SPD Physics & MC meeting
24 May 2023

Track parameters at the primary vertex

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Introduction

1. In general we need to know the track parameters at the primary vertex for physical analysis.

2. But now the track parameters are determined at the first and last points of track (or hits) after fitting procedure. You can extract this values just apply the next methods: **GetFirstState()**, **GetLastState()** and **GetFinalState().**

3. **GetFinalState()** - method which determines tracks parameters around the reconstructed primary vertex position just to extrapolate track from the first point to primary vertex.

4. As you can see this **GetFinalState()** method does not take into account that track is originated from primary vertex.

5. For improving the track parameters at the primary vertex it is necessary to add information with position and covariance matrix of primary vertex to procedure for track parameters determination.

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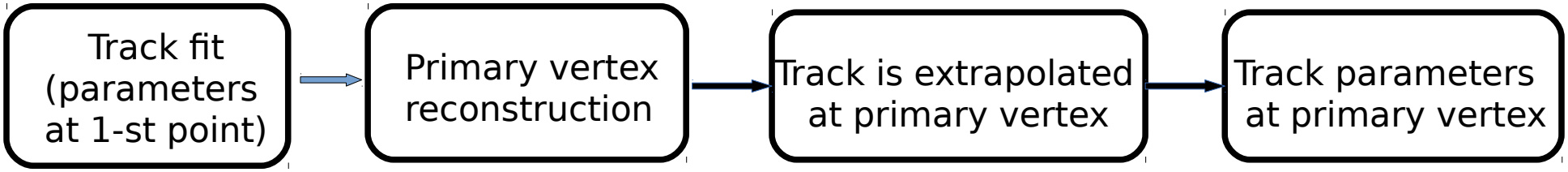
1. This study was stimulated by Vladimir Kurbatov.

2. Special generator from Vladimir (inside SPDroot) can simulate proton and deutron in final state for study of dibaryon state.

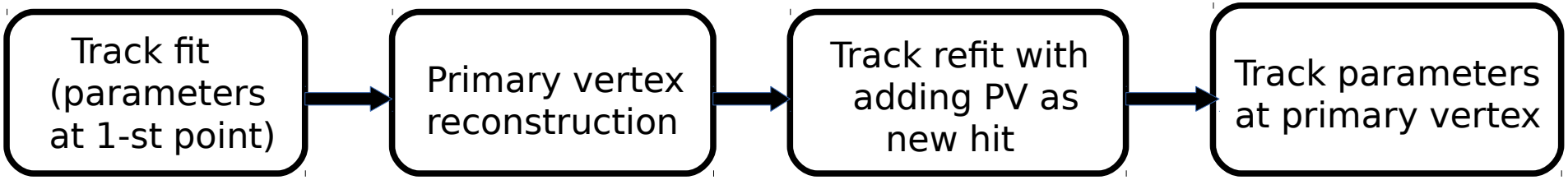
3. Main aim of this study was to check possibility for improvement the track parameters with adding primary vertex information to track fitting procedure.

