TOP-BOTTOM ASYMMETRY FOR BUMP-HUNT

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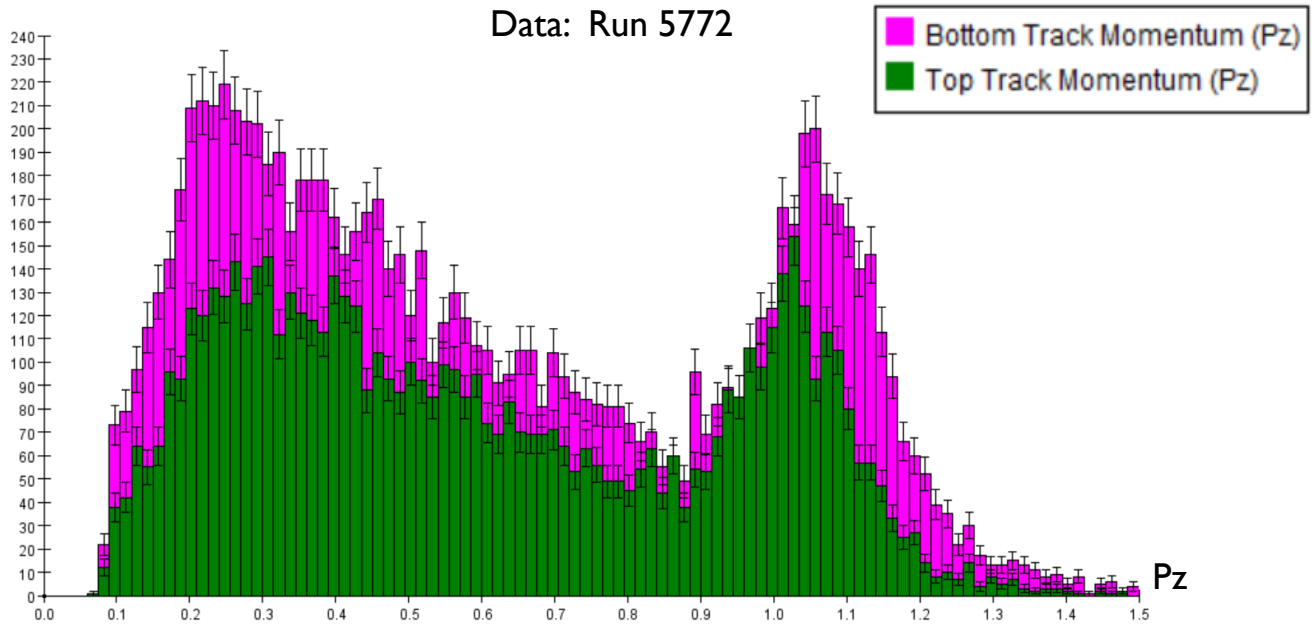
JUNE 11 2018

"Bump-hunting rabbit-holes"

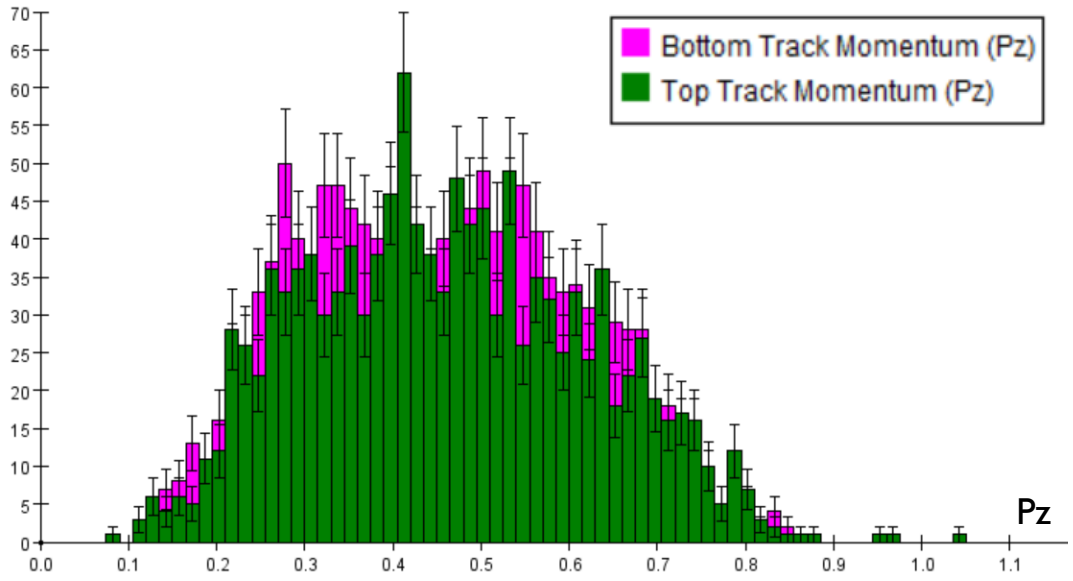
RECALL FROM COLLABORATION MEETING …

Asymmetry in GBL Tracks
right after reco
~30-35% in data
~10% in MC

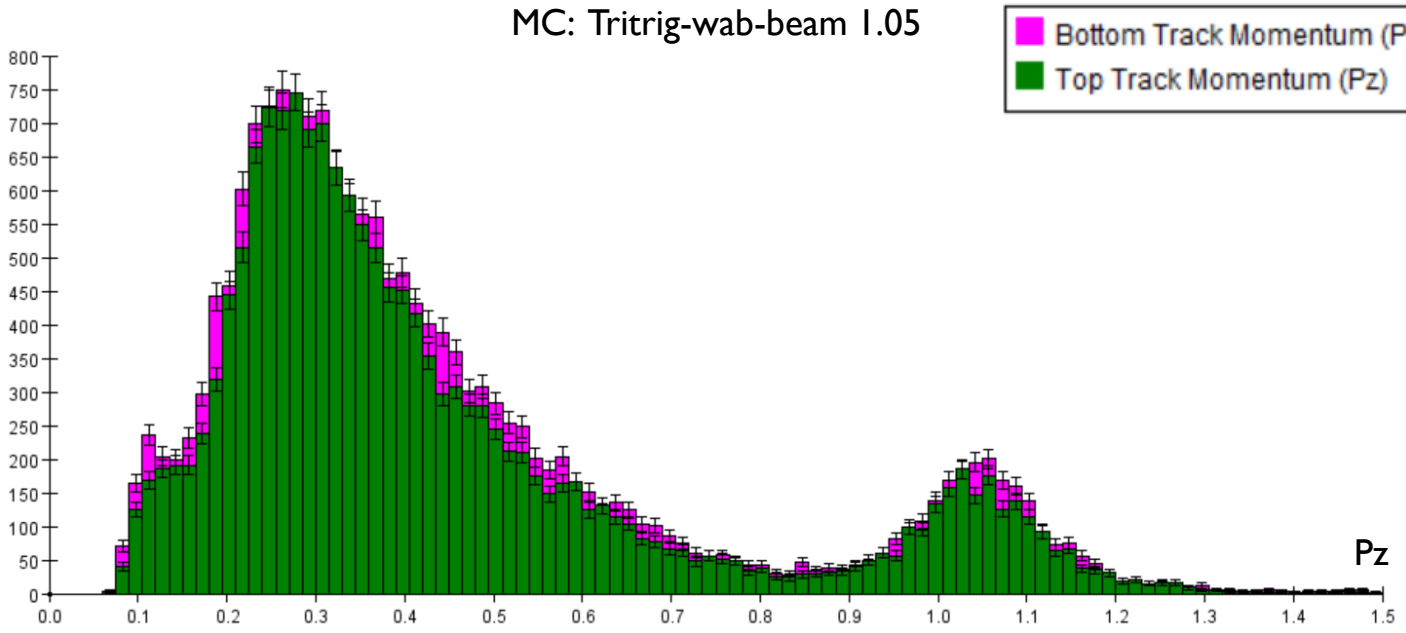
Data: Run 5772



MC: A'

