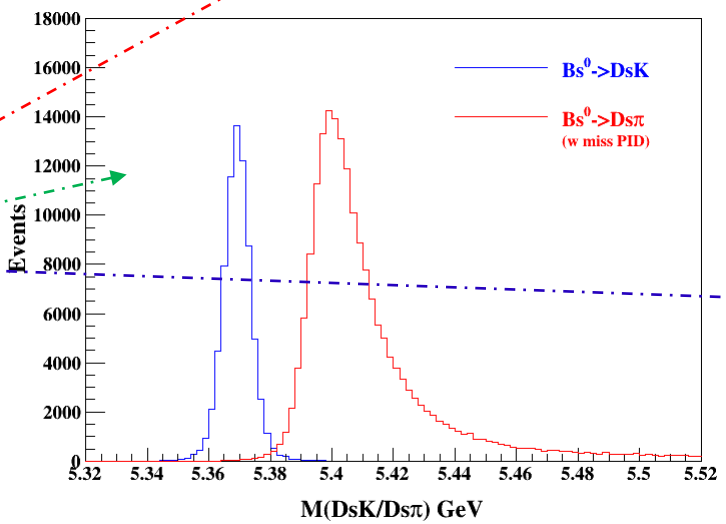
original PID separation power



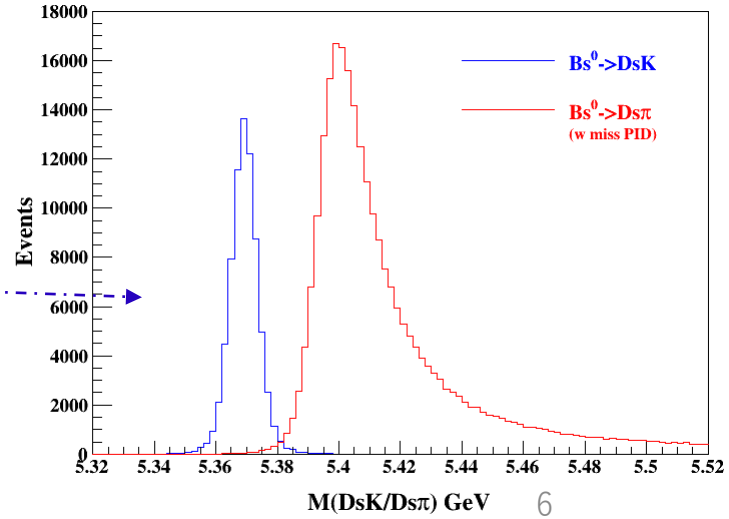
PID separation power x 0.8



PID separation power x 0.6



PID separation power x 0.4



Short comments

・By considering channels, like Bs0->DsK, Ds->KKpi, which only has charged tracks, the good resolution is already achieved to separate signals even with low PID performance.

・Then two branches:

- Considering the other backgrounds which would be much dependent on the PID performance.

- Considering similar channels, such as Bs0->Ds*K (Ds*->Dsγ) which would have worse mass resolution, so that the PID performance would be critical to study those channels.

(very preliminary study)

Trial of inclusive analysis

- Using Z->bb MC samples (baseline concept)

  (/cefs/data/DstData/Zpole/CEPC_v4/E91.2.Pbb.e0.p0.whizard195/****)

- Analysis condition

  - clustering into 2-jets, E(pfo) > 0.6 GeV

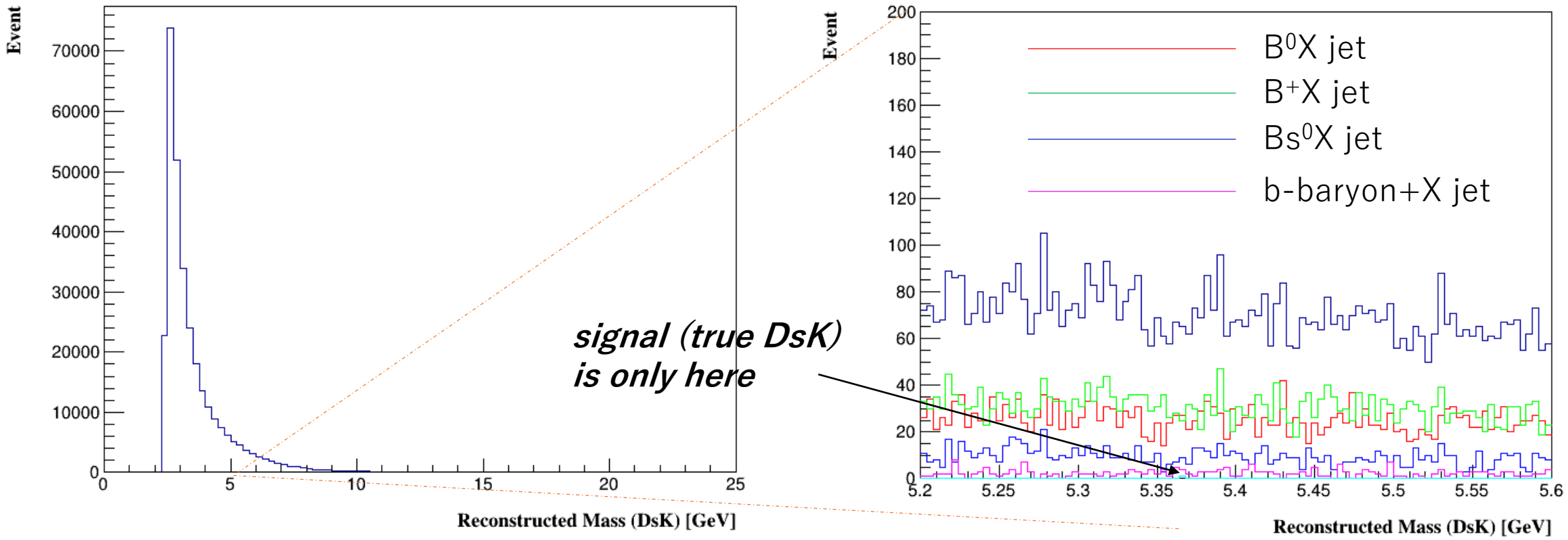
  - for the PFOs from each of jet,

    - searching Ds(KKpi), which Ds(Kkpi) should be within Ds mass window

    - combine Ds with other K/pi

    - PID (of K & pi) is given from MC truth information, by matching MC truth track and reconstructed track

Mass spectrum for DsK candidates



Need more sophisticated analysis and cut condition to evaluate the backgrounds, thus for further PID study …

Summary

・Evaluation of overlap of the Bs0->DsK/DsPi is updated using much larger MC samples

・Only considering decay channel Bs0->Ds(KKpi)K, relatively good separation would be obtained even under low PID performance.

(of course, current study is a quick look and there are several things, PID/momentum resolution and so on, to evaluate/change)

・It might be worth to consider other channels/decay modes.

・Any suggestion/comments are grateful !