

SiBT implementation in vertex reconstruction

Danil Chemezov
VBLHEP
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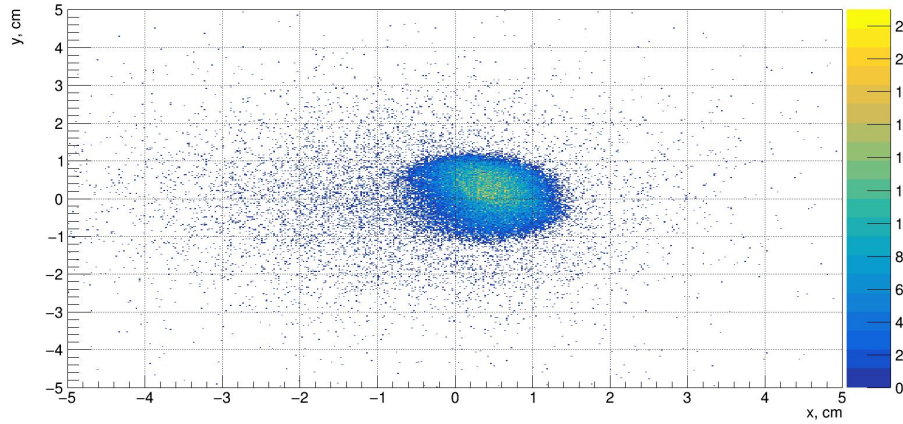
Algorithm

The main goal is to try to refine the position of the vertex using the track from the SiBT. For this purpose, the beam track is propagated to the point $z = z_{\text{primaryVertex}}$. The new x and y coordinates of the vertex are calculated as the weighted mean of the SiBT-vertex and VF-vertex:

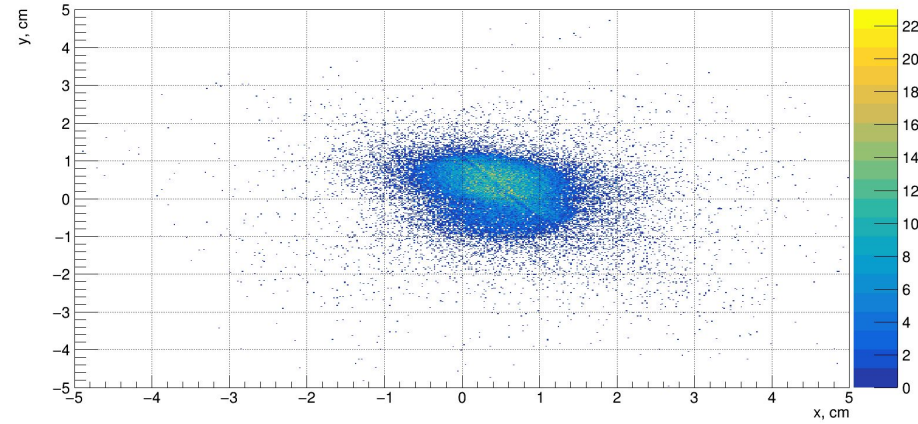
$$\text{combineVertex}_{x,y} = \frac{\text{primaryVertex}_{x,y} \cdot w_{\text{primary}_{x,y}} + \text{beamVertex}_{x,y} \cdot w_{\text{beam}_{x,y}}}{w_{\text{primary}_{x,y}} + w_{\text{beam}_{x,y}}}, \text{ where } w = \frac{1}{\sigma^2}, \sigma = \text{cov}(i,i) \text{ for } i=0,1$$