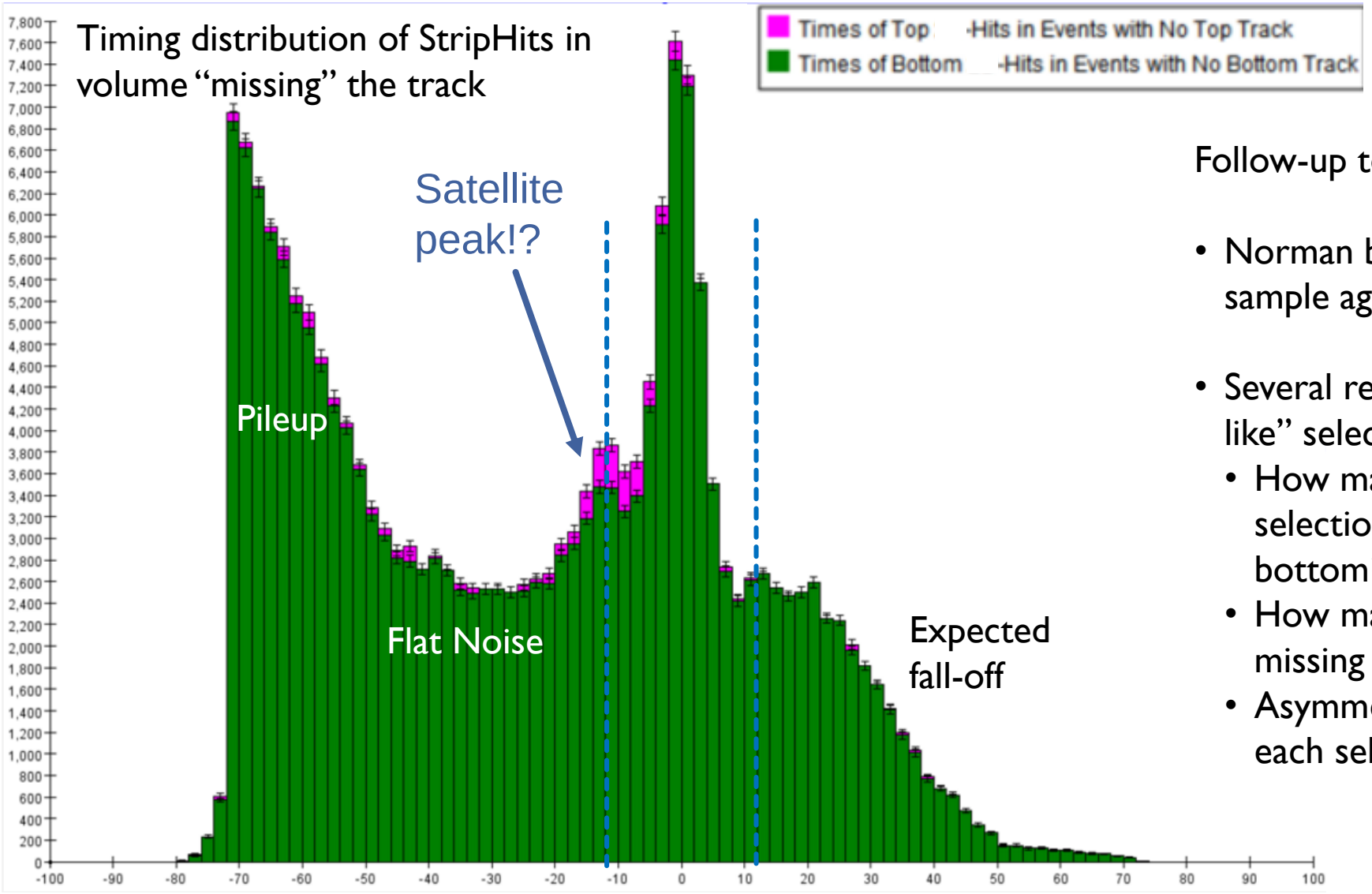


MC: Tritrig-wab-beam 1.05



RECALL FROM COLLABORATION MEETING …

Studied special sample of pairs-triggered data events: Exactly 1 reco cluster in top, 1 in bottom



Follow-up to collaboration meeting:

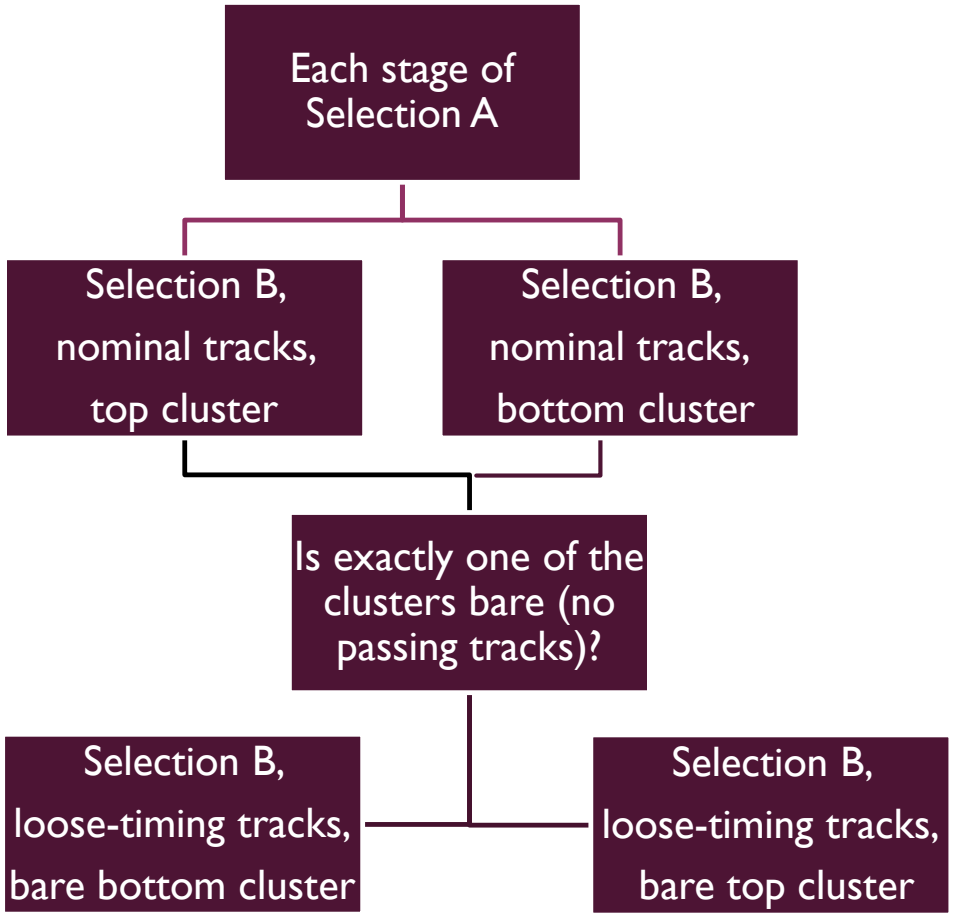
- Norman began reconstructing this special sample again, with loosened timing cuts
- Several requests to perform "bump-hunt-like" selection on this special sample
  - How many events passing the rest of the selection are missing a track on top? On bottom?
  - How many such events recover their missing track with looser timing cuts?
  - Asymmetry of Pz spectrum throughout each selection stage?

