Definition of new variables for new BDT

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Outlines I

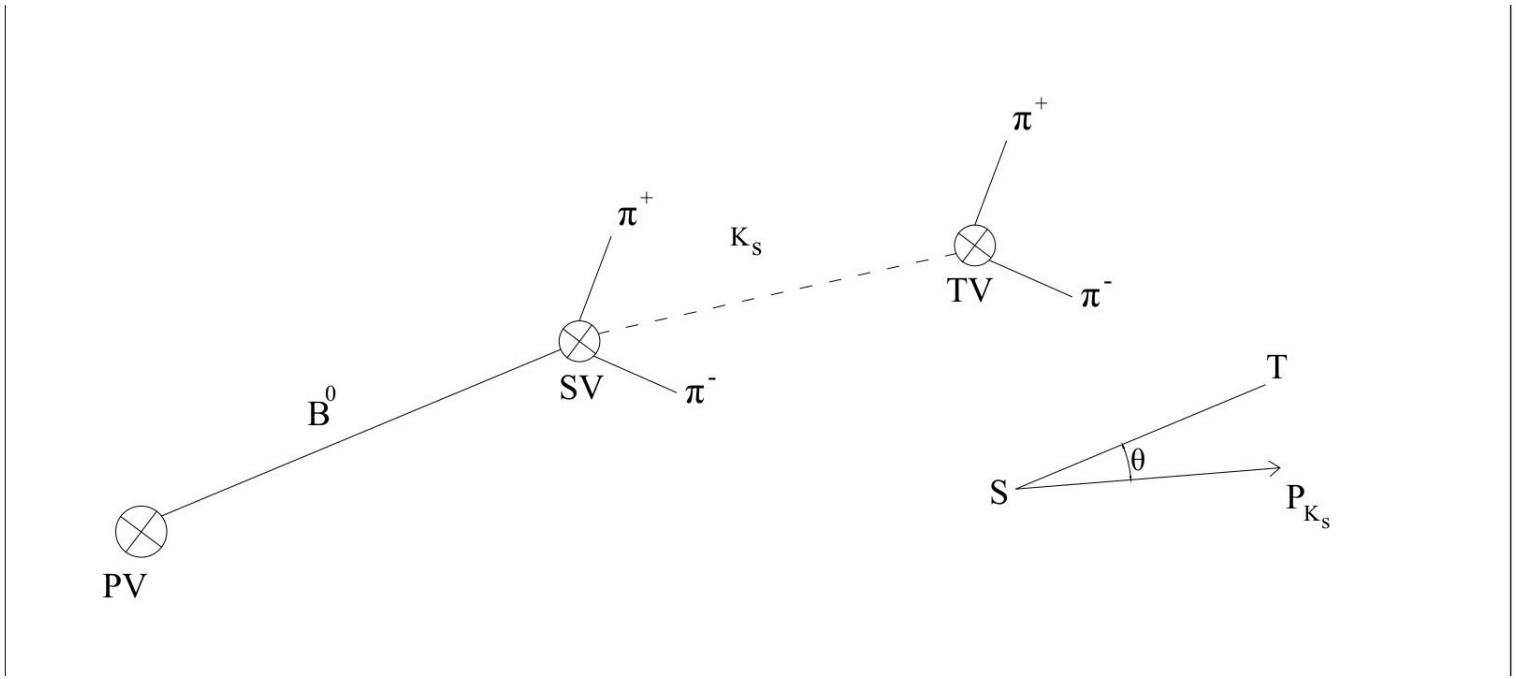
Motivation

- fight against the huge ratio of background over signal in the B_s^0 mass window
- Apply the BDT in higher level such as Stripping.
- Define novel methods and veriables to achieve further descrimination between Signal and Background

Proposed variables

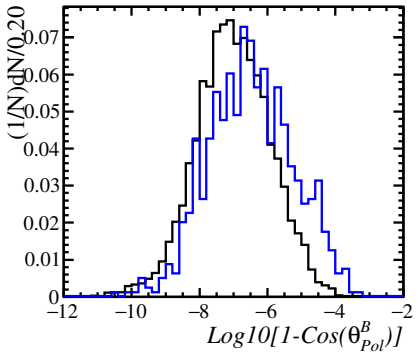
- Pointing Angle
- Polar Angle
- PID
- Number of Long Tracks