Procedure

Present procedure for track parameters determination at the primary vertex

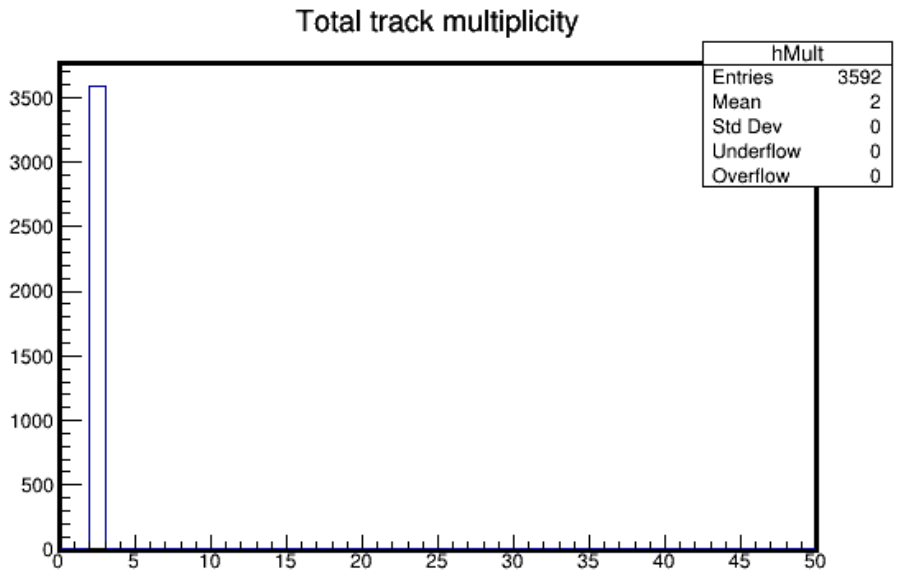


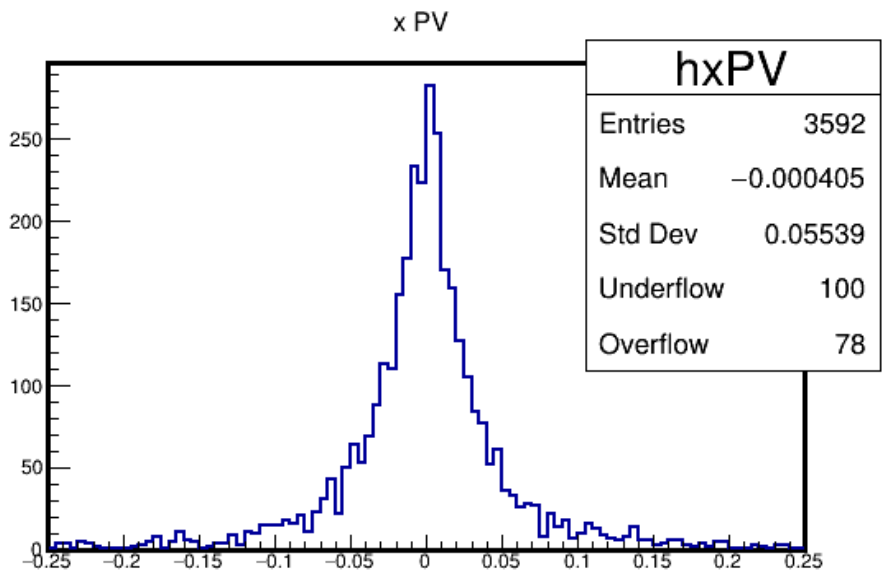
The next procedure is proposed

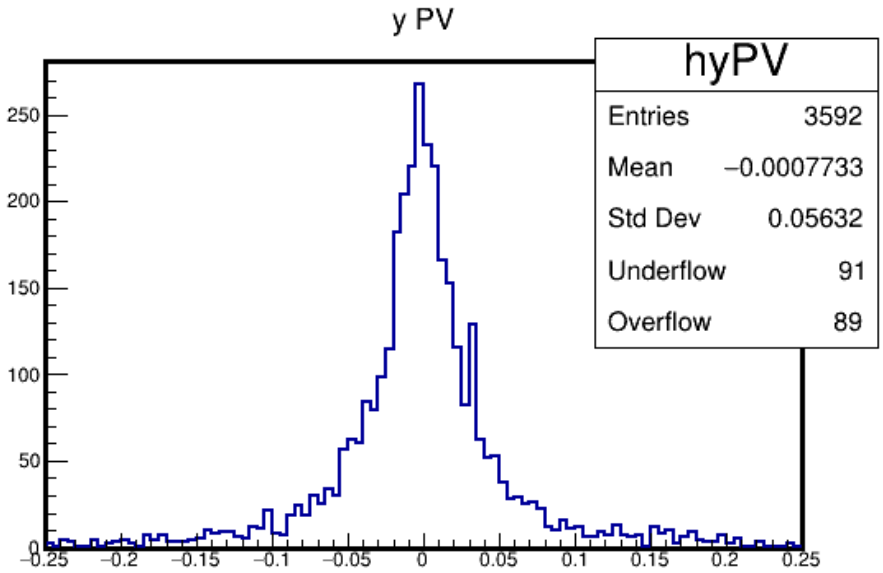


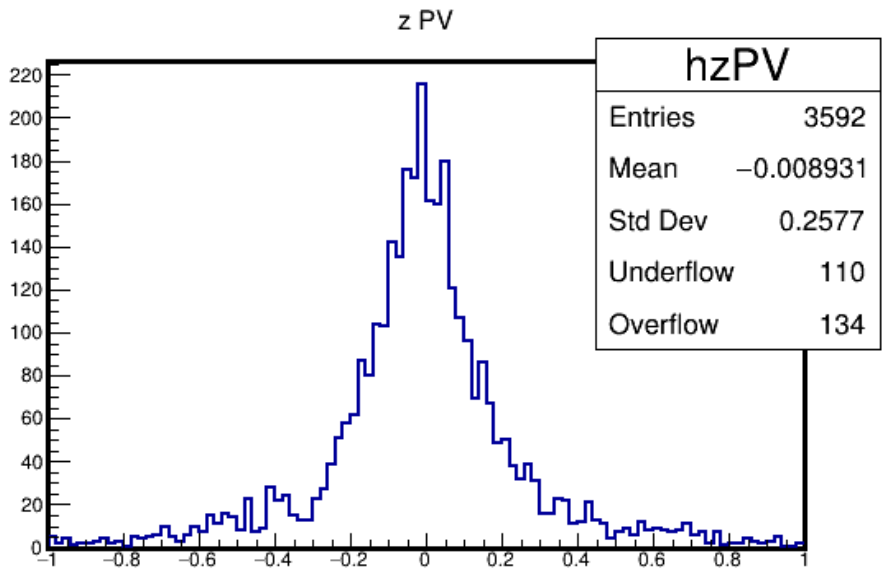
Two set of events were generated, simulated and reconstructed with SPDroot and MAPS version of vertex detector:
a) dibaryon events with Vladimir Kurbatov generator;
b) Minimum bias events with Pythia8 generator.

Dibaryon (1)

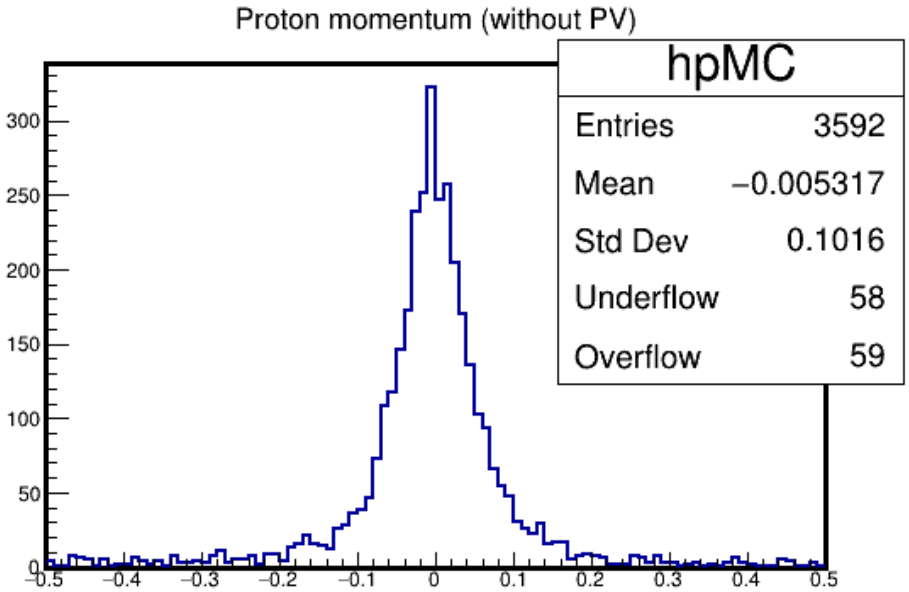

Total track multiplicity
hMult
Entries 3592
Mean 2
Std Dev 0
Underflow 0
Overflow 0