BUMP-HUNT-LIKE SELECTION

Difficult because "one track on top, one on bottom" is amongst the first criteria applied

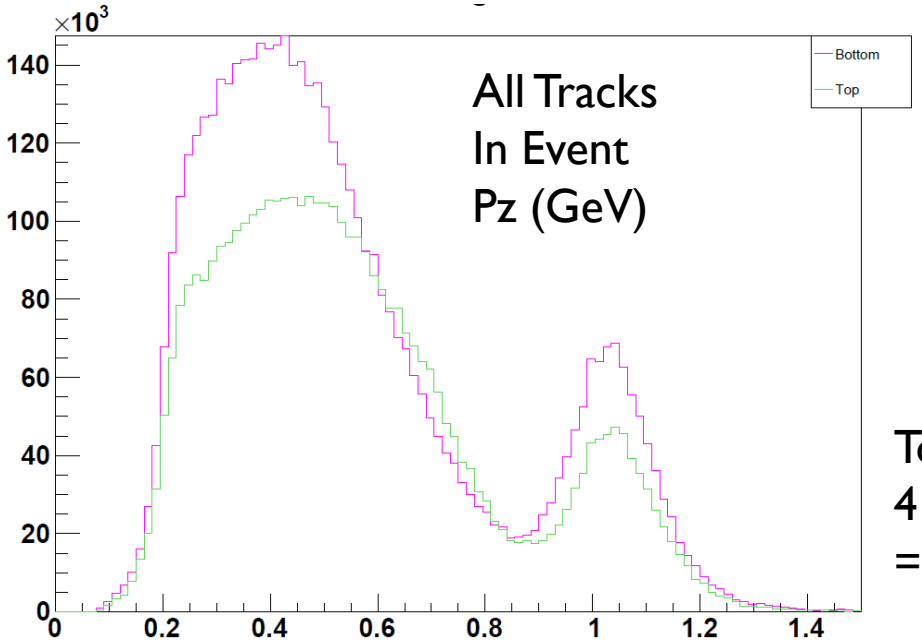
My modified cut-flow:

- Selection A (run on Events)
  0. Exactly one reco cluster on top and one reco cluster on bottom
  1. Pairs1 trigger
  2. Both reco clusters corresponding to the Pairs1 trigger clusters
  3. 0.8 Ebeam < reco cluster Esum < 1.2 Ebeam
  4. Seed time of reco clusters within 2 ns

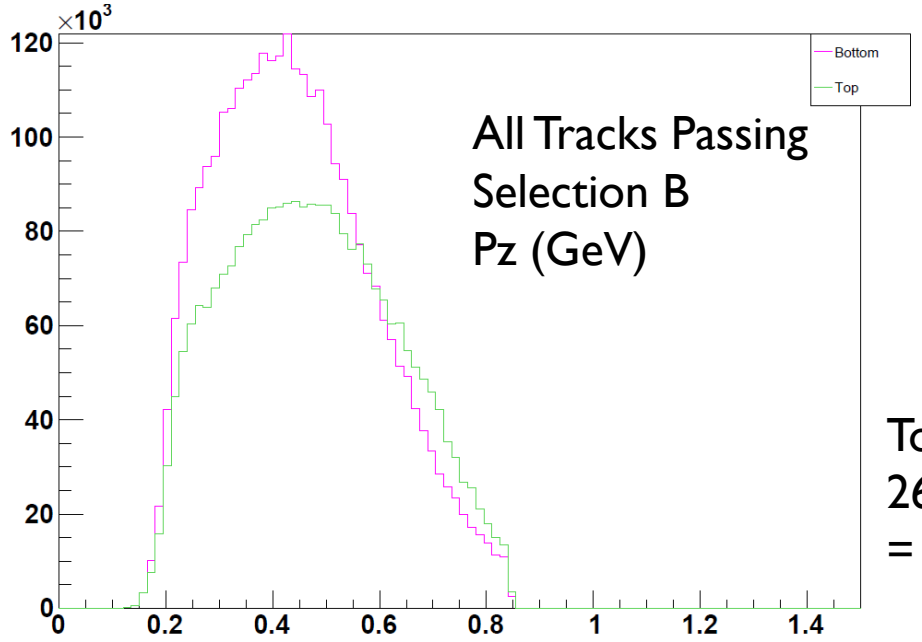


- Selection B (run on Tracks, with respect to a Cluster)
  0. Track is in same volume (top/bottom) as Cluster
  1. Track has at least one hit in SVT Layer1
  2. Track χ^2<50
  3. Track momentum < 0.8 Ebeam
  4. Track time within 4 ns of offset Cluster time
  5. Extrapolated track position at ECal within (x=40 mm, y=20 mm) of corrected Cluster position

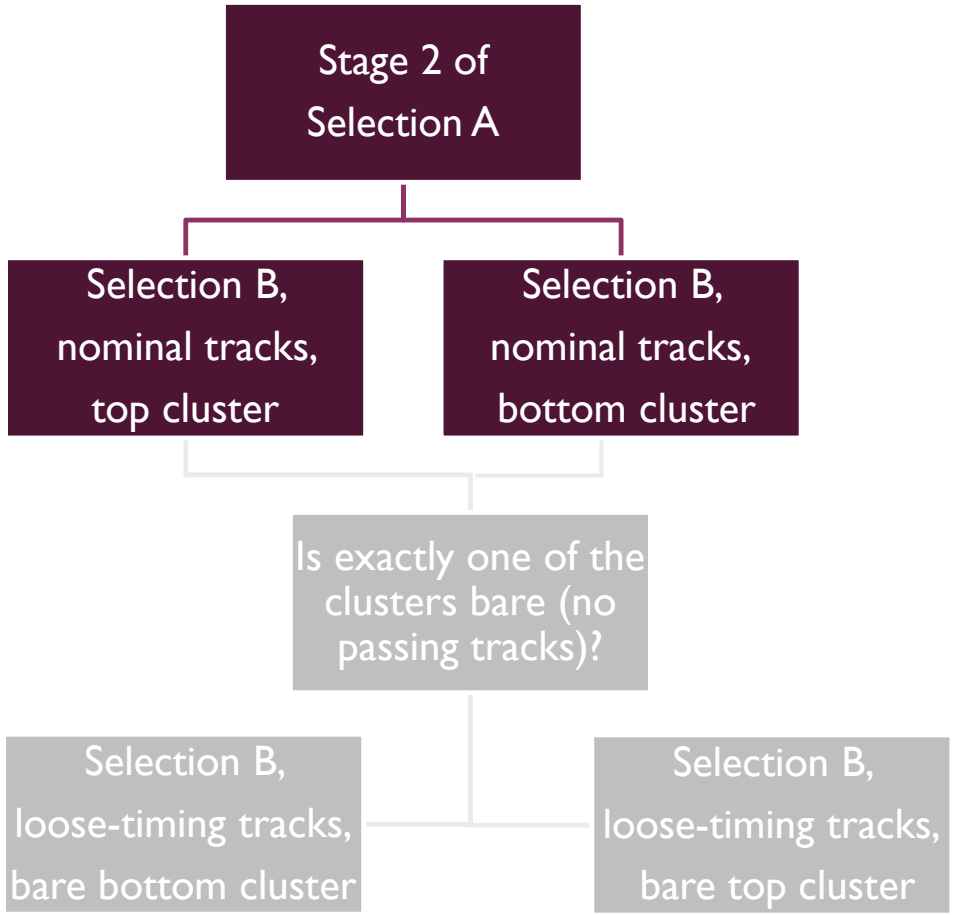
ASYMMETRY: SELECTION A, STAGE 2 (T/B CLUSTERS W/TRIGGER)