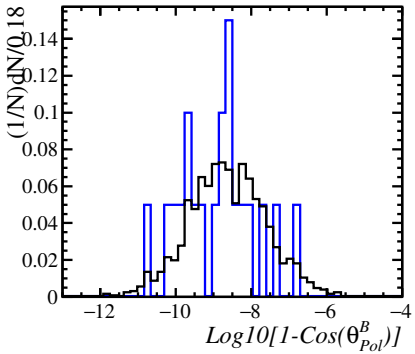
pointing Angle

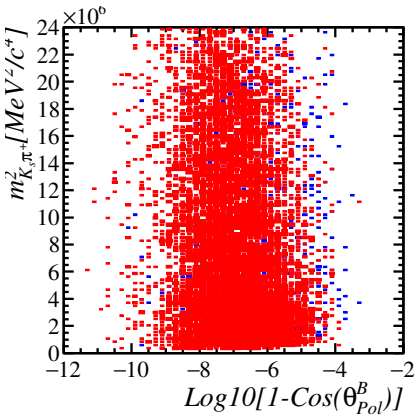


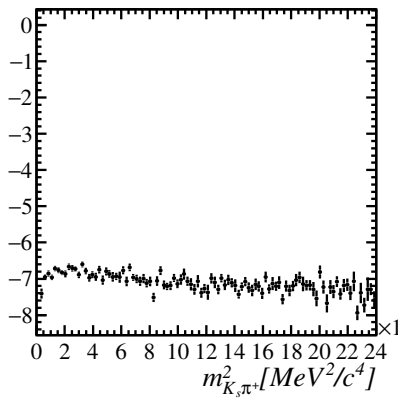
$$Cos(\theta_{\mathrm{PA}}) = \frac{\overrightarrow{\mathrm{TS}} \cdot \overrightarrow{P_{K_s}}}{\mathrm{TS} \cdot P_{K_s}} \tag{1}$$