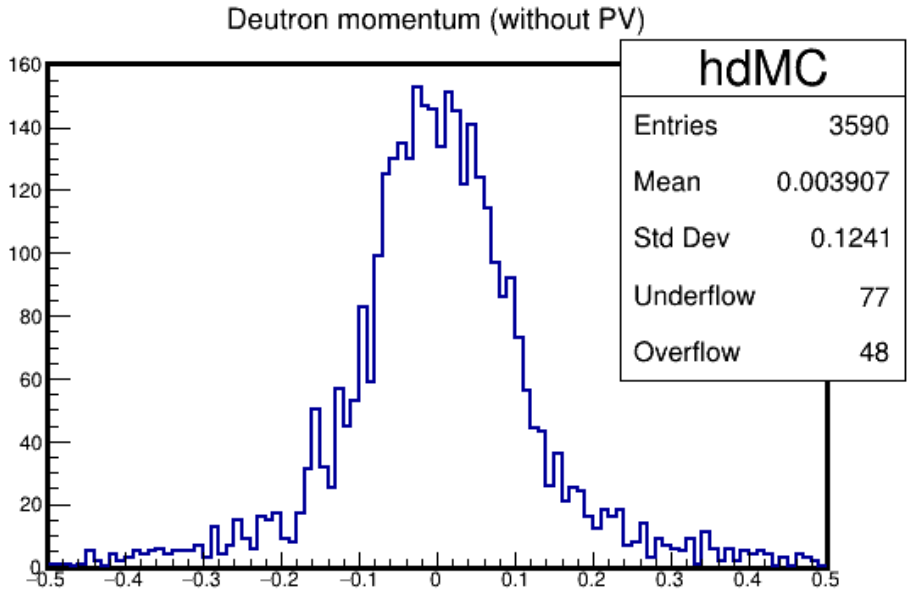

x PV
hxPV
Entries 3592
Mean −0.000405
Std Dev 0.05539
Underflow 100
Overflow 78


y PV
hyPV
Entries 3592
Mean −0.0007733
Std Dev 0.05632
Underflow 91
Overflow 89

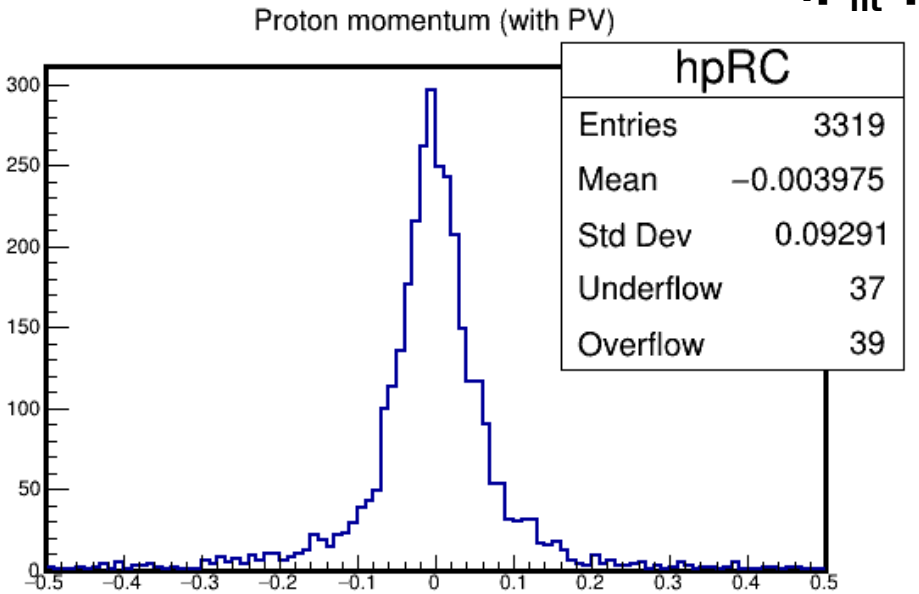

z PV
hzPV
Entries 3592
Mean −0.008931
Std Dev 0.2577
Underflow 110
Overflow 134

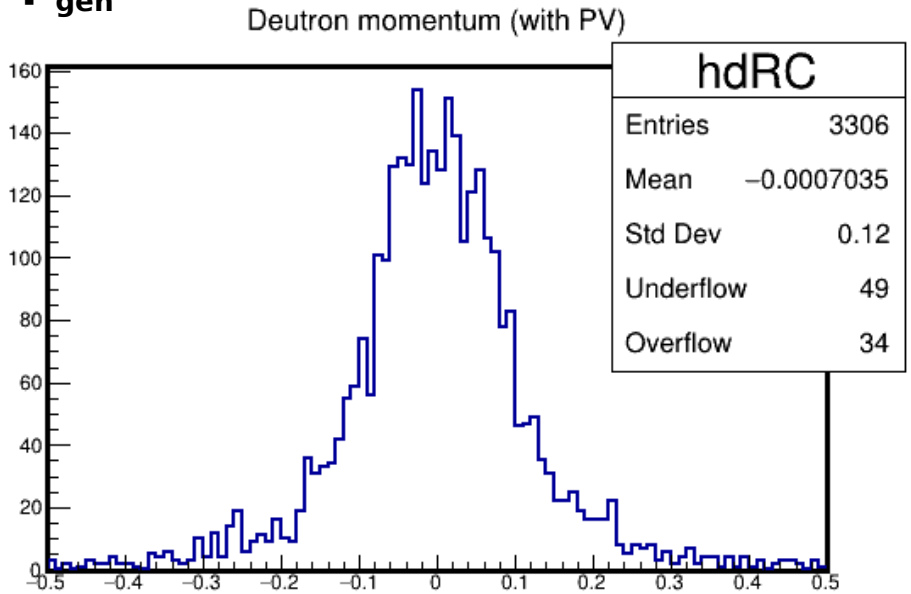
Dibaryon (momentum) (2)