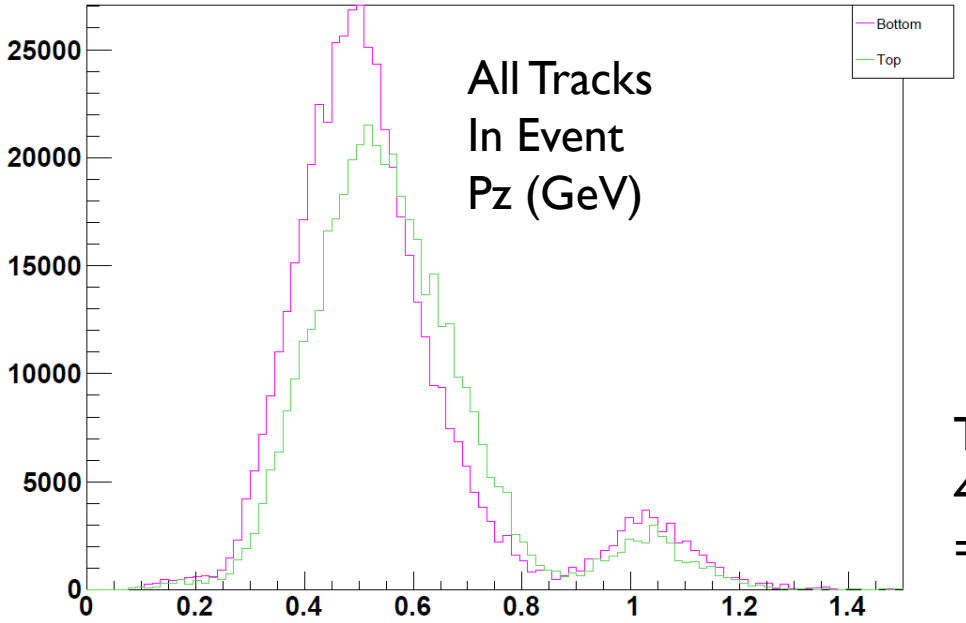
Top/bottom:
4148094 / 5159172
= 0.804



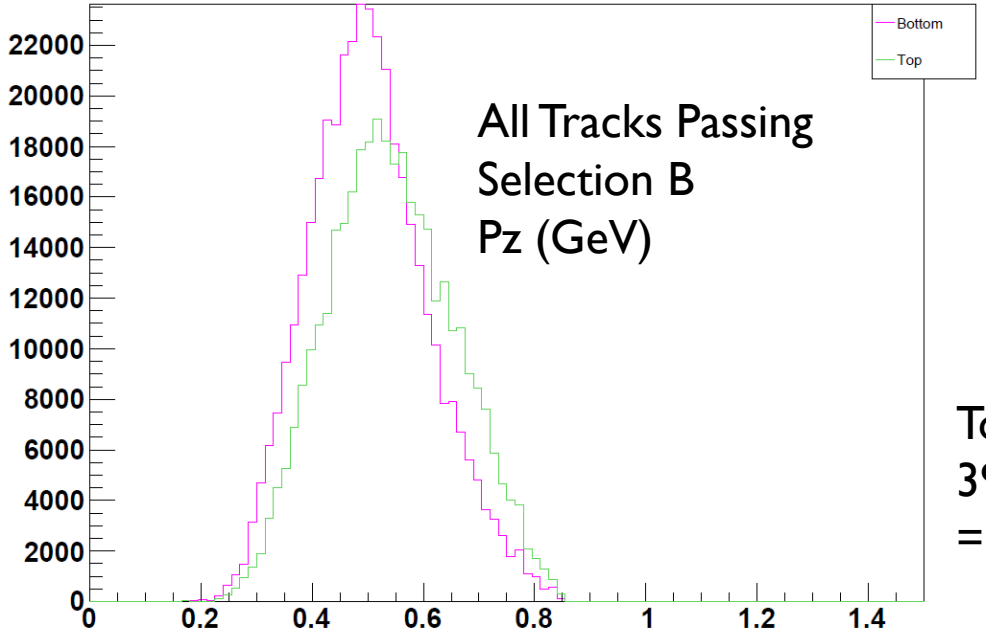
Top/bottom:
2638885 / 3132978
= 0.842



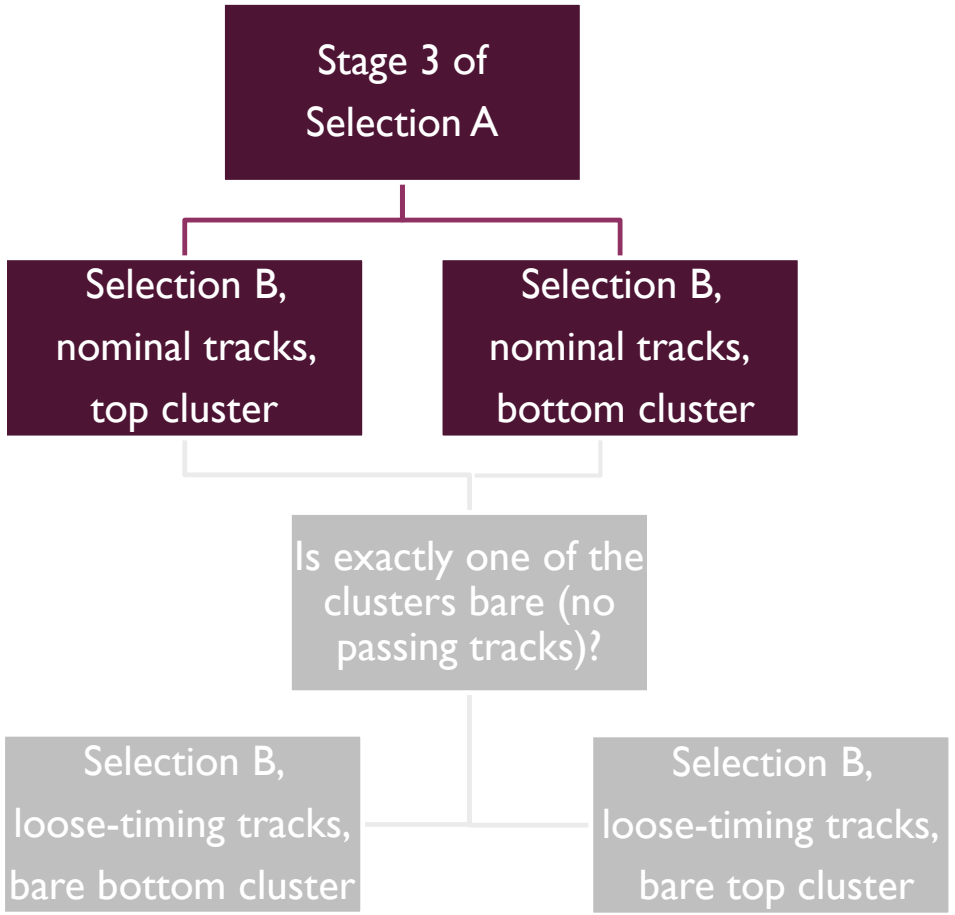
ASYMMETRY: SELECTION A, STAGE 3 (ESUM)



