vertex Z finder from seeds

Petr Balek

4 April 2023

introduction

- relevant issue: [#1778](#)
- idea is to provide an estimation of the vertex position, that can be used for filtering of the track seeds
- will (hopefully) reduce amount of seeds to consider
- assuming there is only 1 high-multiplicity vertex in an event

procedure

- on the input, there are space-points
- sort them according to their distance from Z-axis:
  - ▸ near, middle, far
- make all possible combinations
- discard a combination if slopes in X-Y or Z-R between near-middle and middle-far space-points are too different
  - ▸ currently required to have less than 0.1, no optimisation yet
- fit Z-R coordinates with a straight line, check when it intersects Z-axis
- find maximum in the histogram of the intersections
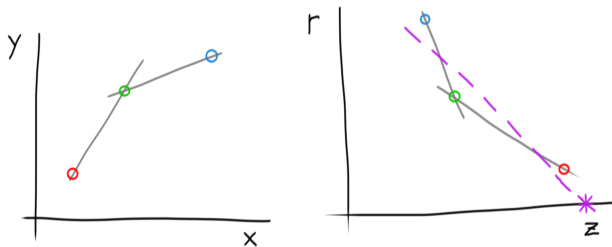
performance; truth $vtx_z = 20\,\text{mm}$

summary & outlook
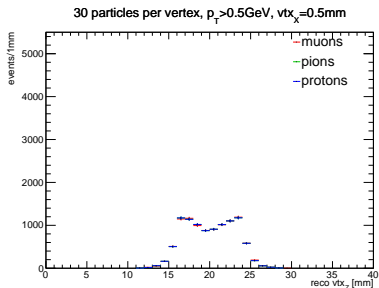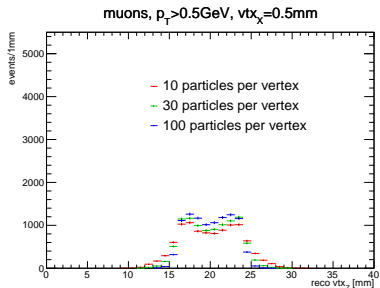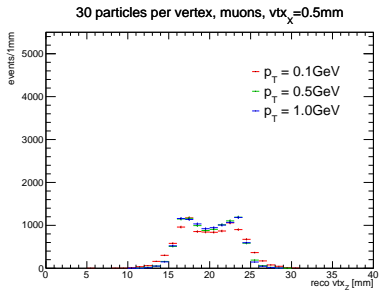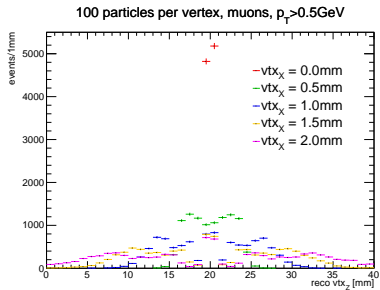
- position of the truth vertex away from the Z-axis worsen the estimate the most
  - looking for *maximum* in the histogram, maybe *mean* would be better?
  - maybe somehow estimate also X-Y position and use it for Z position? or estimate R from the width of the histogram?

- currently saving only reco vertex Z position
- save whole histogram would allow for better insight
  - what fraction of space-point combinations are far away from the vertex? (approximately this fraction of track seeds we can later discard)
  - should we get the maximum of the histogram, or its mean, or something else?