Hit plots

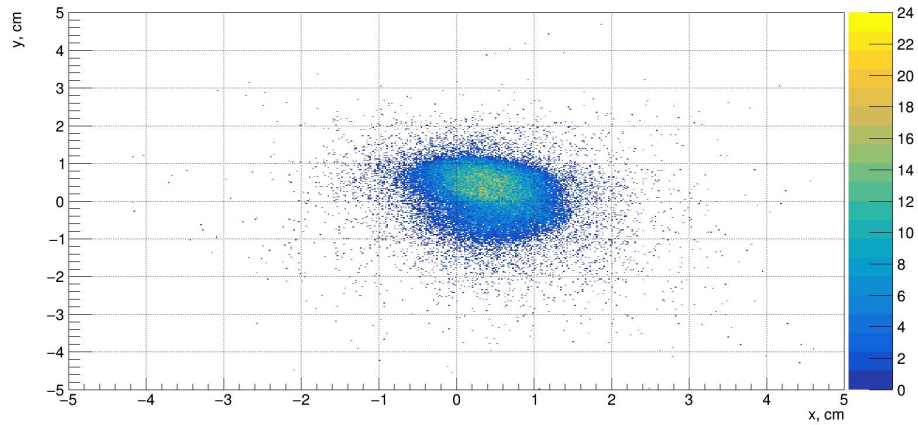
primaryVertexY:primaryVertexX



beamVertexY:beamVertexX

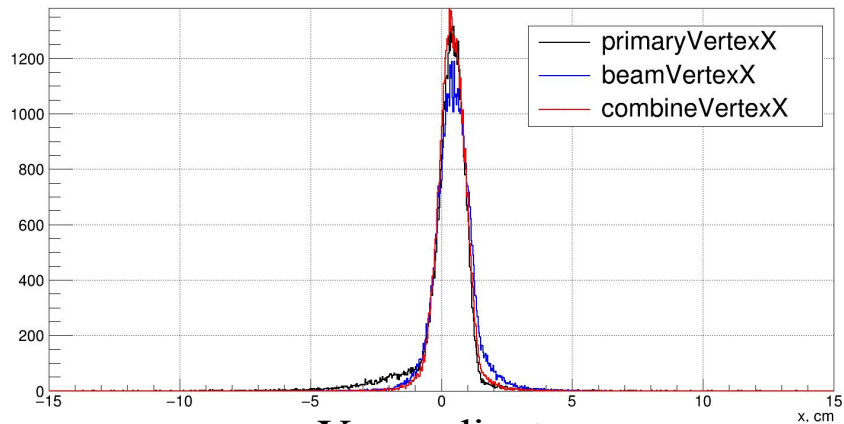