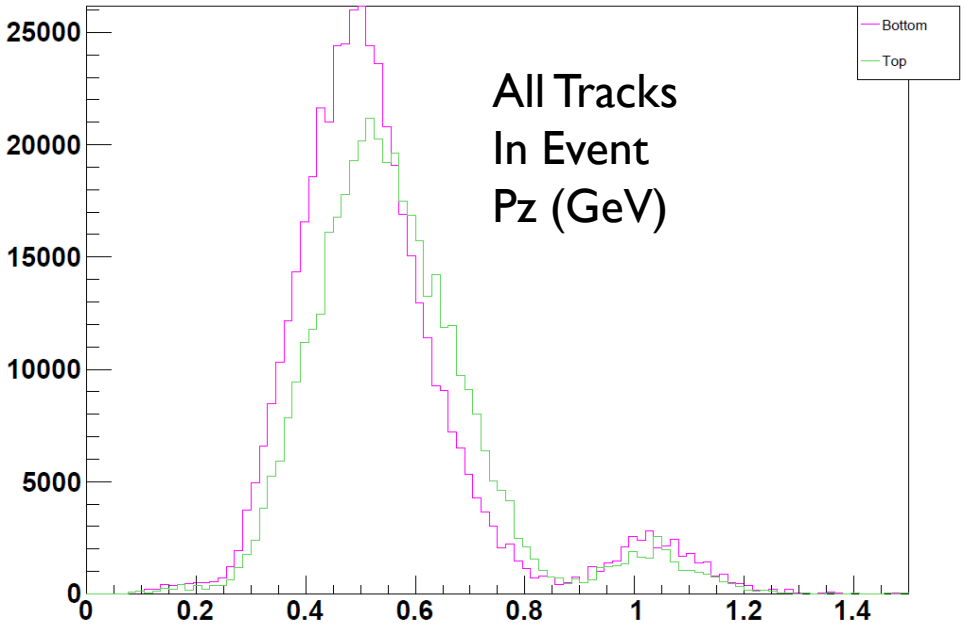
Top/bottom:
449928 / 513670
= 0.876



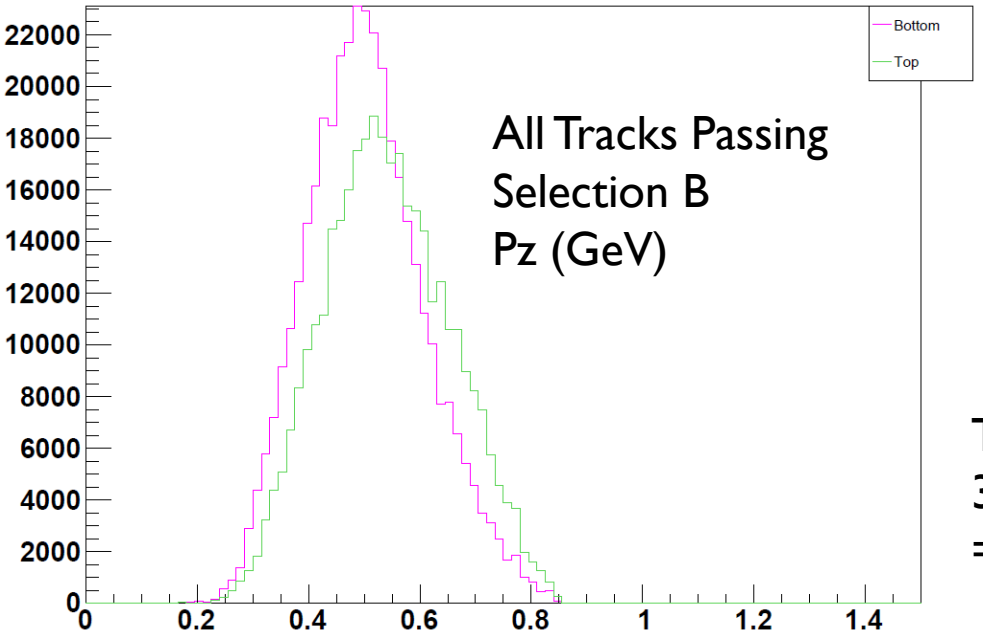
Top/bottom:
396207 / 361877
= 0.913



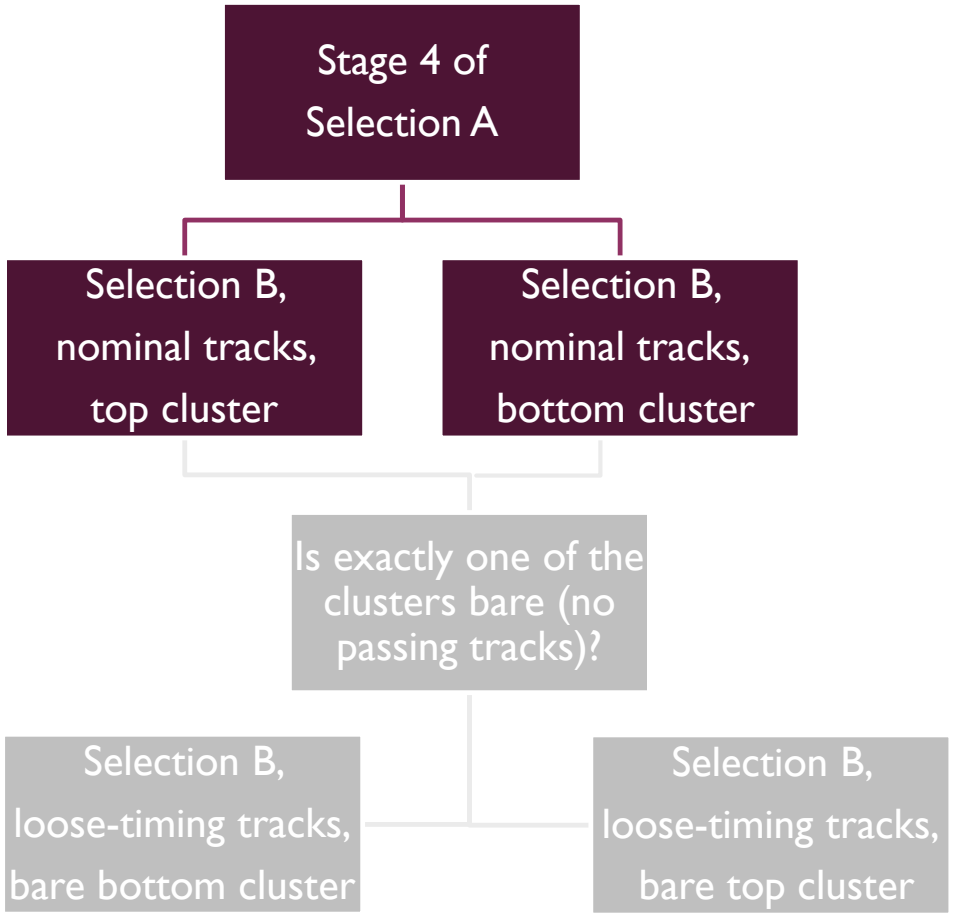
ASYMMETRY: SELECTION A, STAGE 4 (CLUSTER TIMING)