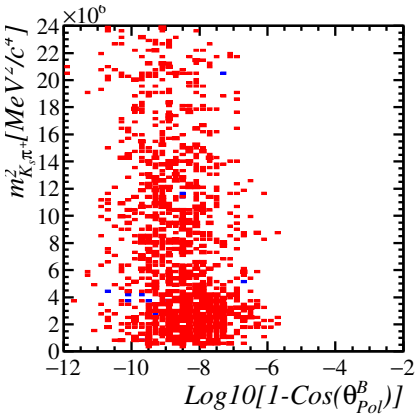
Descrimination and Correlation with DP

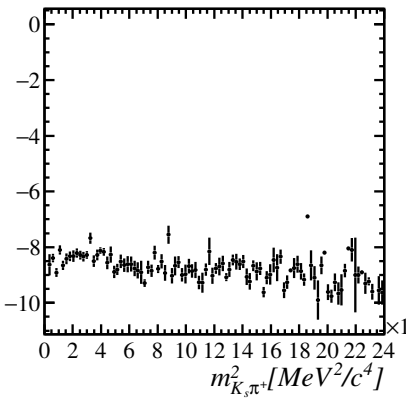




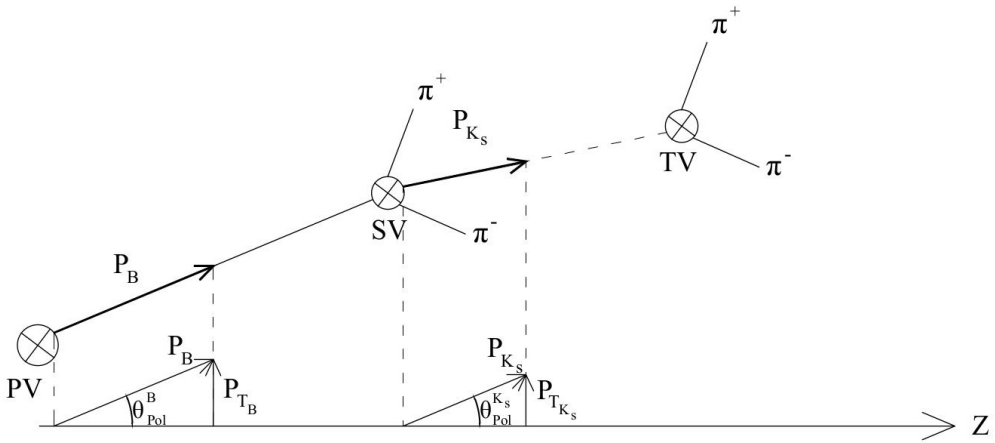






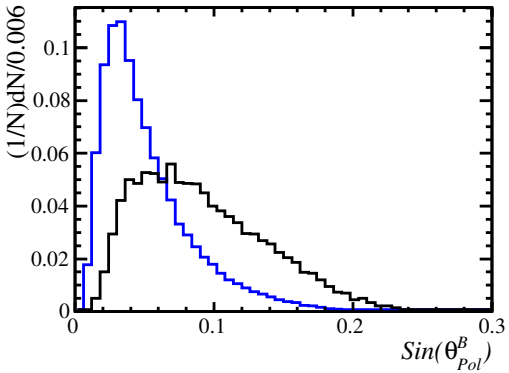


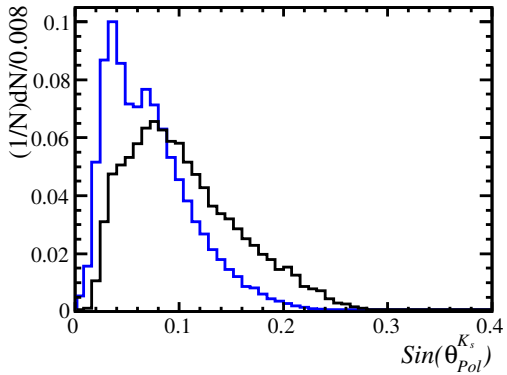
Polar Angle

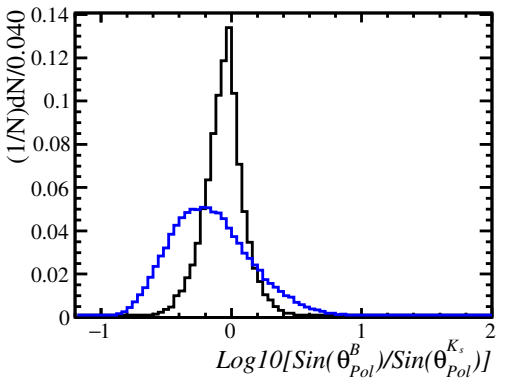


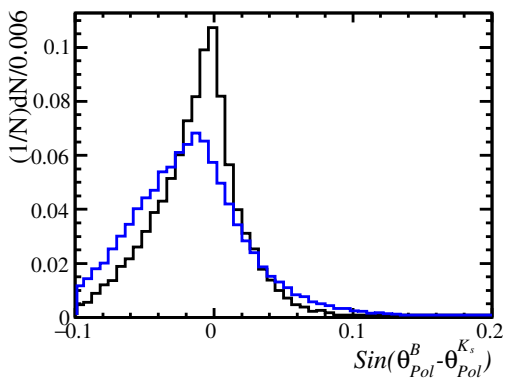
$$Sin(\theta^{B}_{\mathrm{Pol}}) = P^{B}_{T}/P^{B}$$
$$Sin(\theta^{K_s}_{\mathrm{Pol}}) = P^{K_s}_{T}/P^{K_s}$$
$$Log10[\frac{Sin(\theta^{B}_{\mathrm{Pol}})}{Sin(\theta^{K_s}_{\mathrm{Pol}})}]$$
$$Sin(\theta^{B}_{\mathrm{Pol}} - \theta^{K_s}_{\mathrm{Pol}})$$

