

Track – Hit Association in Silicon Detectors

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on behalf of DESY and IPHC Strasbourg

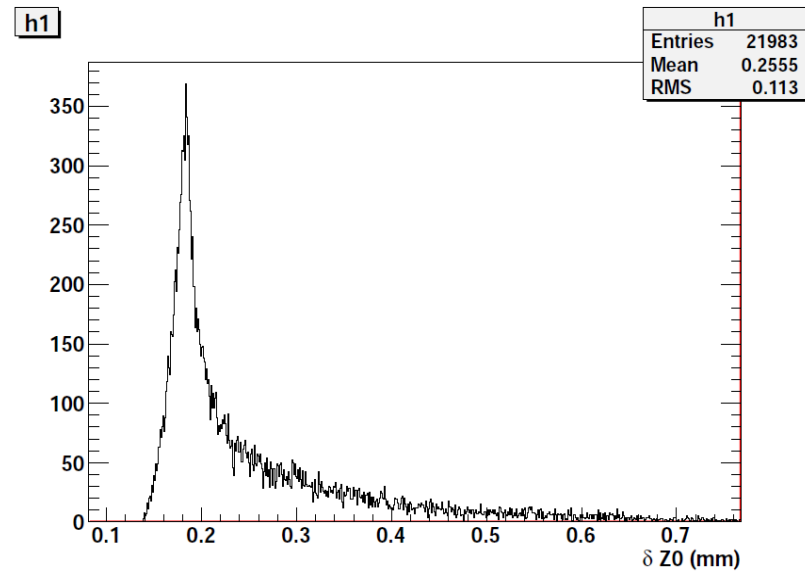
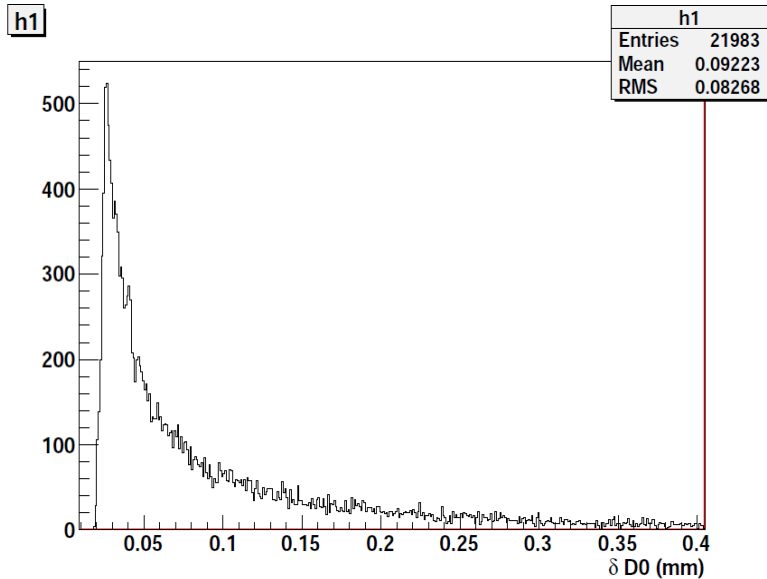
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Outline

- Back up solution to standalone silicon tracking
- Track reconstructed at the TPC
- Propagated to outermost SIT layer
 - Search for hit inside the propagation area
 - Add hit if found
 - Refit
 - So on so forth to the remaining SIT & VXD layers
- ◆ Today:
 - Examine the track-hit matching
- Sample
 - Ttbar + pair bkg overlayed, $\sqrt{s} = 1 \text{ TeV}$