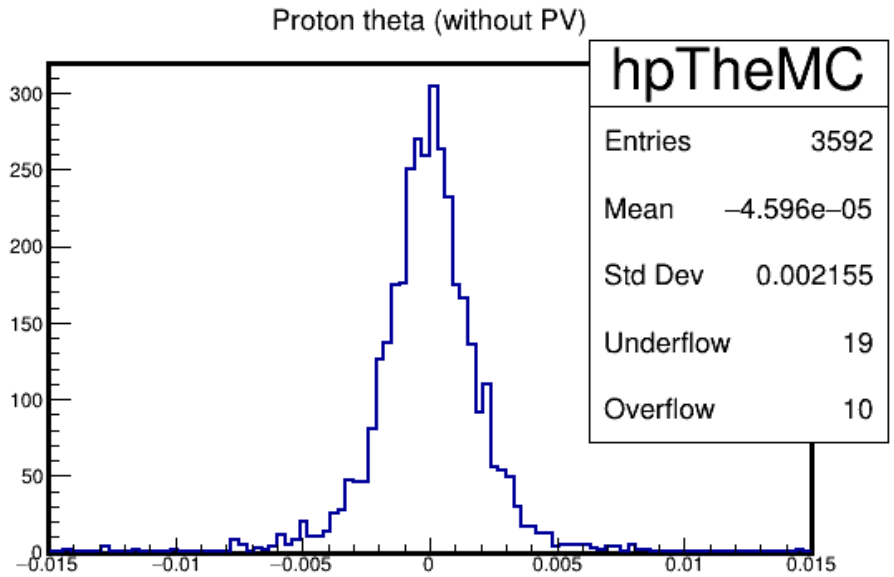


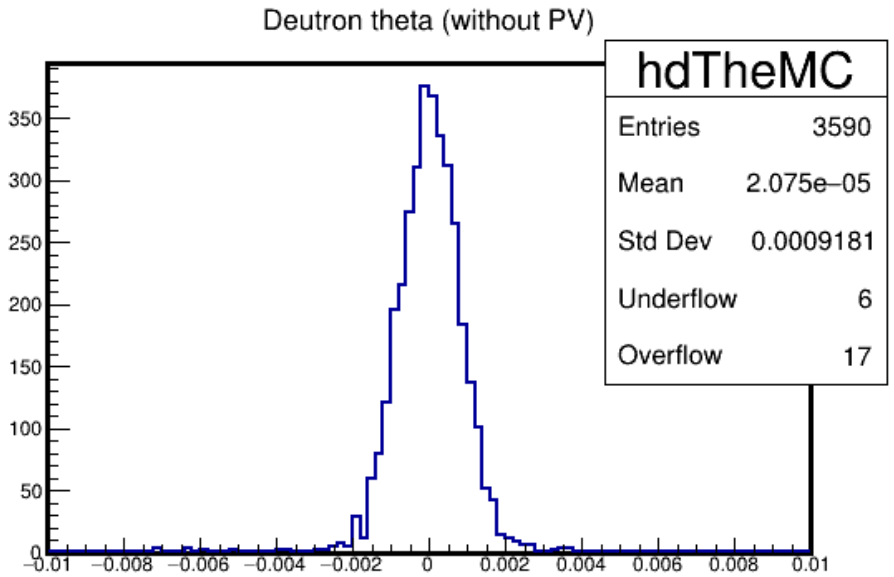
$(p_{fit}-p_{gen})/p_{gen}$



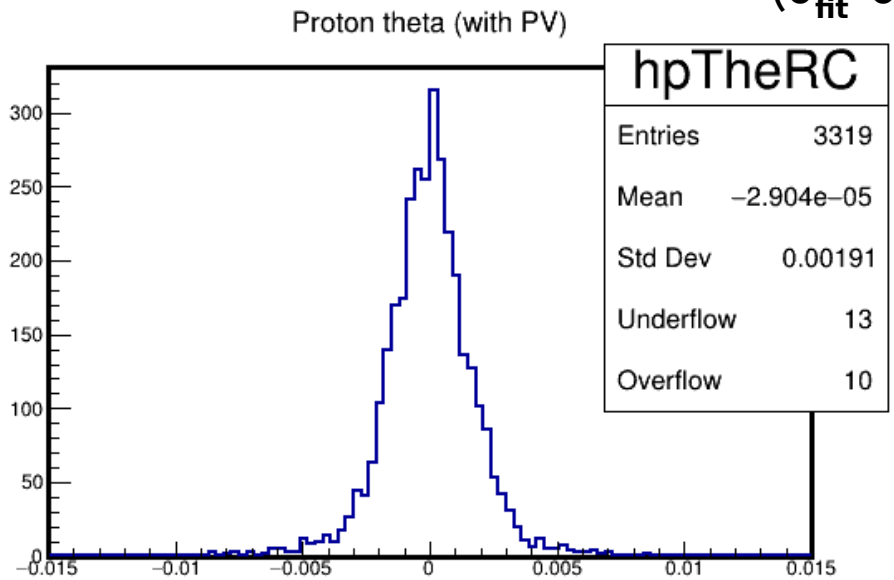