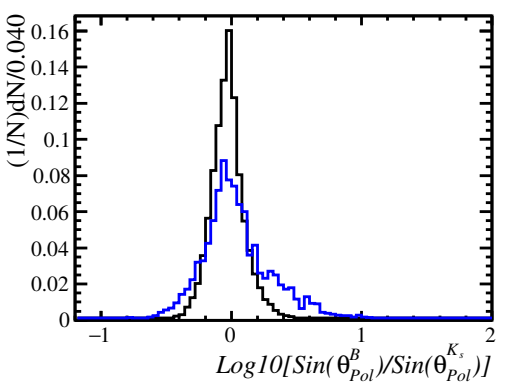
Descrimination

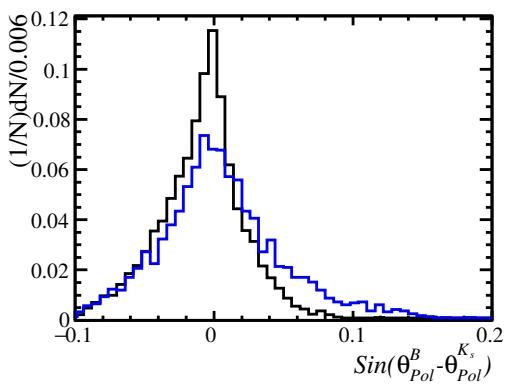




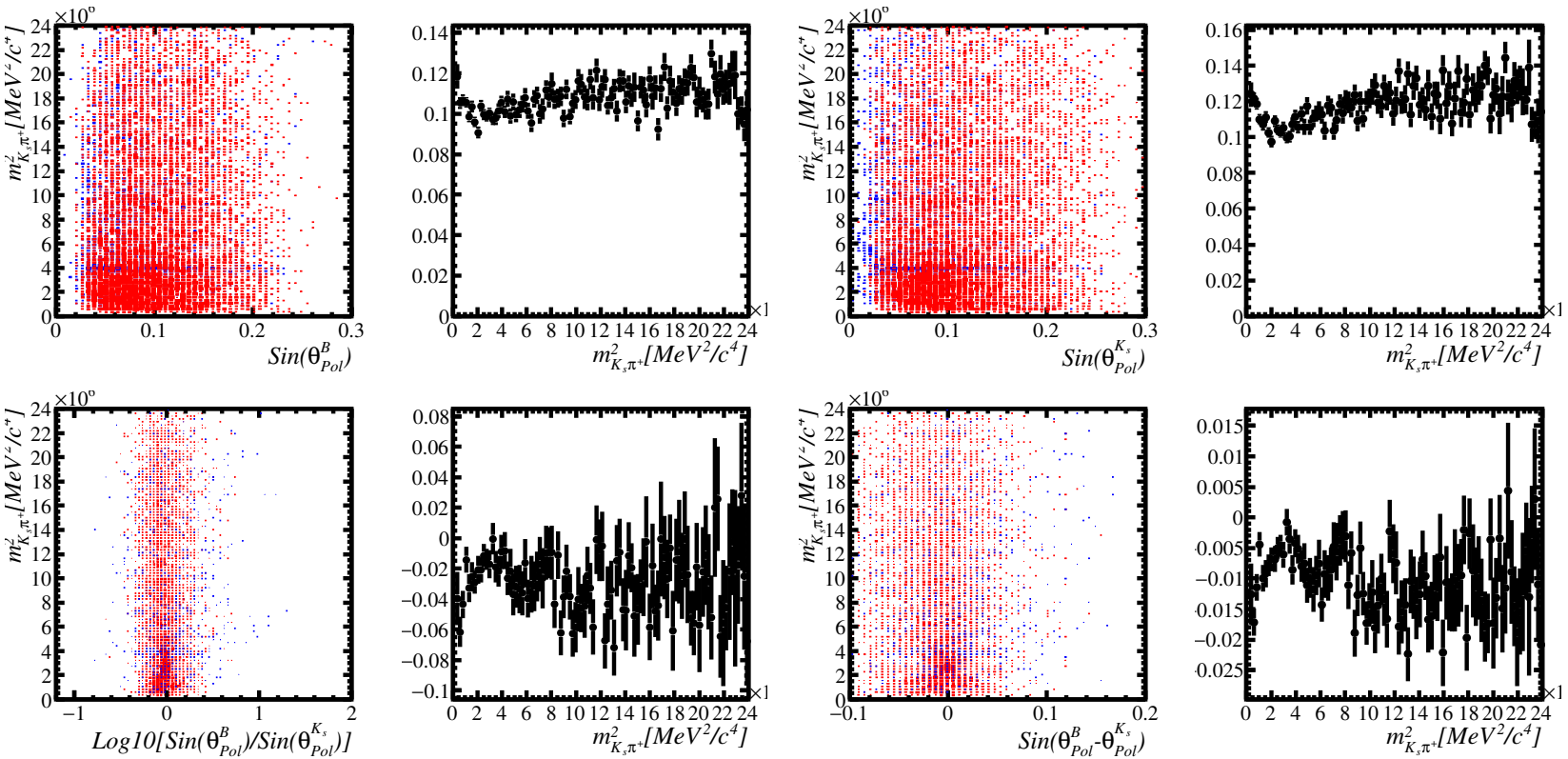




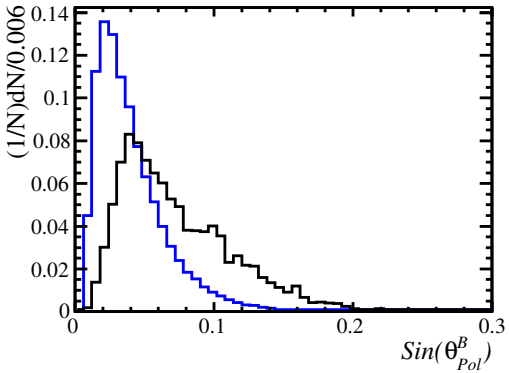


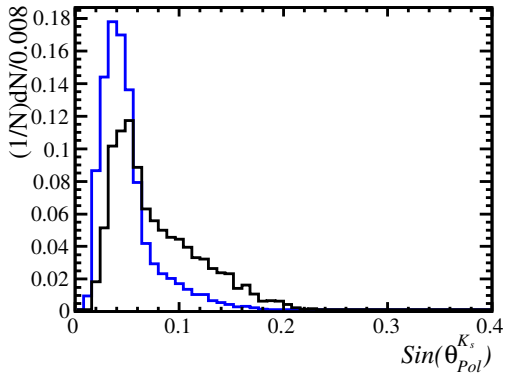


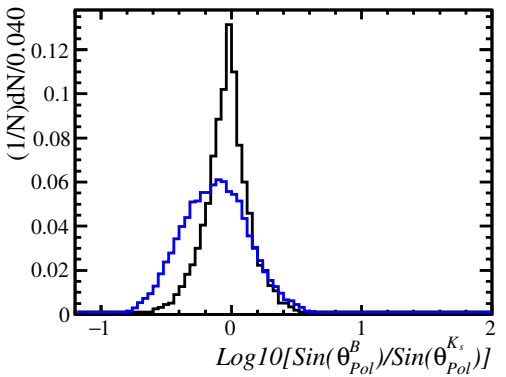
Correlation with DP

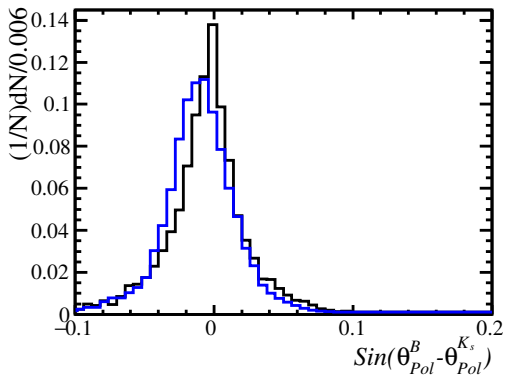


