

Performance of Primary Vertex Reconstruction in ATLAS



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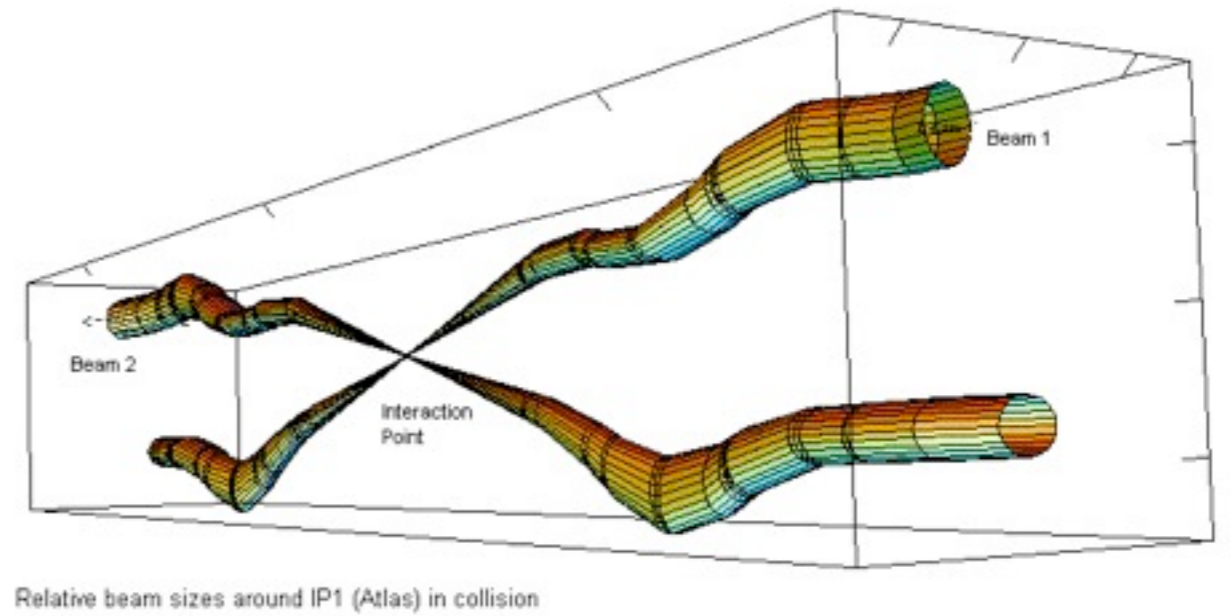
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- Primary vertex

- Primary interaction point of the PP collision at LHC.

- Primary vertex reconstruction is important for many physics analyses at LHC experiments.

- It can be reconstructed from associated reconstructed tracks of charged particles to particular vertex candidate.



- Reconstruction

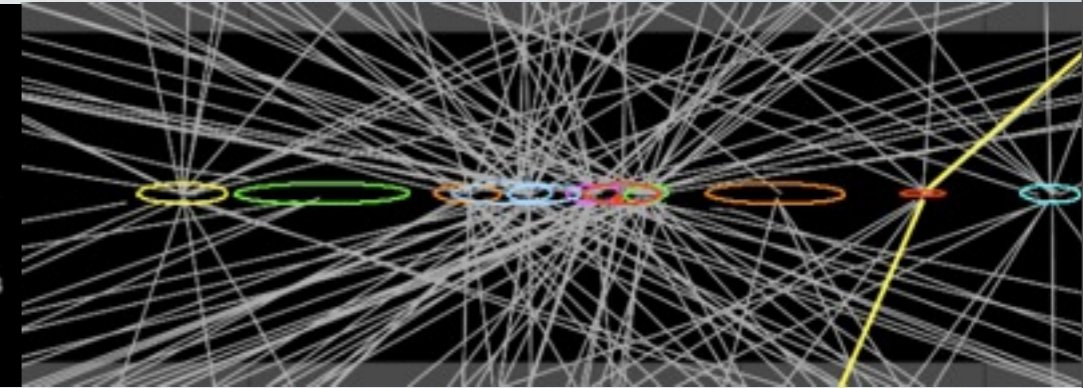
- Reconstruction generally involves two steps:

- a) Finding: associate reconstructed tracks to vertex candidate.