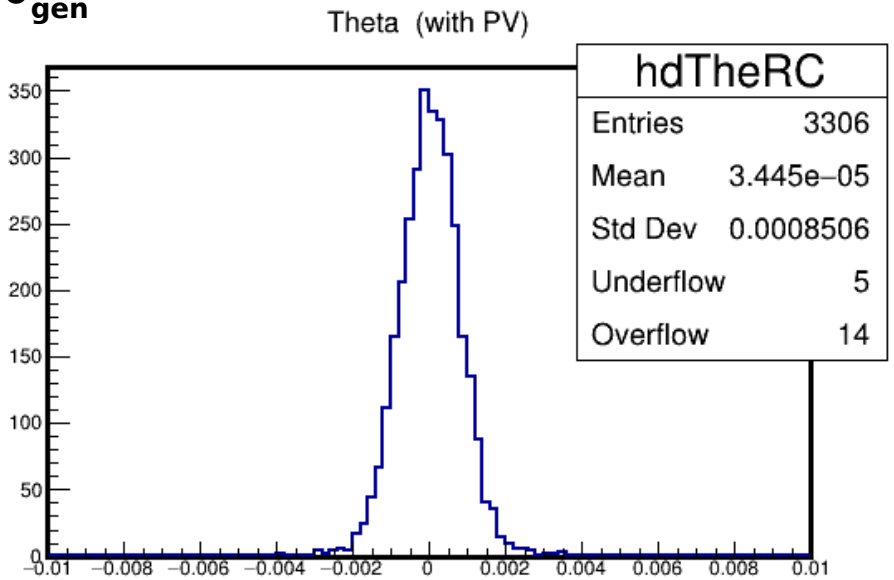
Dibaryon (theta) (3)



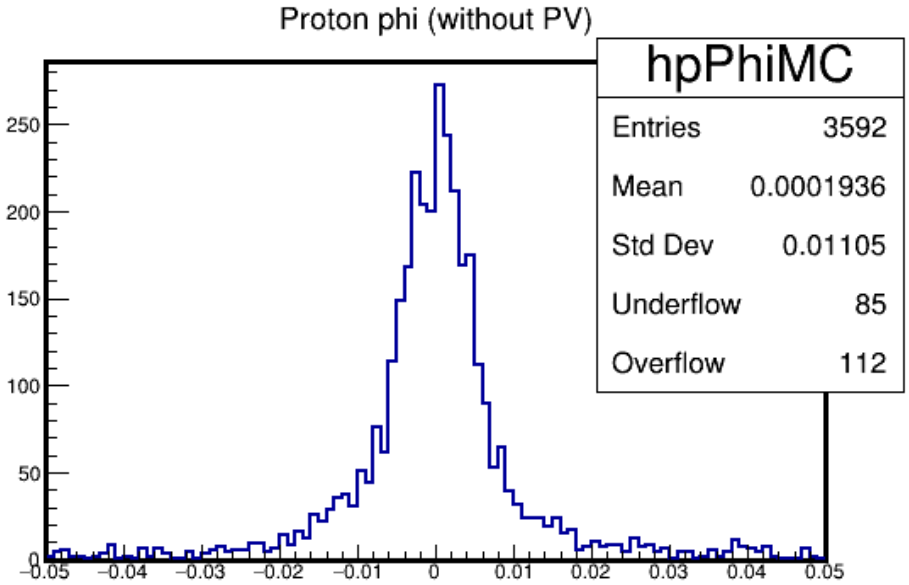


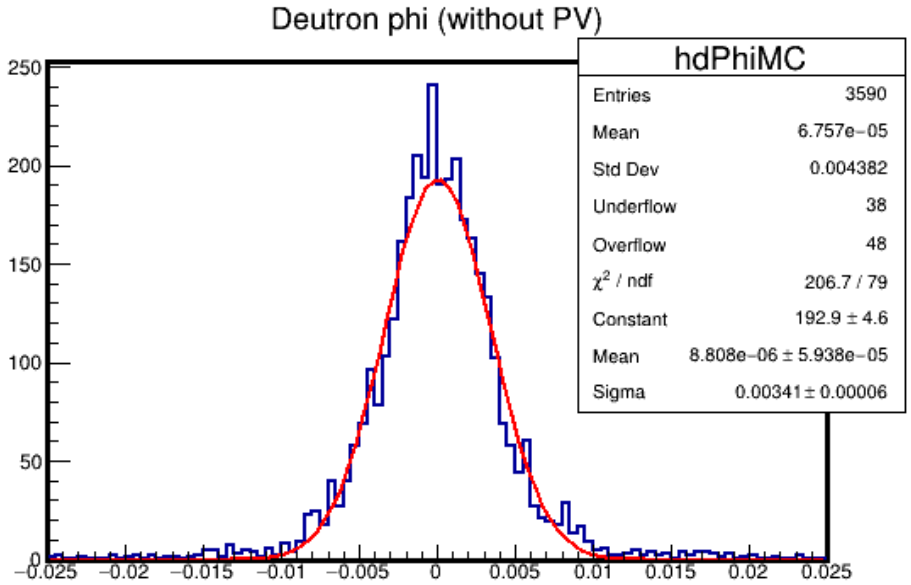
$(\theta_{fit}-\theta_{gen})/\theta_{gen}$