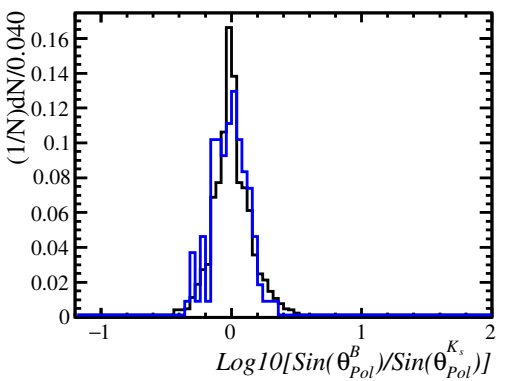
Descrimination

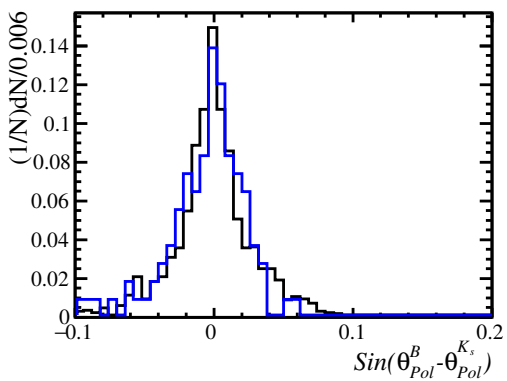




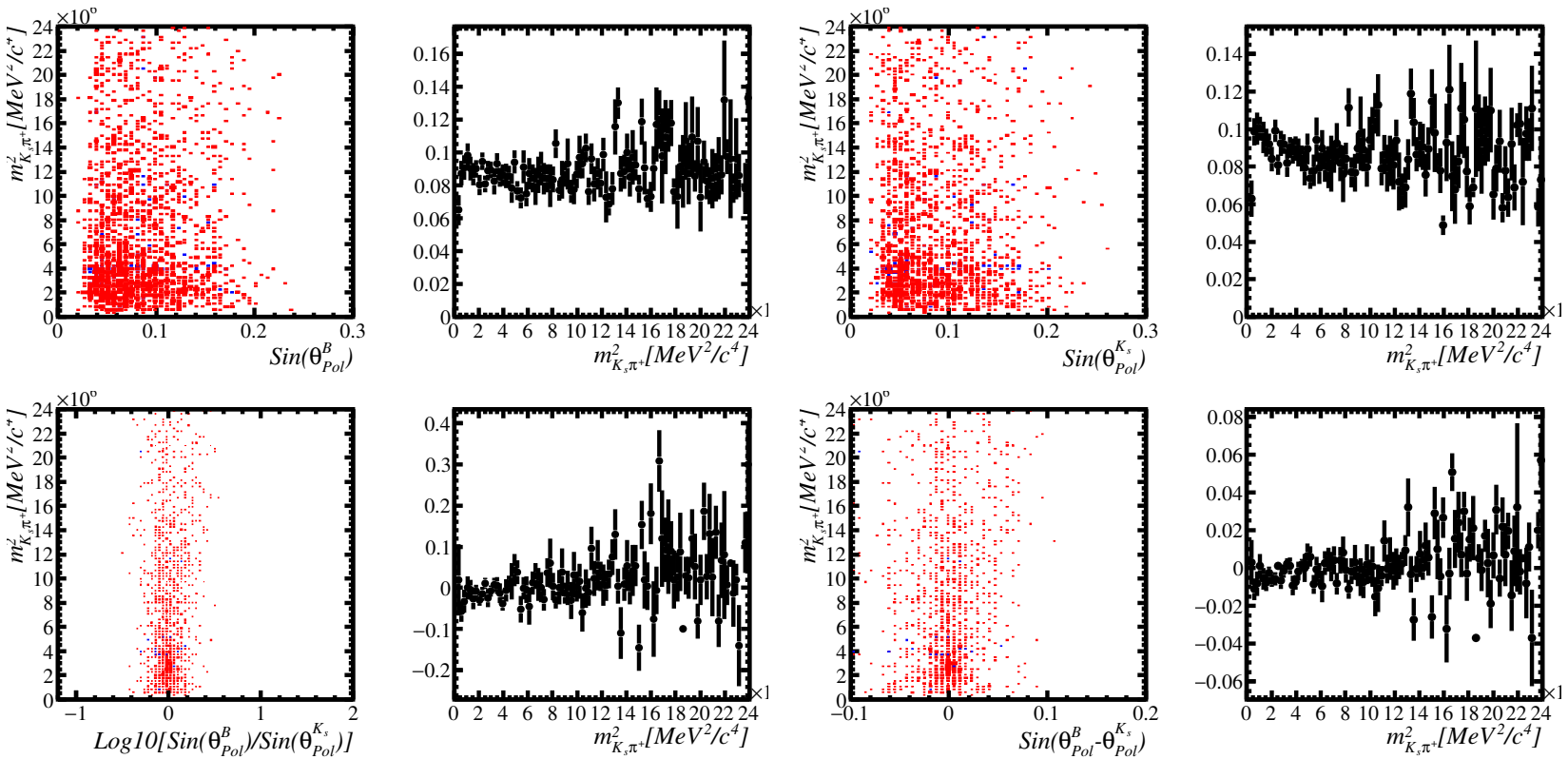




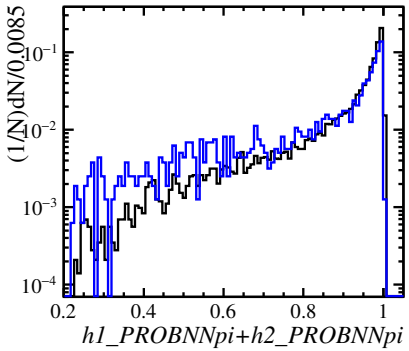


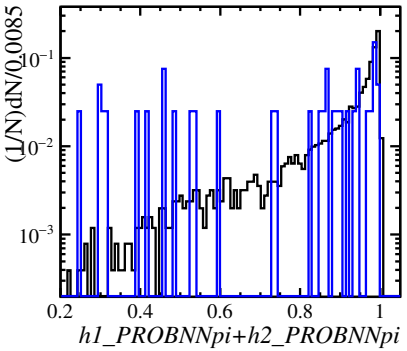


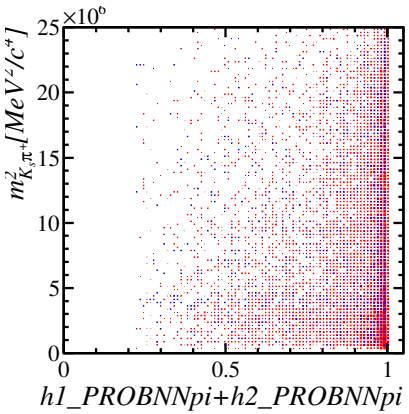
Correlation with DP

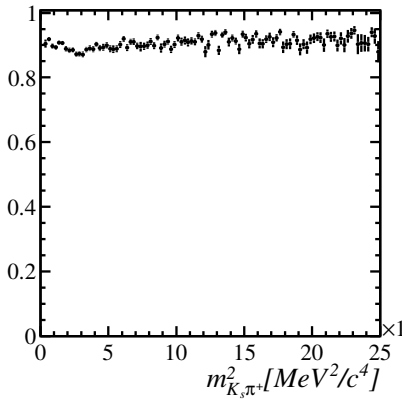