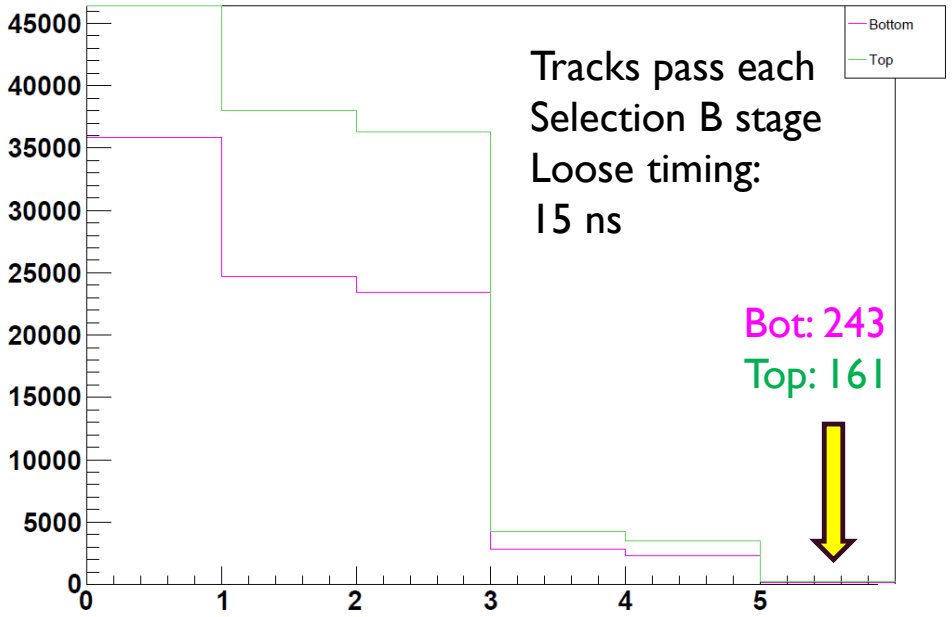
Top/bottom:
429053 / 483145
= 0.888

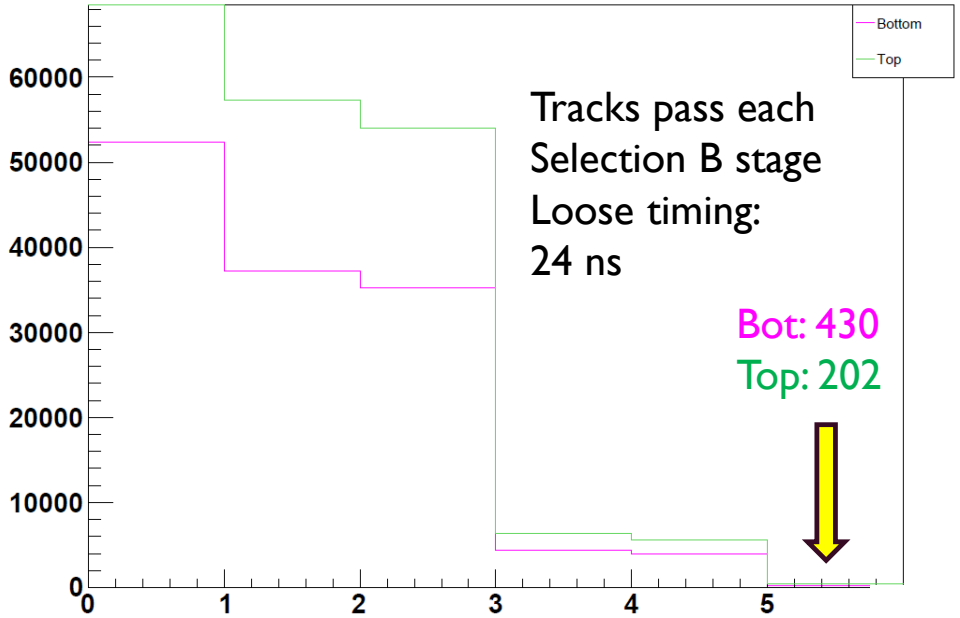


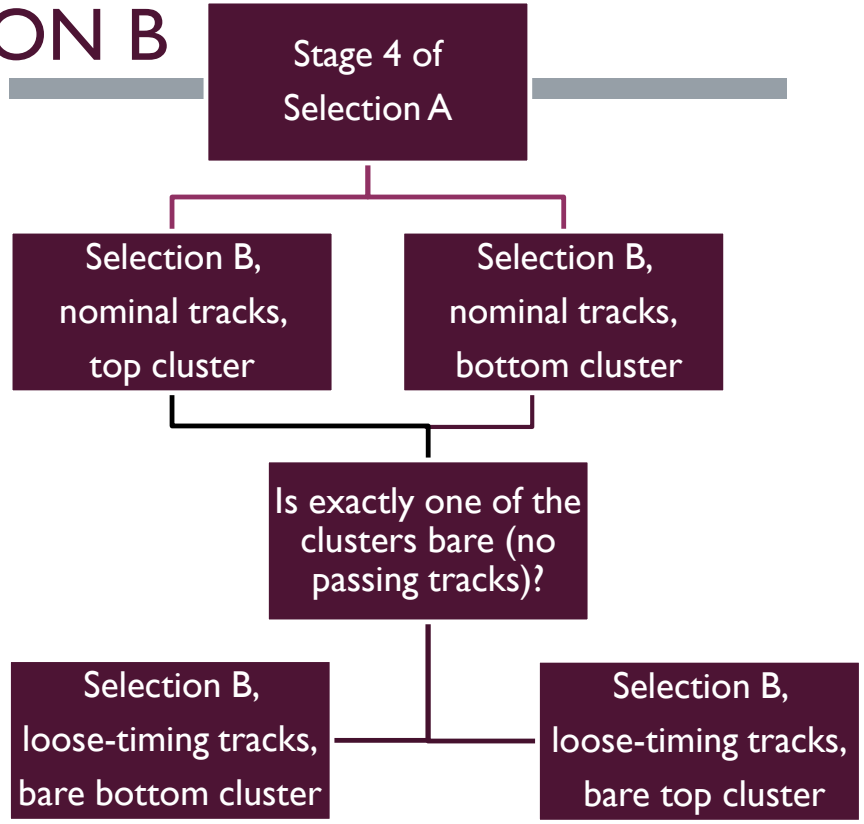
Top/bottom:
355036 / 386271