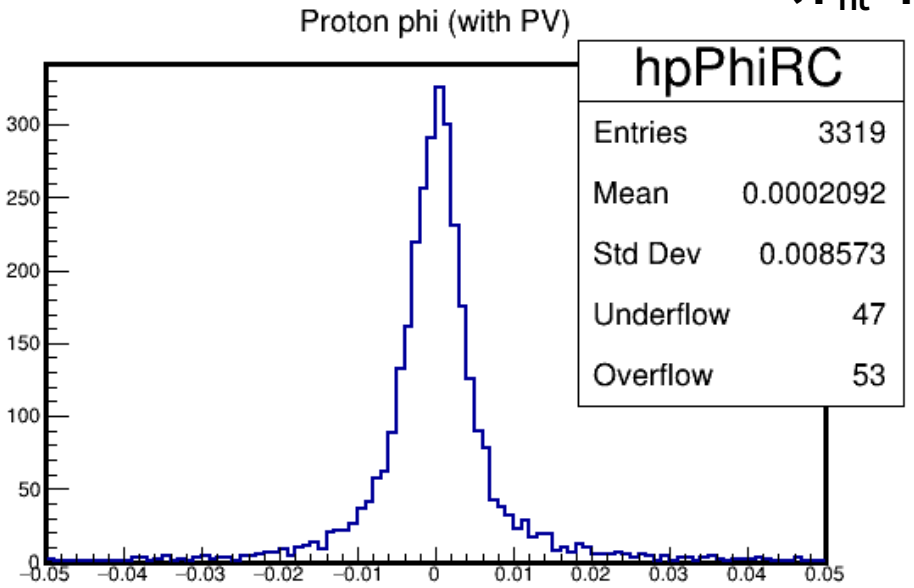


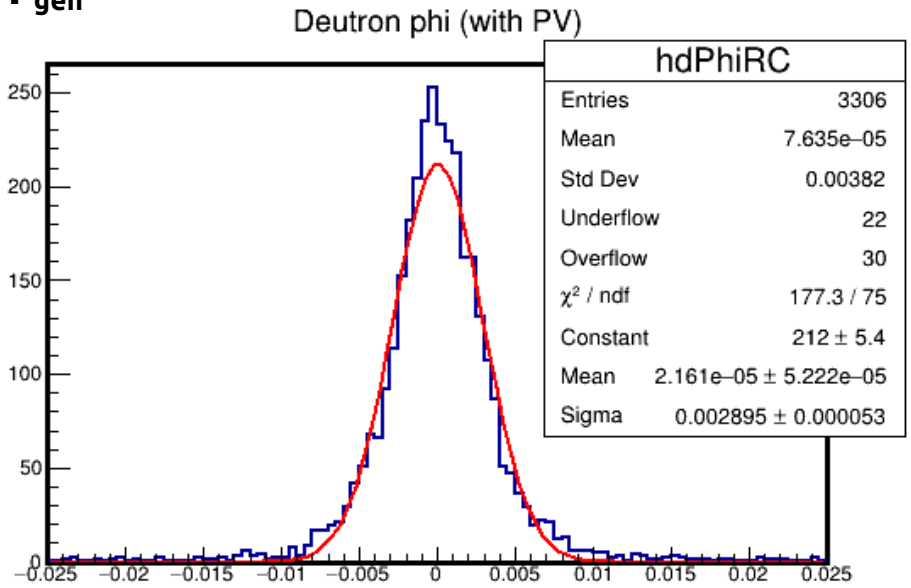
Dibaryon (particles angle, φ) (4)