combineVertexY:combineVertexX

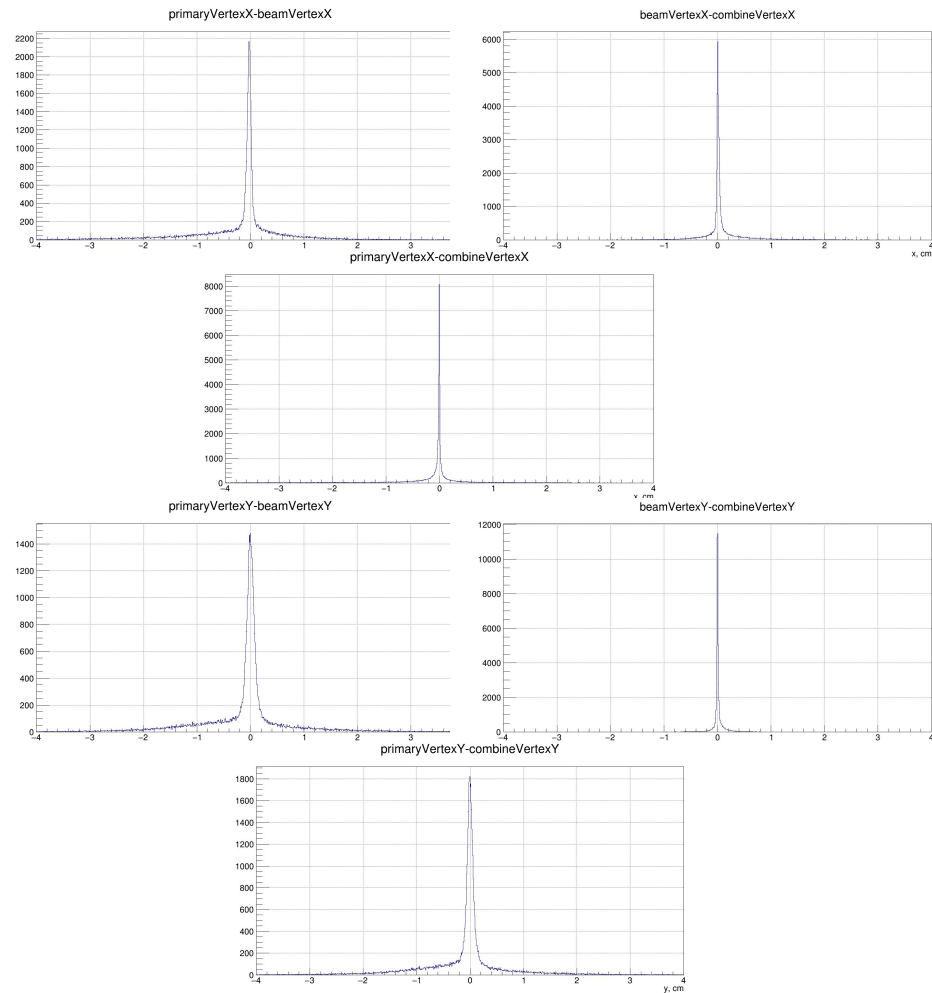
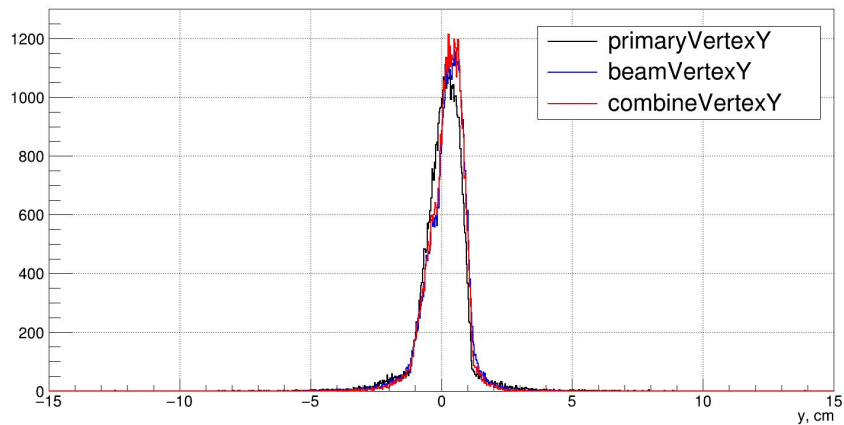