From TPC to Silicon

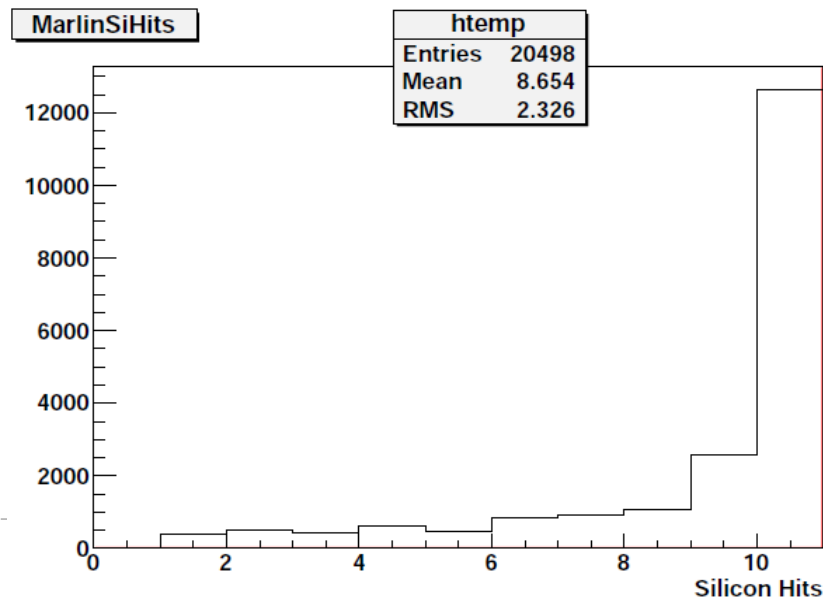
TPC → outermost SIT



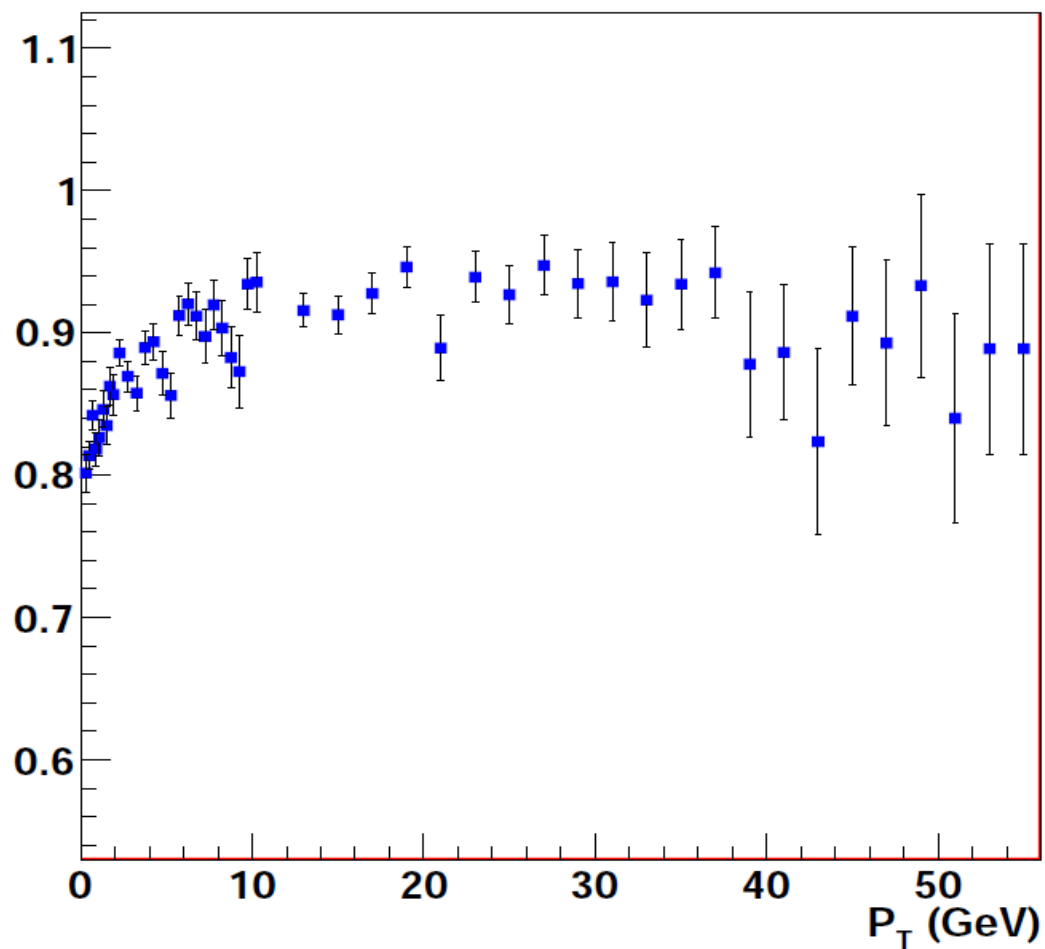
- Search area:
 - Track impact parameters uncertainties
 - Sensor s.p. Resolution
- Track sample
 - We will examine tracks centrally produced, with > 10 TPC hits, $P_T > 300$ MeV, $\chi^2/\text{ndf} < 20$
- Best candidate
 - Hit closest to track propagation point
- About SIT:
 - First we stick to the SITTrackerHits (we know they are there!)
 - Then go to SpacePoints

Track – hit matching

- This not efficiency
- From the Si hits associated to the TPC track, how many belong to the dominant MC particle
- > 75 % considered found
- But how many Si hits do we finally associate?