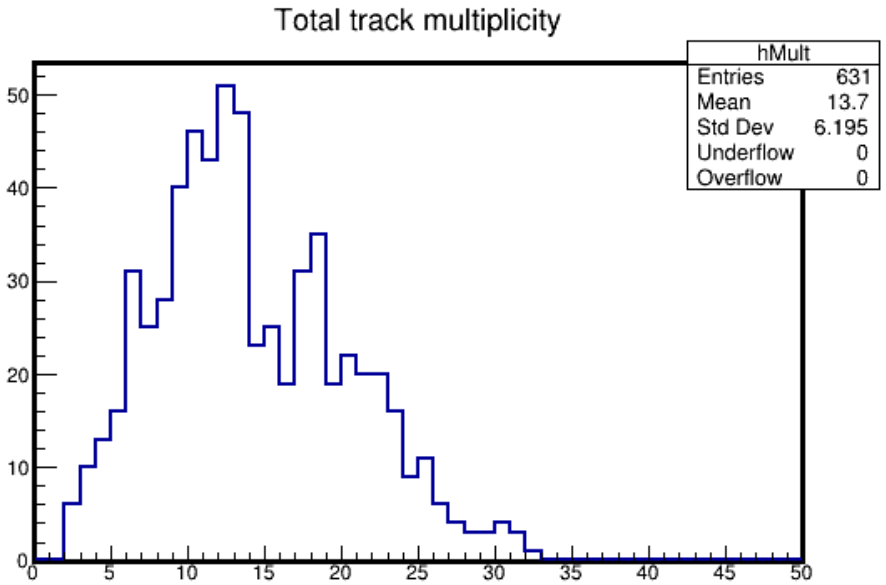


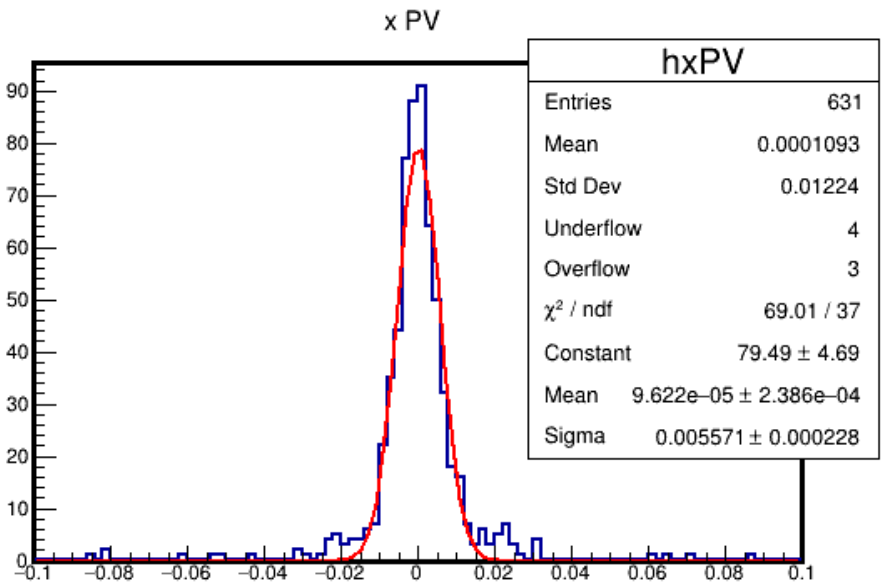
$$(\Phi_{fit}-\Phi_{gen})/\Phi_{gen}$$

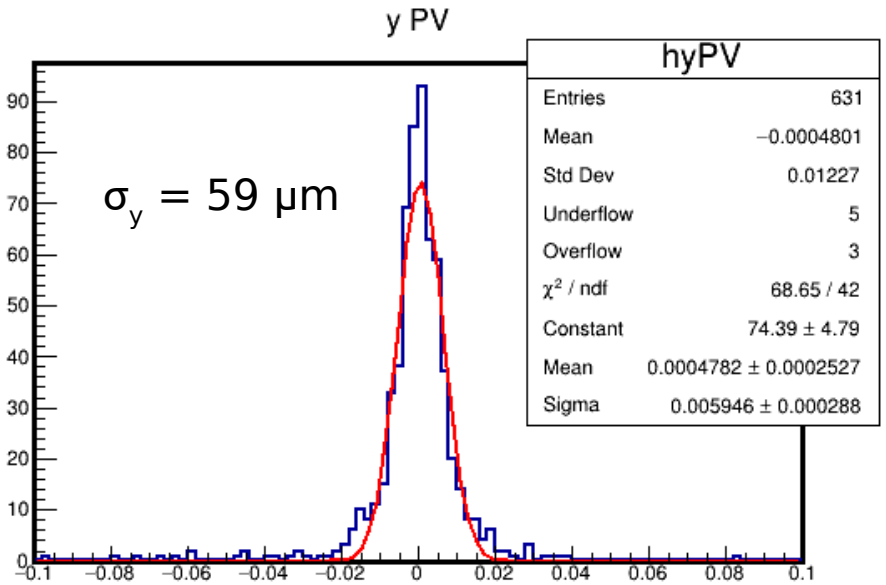


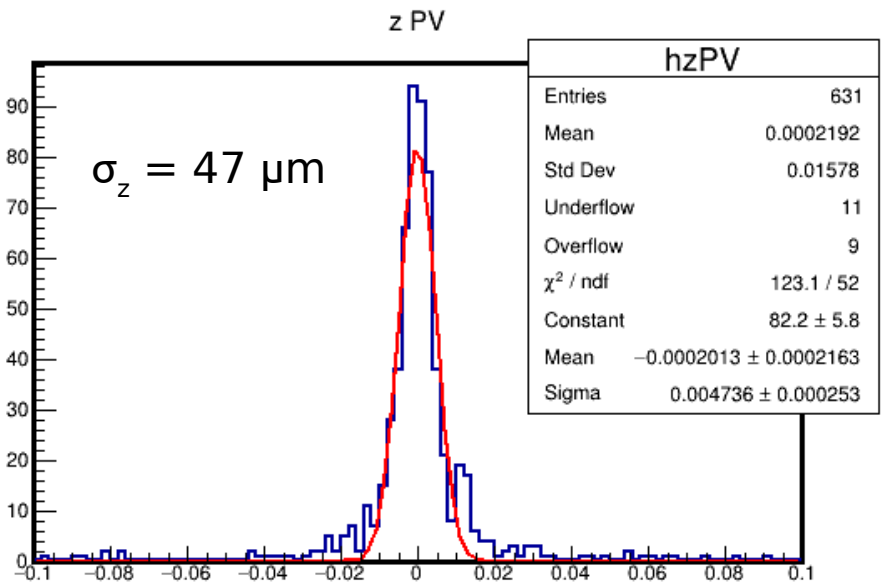


Minimum Bias (1)