Comparison x and y

X-coordinate

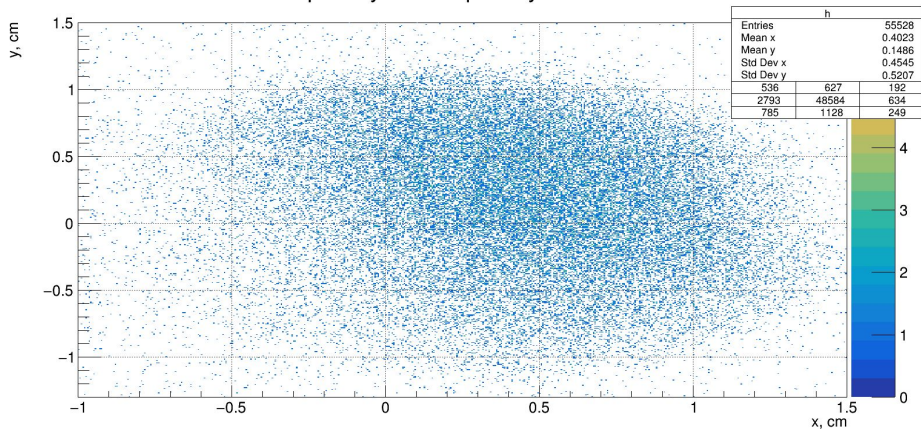


Y-coordinate

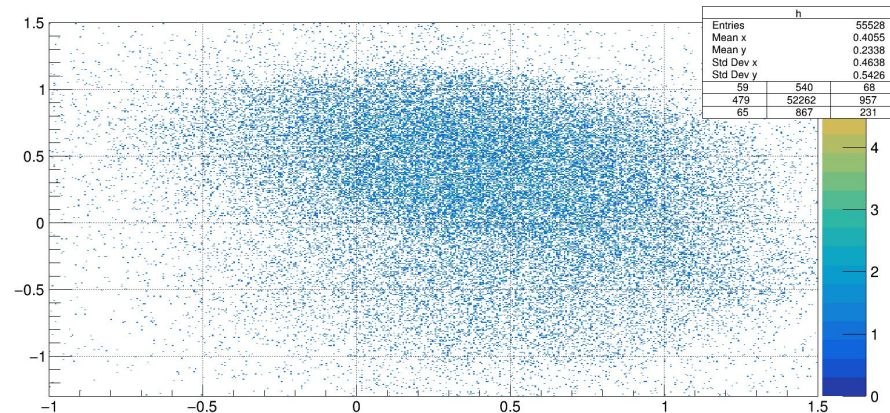


Impact on statistics

primaryVertexY:primaryVertexX



combineVertexY:combineVertexX



Inside the area cuted by VC:

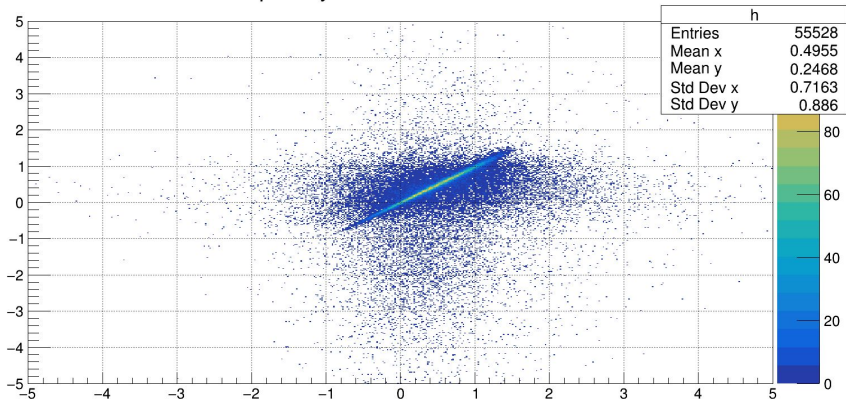
- before correction with SiBT - 48584 events;
- after correction with SiBT - 52262 events;

Relative to the total number of reconstructed vertexes, the statistical gain is about 6.6%