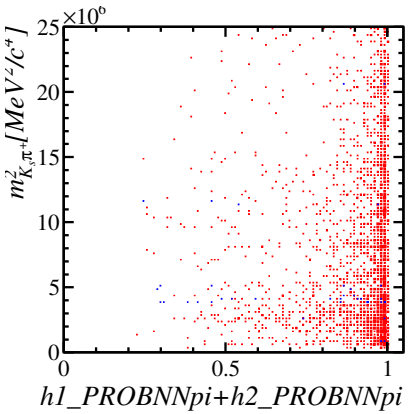
PROBNNpi

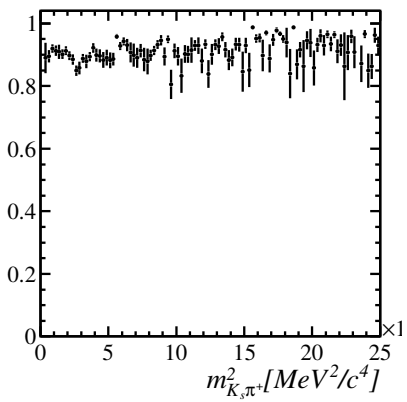

(1/N)dN/0.0085
h1_PROBNNpi+h2_PROBNNpi

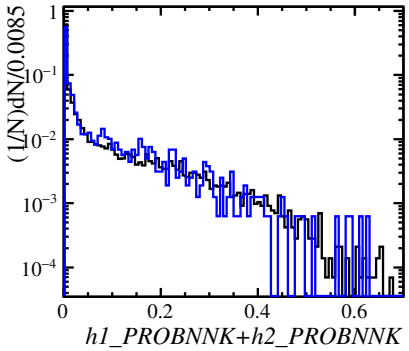

(1/N)dN/0.0085
h1_PROBNNpi+h2_PROBNNpi

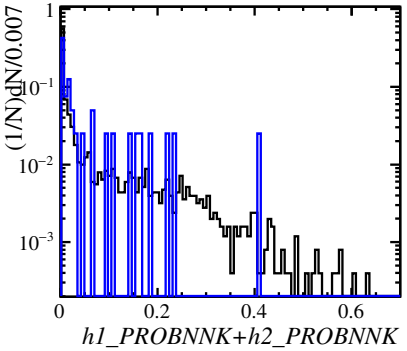

×10⁶
$m^2_{K_s\pi^+}[MeV^2/c^4]$
h1_PROBNNpi+h2_PROBNNpi


×1
$m^2_{K_s\pi^+}[MeV^2/c^4]$


×10⁶
$m^2_{K_s\pi^+}[MeV^2/c^4]$