- b) Fitting: reconstruction of position, covariance matrix and other quantities related to the qualities of fit.

- Several PP collisions in the same bunch crossing

- Hard scatter interaction
i.e. physics process of interest
- Pileup interactions

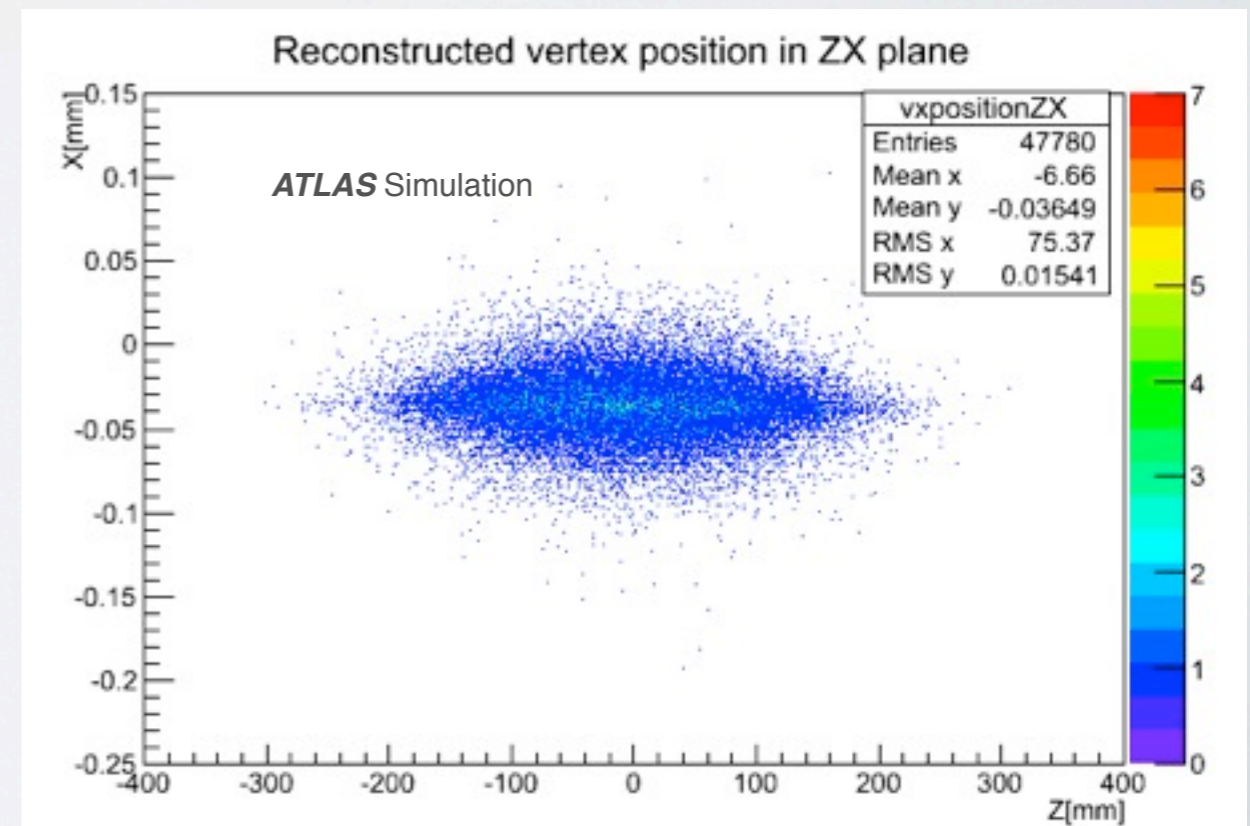
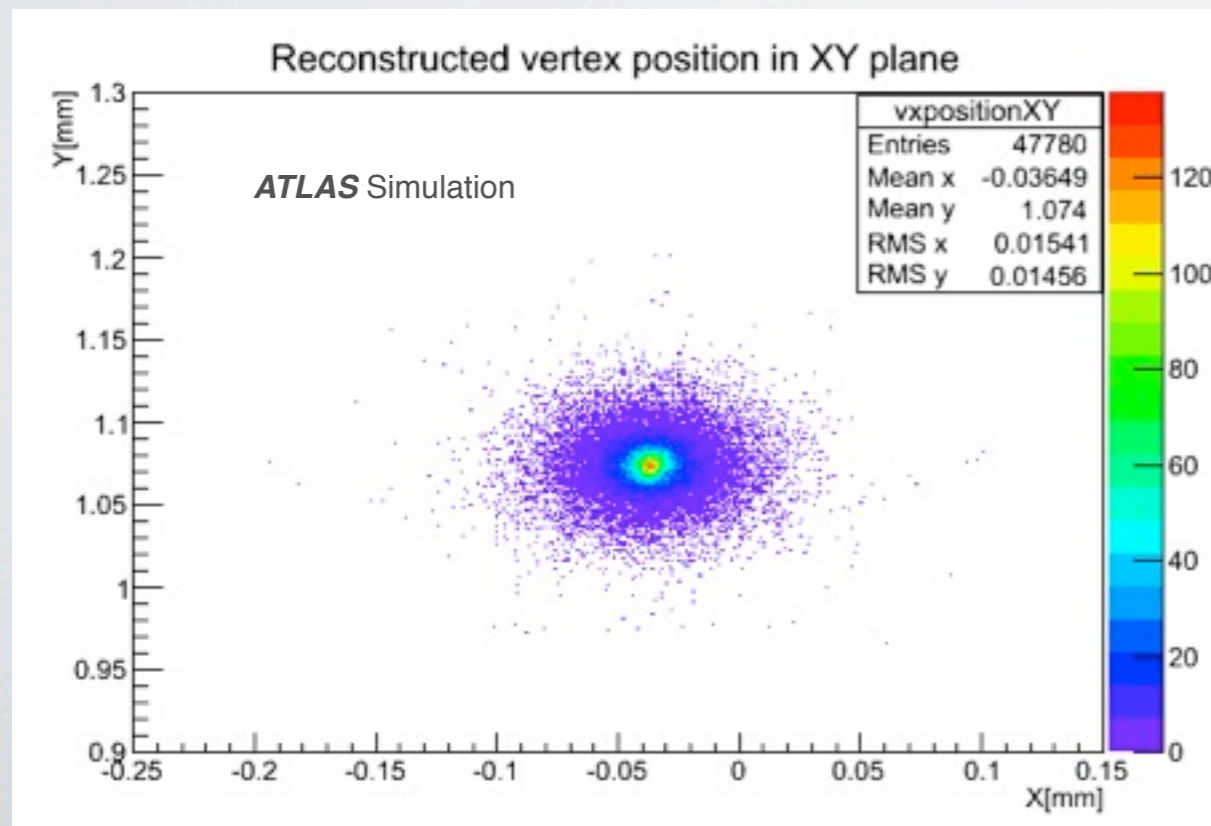