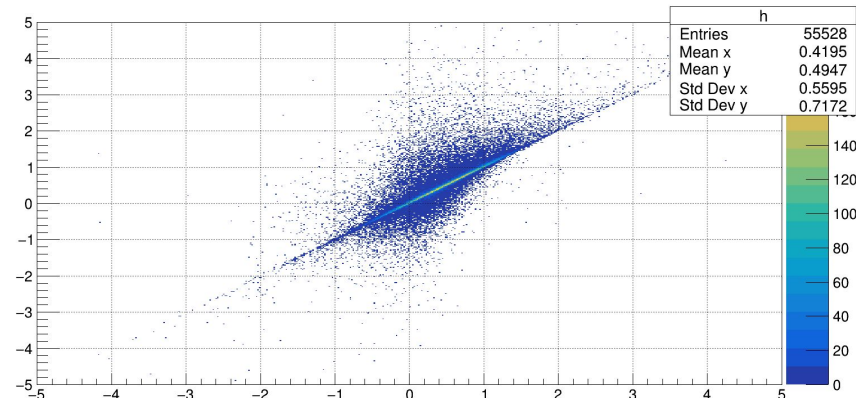
Backup

Correlation plots for x-coordinate

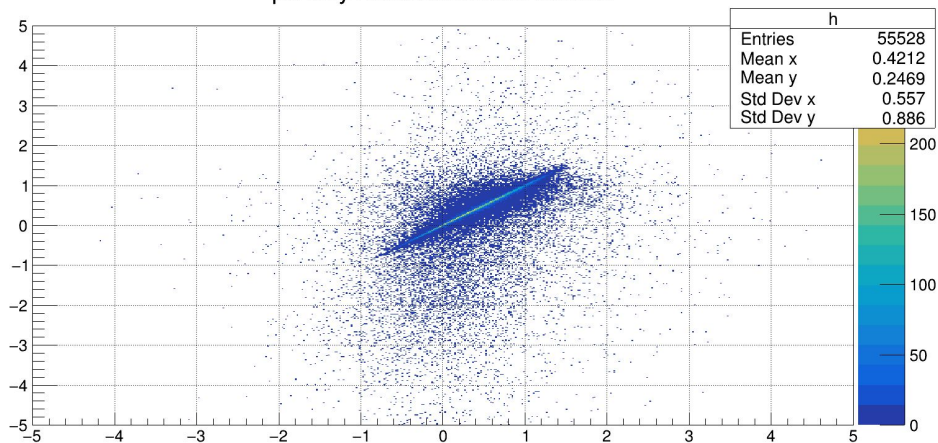
primaryVertexX:beamVertexX



beamVertexX:combineVertexX

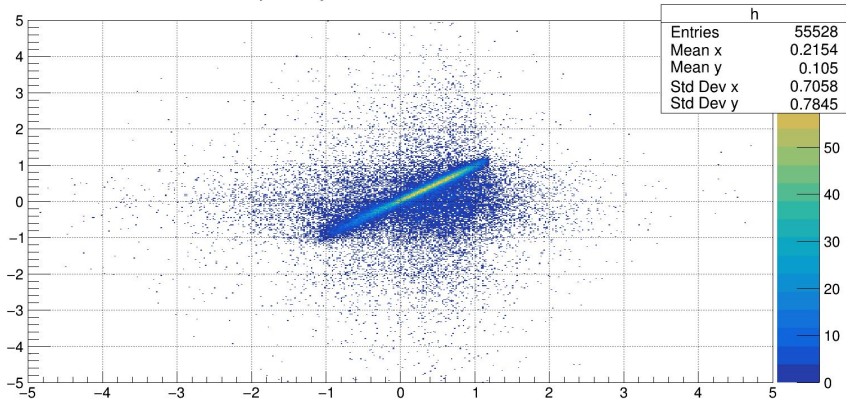


primaryVertexX:combineVertexX

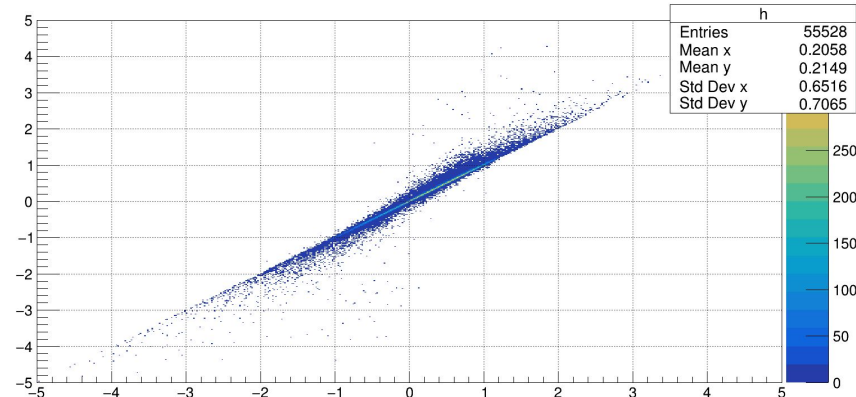


Correlation plots for y-coordinate

primaryVertexY:beamVertexY



beamVertexY:combineVertexY



primaryVertexY:combineVertexY