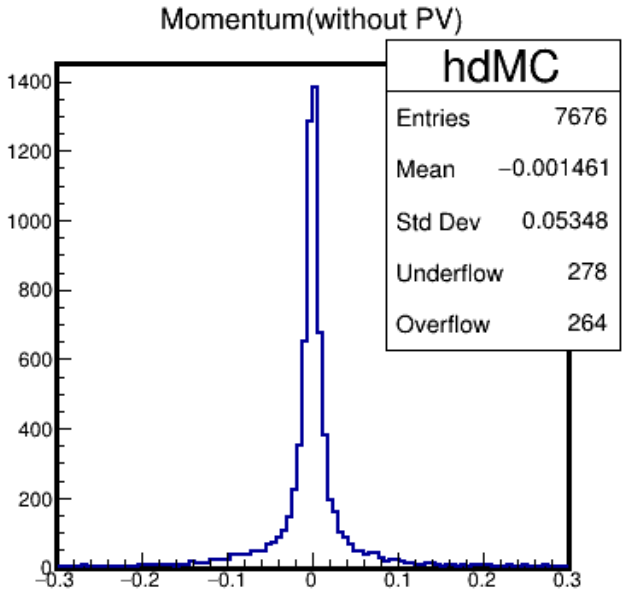


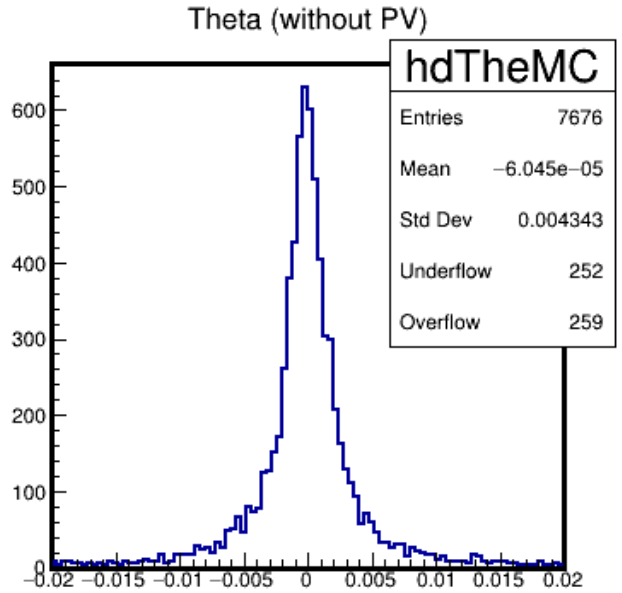


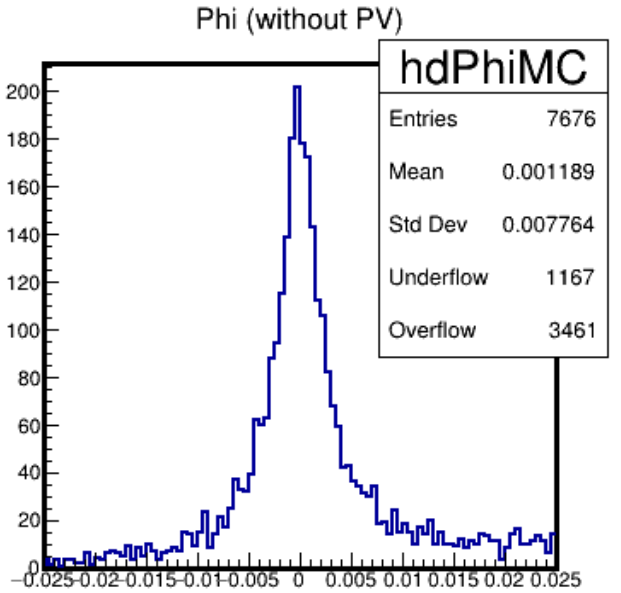


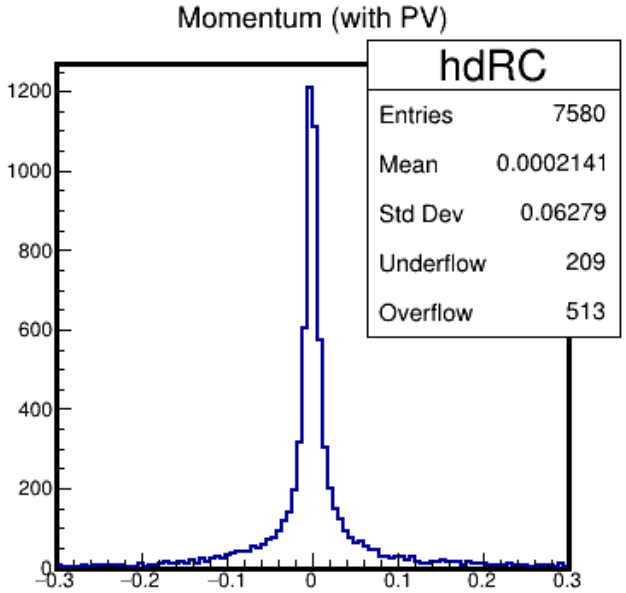


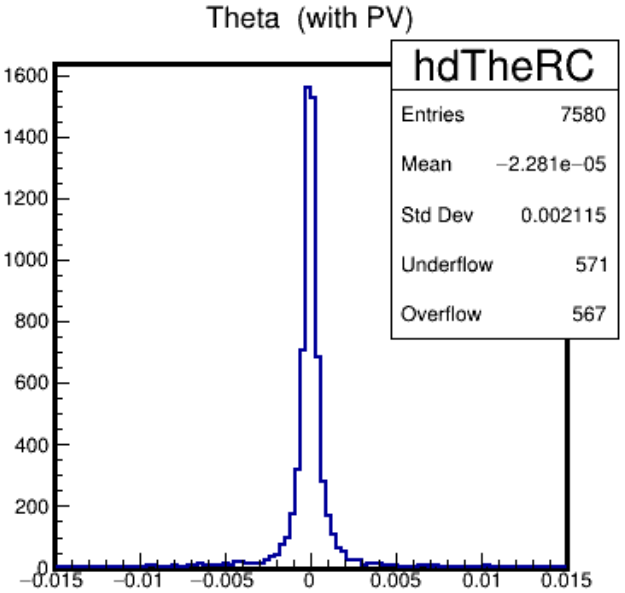
Minimum Bias (2)

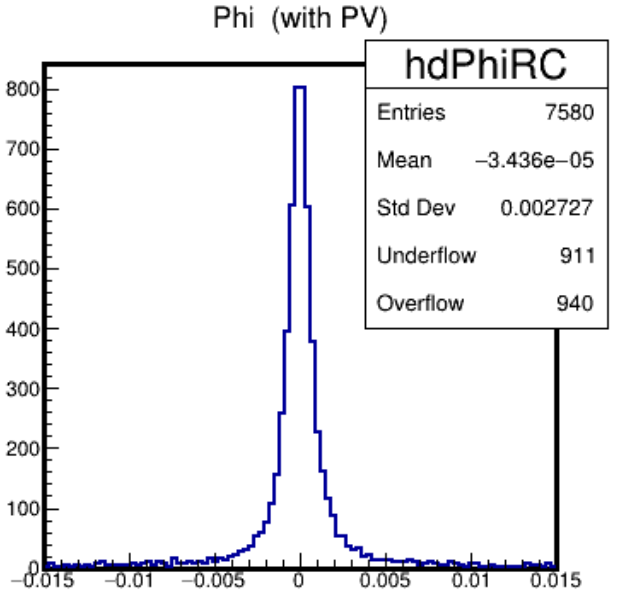












Summary

1. Adding the primary vertex information to track fitting procedure shows the improvement of the track parameters at primary vertex (mainly for angles).

2. Next step - to provide common fitting procedure for tracks and primary vertex.