- Stored information

- Hard scatter PV, Pileup PVs
- MC-based informations of true primary vertex are available
i.e. true PV position(X,Y,Z), number of PV

- Reconstructed vertex position

Monte Carlo sample



• Merging and splitting of vertex

★ true collision

● reconstructed PV

a) One true collision corresponds to one reconstructed PV

★● *Ideal case*

b) Two true collisions correspond to one reconstructed PV

★●★

c) One true collision corresponds to two reconstructed PVs

●★●

d) One true collision corresponds to no reconstructed PV

★

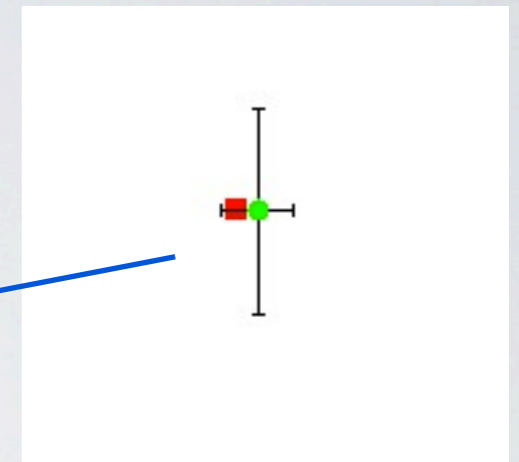
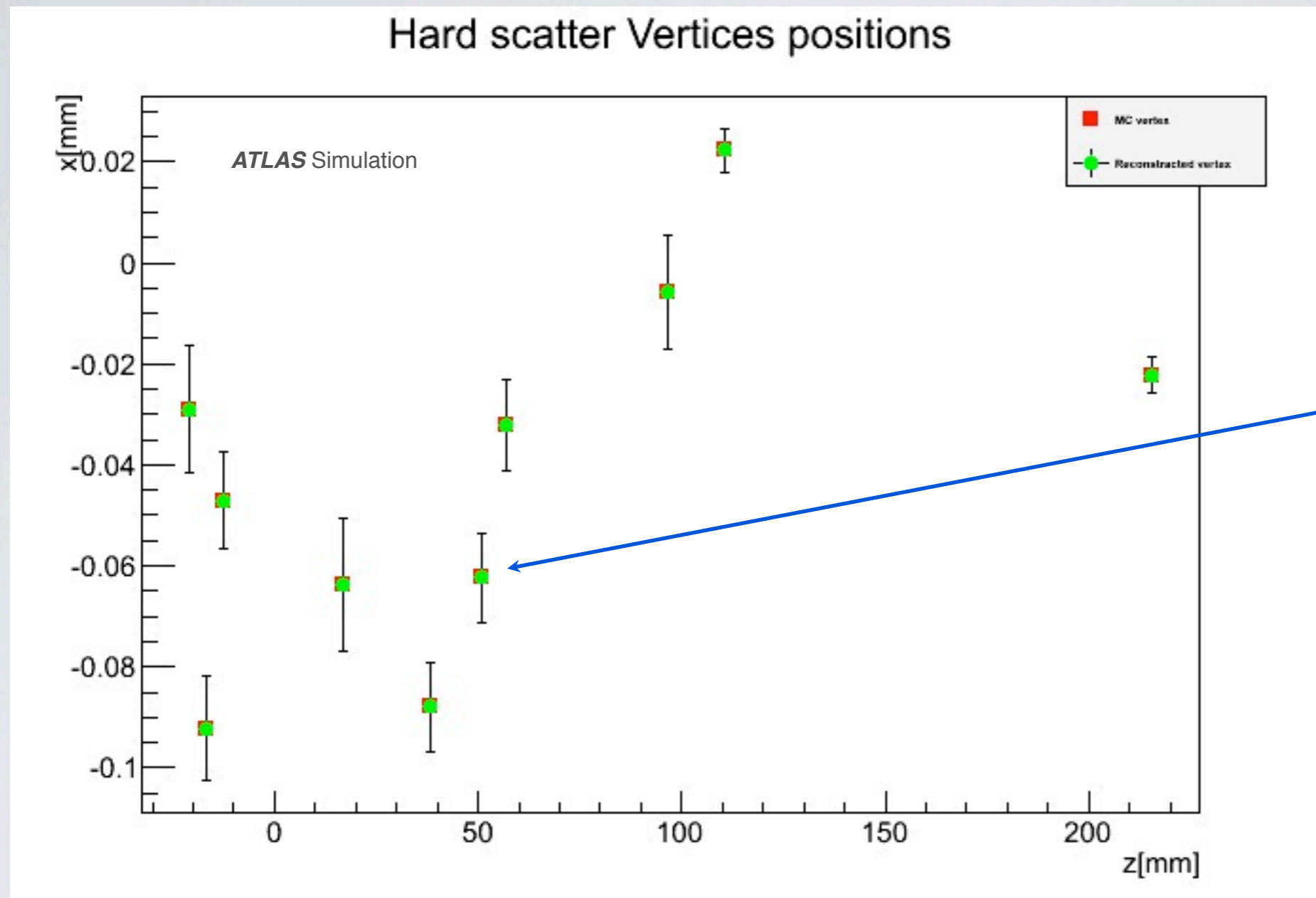
• Distance between reconstructed PV and corresponding true vertex

d is distance between reconstructed PV(with index rec) and true MC vertex (with index $true$)

$$d = z_{rec} - z_{true}$$

if d is in the order of error of reconstructed PV position, the true vertex selected as a corresponding true vertex of this reconstructed primary vertex.

Position of reconstructed and true hard scatter PVs for ten events



Conclusion

- Good consistency between true and reconstructed PV positions.
- Work ongoing to quantify exact performance.