h1_PROBNNpi+h2_PROBNNpi


×1
$m^2_{K_s\pi^+}[MeV^2/c^4]$


(1/N)dN/0.0085
h1_PROBNNK+h2_PROBNNK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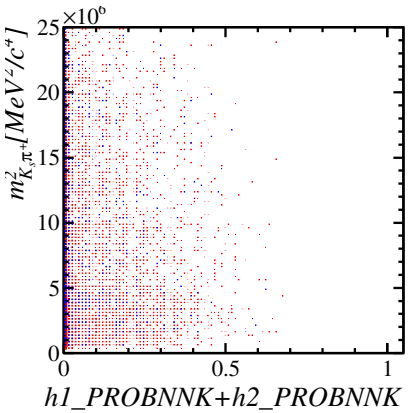
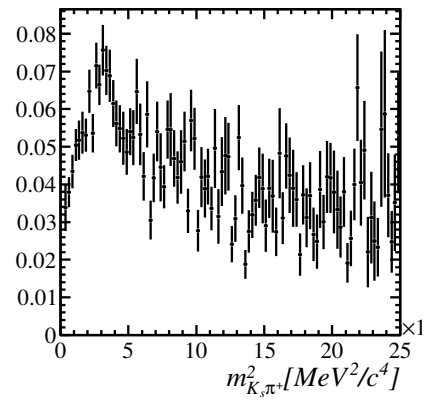
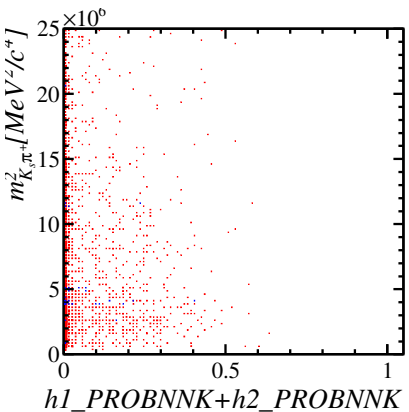
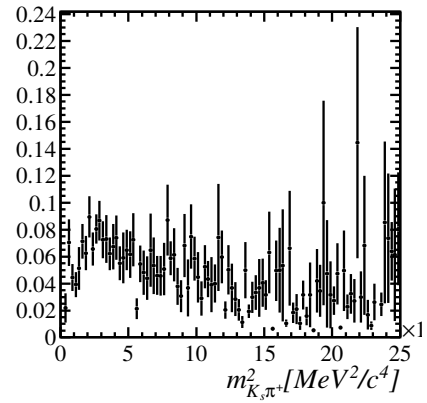
h1_PROBNNK+h2_PROBNNK