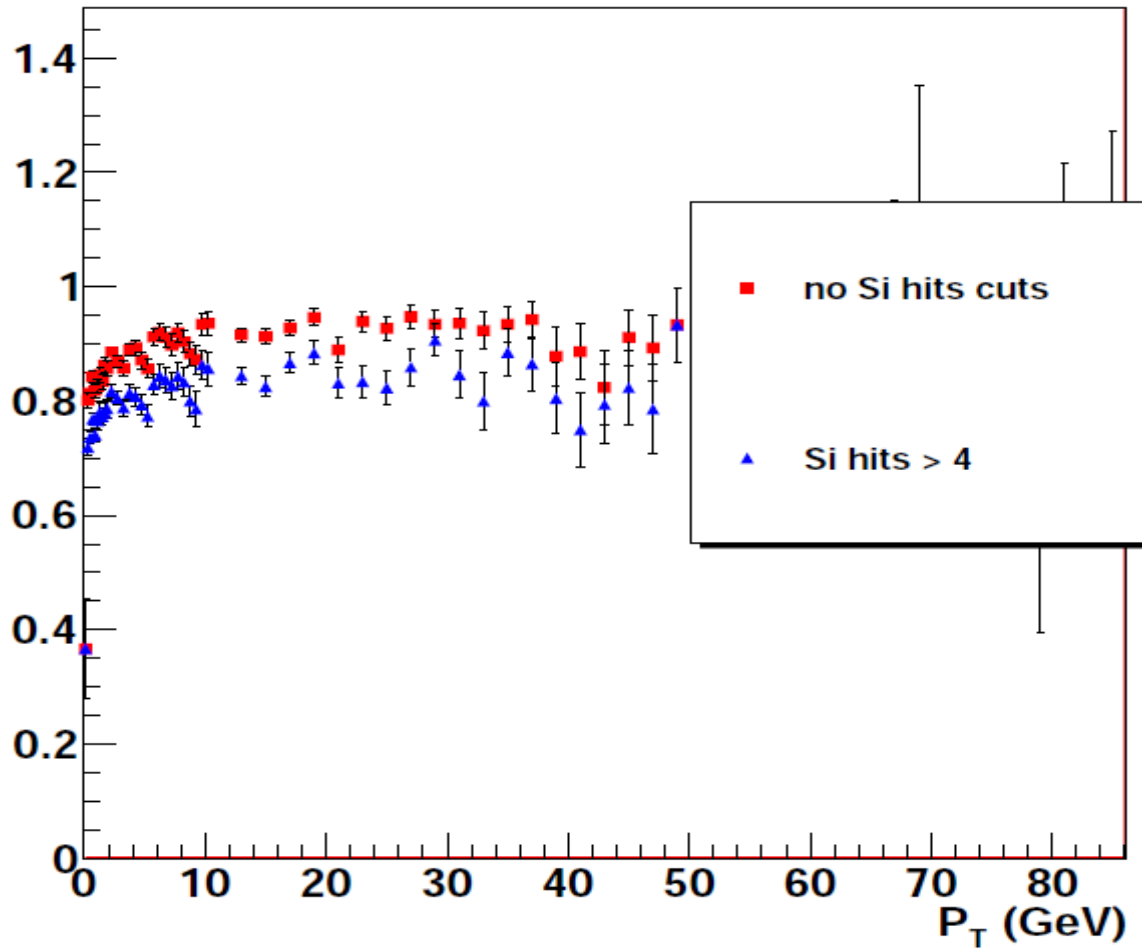
Track-hit matching for Si segment: ttbar + pair bkg



Track – hit matching (2)

- Applying a cut to the minimum Si hits associated (≥ 5)

Track-hit matching for Si segment: ttbar + pair bkg



Why we miss hits?

- Hit is not there:
 - Not very probable (100% assumed sensor det. eff & search area 5-10 times track prop. area)
- Fit fails
- Attach of not “correct” hit
 - It will distract the track
 - Are our hit selection criteria optimal?
 - Maybe instead of the closest, we should attach the one giving the lower χ^2 ...
- Case of space points
 - Space point might not be reconstructed
 - For example close to the border between two sensors

Outline

- Optimising best hit candidate selection
- Then checking Impact Parameter & momentum resolution (low mom.)
- Can stand as an alternative to standalone silicon tracking?
- Long term goal:
 - **Standalone Si tracking**