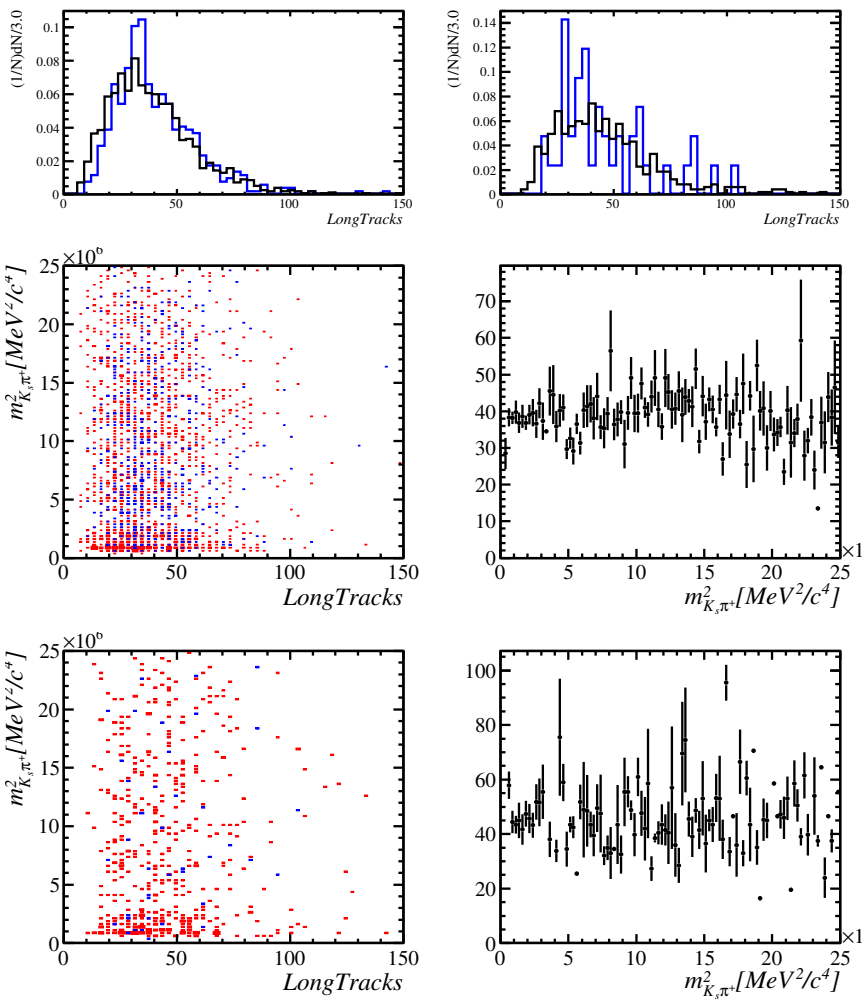

×10⁶
$m^2_{K_s\pi^+}[MeV^2/c^4]$
h1_PROBNNK+h2_PROBNNK


$m^2_{K_s\pi^+}[MeV^2/c^4]$


×10⁶
$m^2_{K_s\pi^+}[MeV^2/c^4]$
h1_PROBNNK+h2_PROBNNK


$m^2_{K_s\pi^+}[MeV^2/c^4]$

Number of Long Tracks



Summary and Conclution

- Pointing Angle:
  - Disriminant on DD stream.
  - Has a mild correlation with DP
  - study the application inside BDT for LL stream: Nonlinear behaviour of BDT might enhance the descrimination.
- Polar Angle variables:
  - Seems to be discriminant.
  - Corelated to kinematics of daughter particle (TProfile): Forbidden(DP)
- PID Variables:
  - PROBNNpi and PROBNNK should be considered next to each other:
    * For both DD and LL: Mild correlation with the DP but seems cancling eachother, its discriminant power should be examined inside the BDT
- No.Long Track:
  - No significant discrimination
  - The profile has shown the correlation of this variables with kinematics of DP

Thank you!