= 0.919



ASYMMETRY: SELECTION A, STAGE 4 + SELECTION B



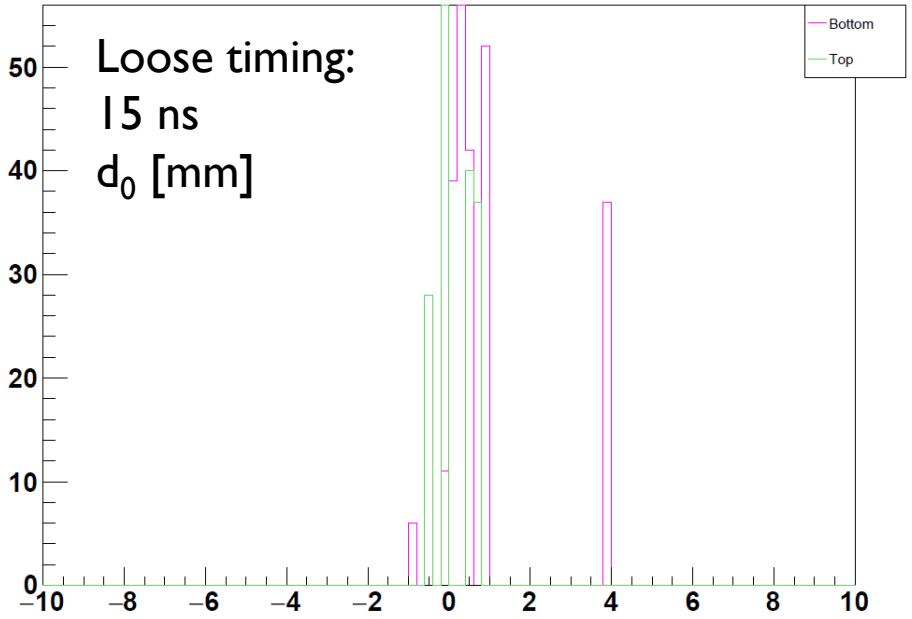


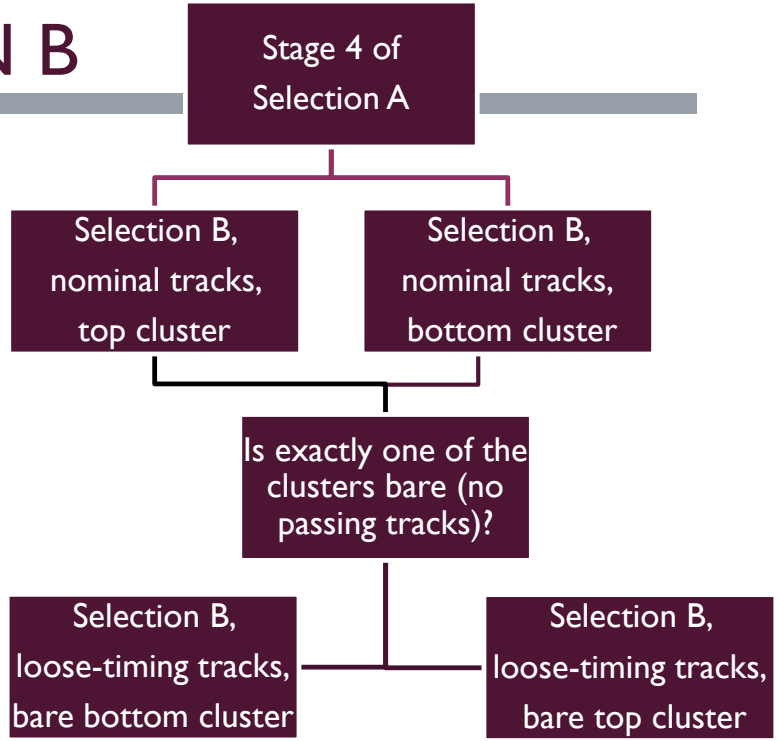


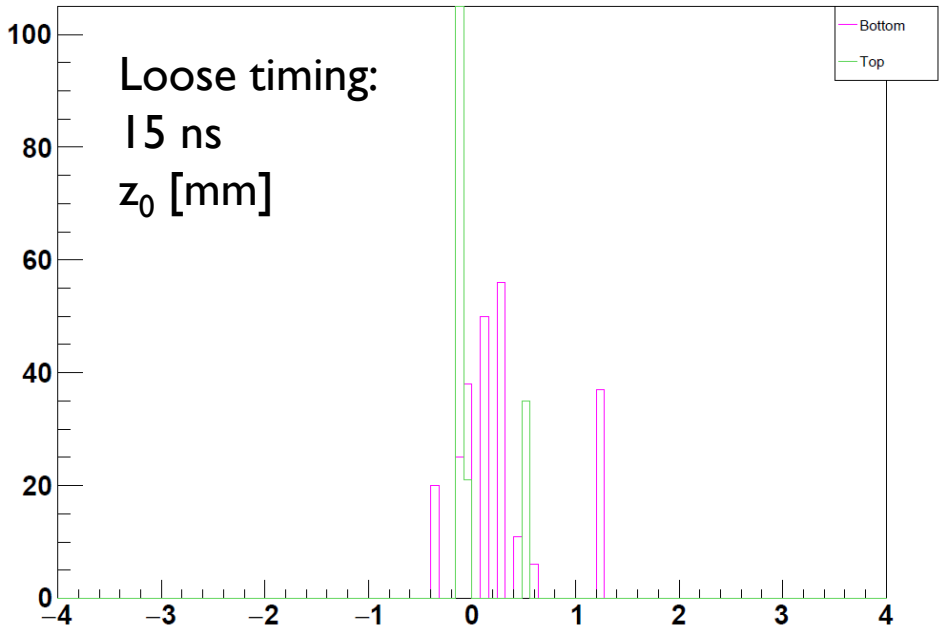
Selection B:

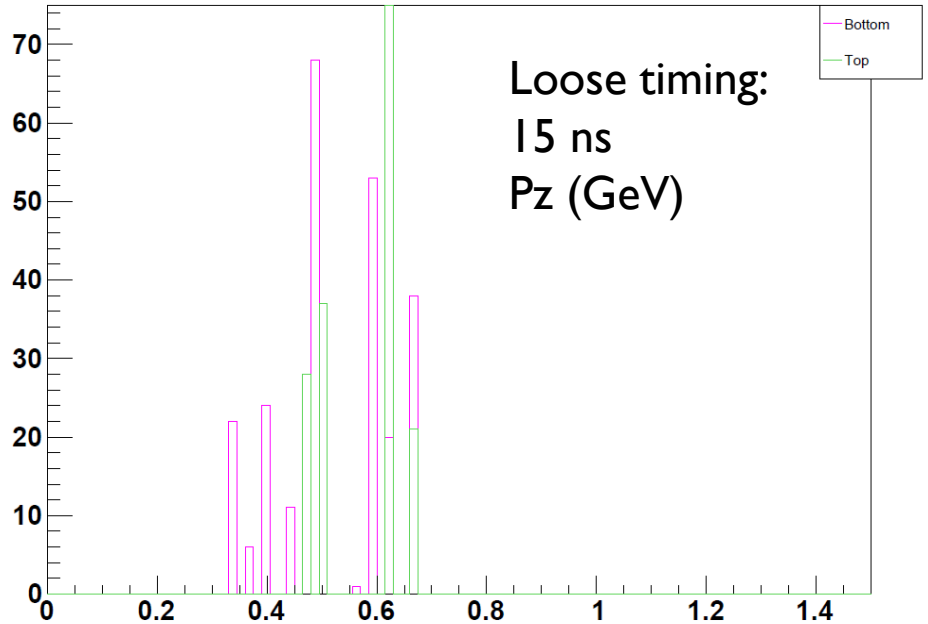
0. Same volume as Cluster
1. Layer1 hit
2. Max track χ^2
3. Max track P
4. Track-Cluster Time
5. Track-Cluster Position

ASYMMETRY: SELECTION A, STAGE 4 + SELECTION B

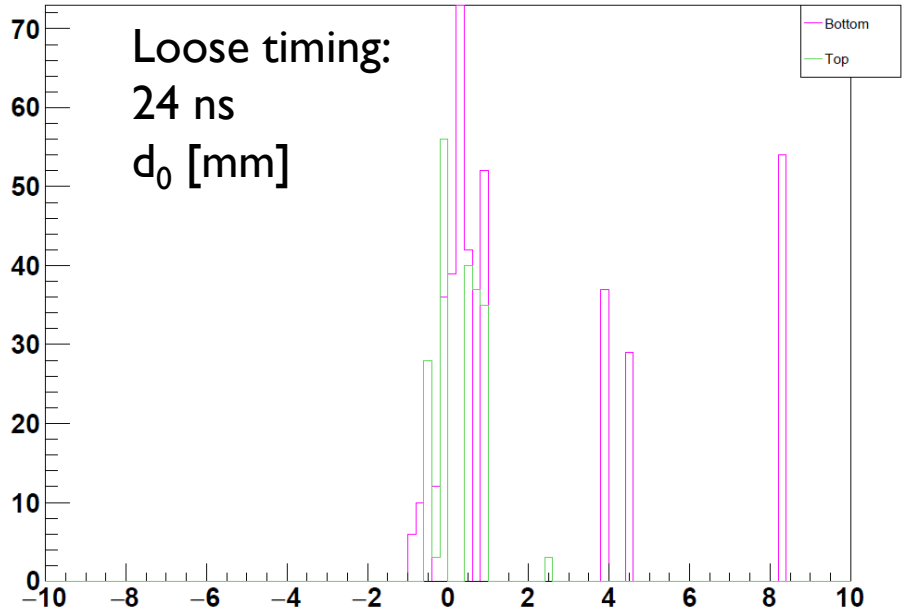


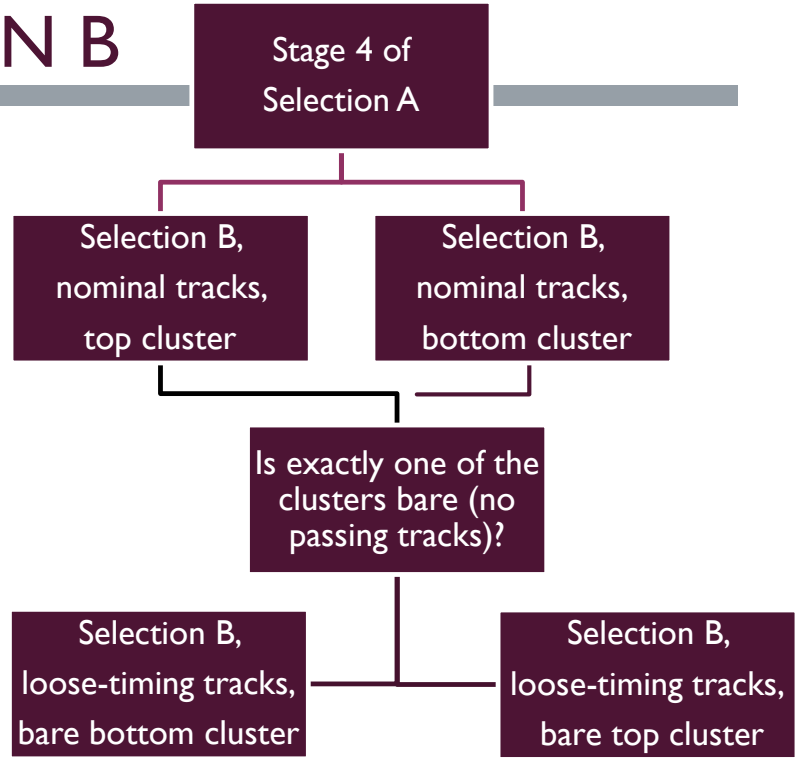


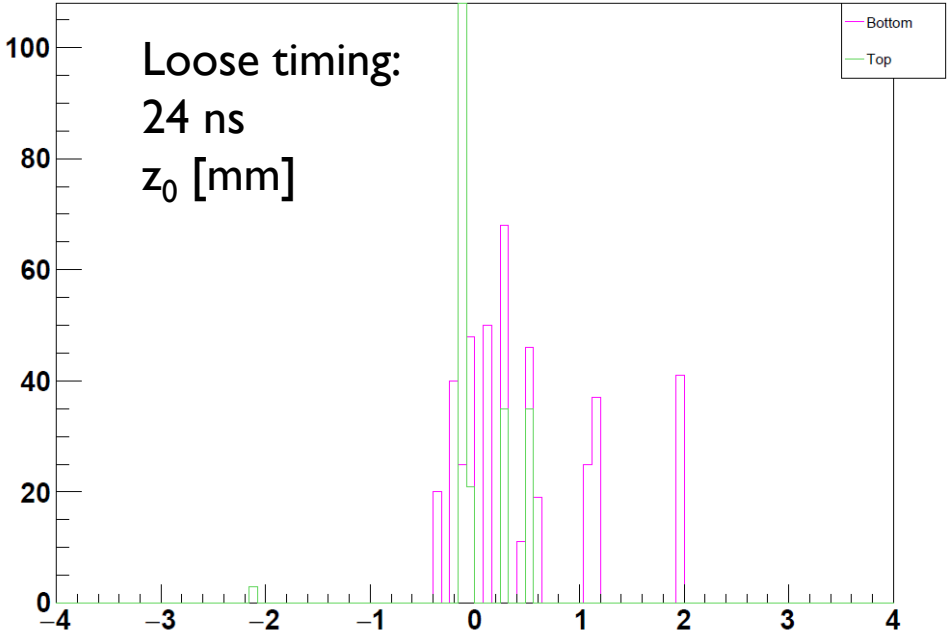


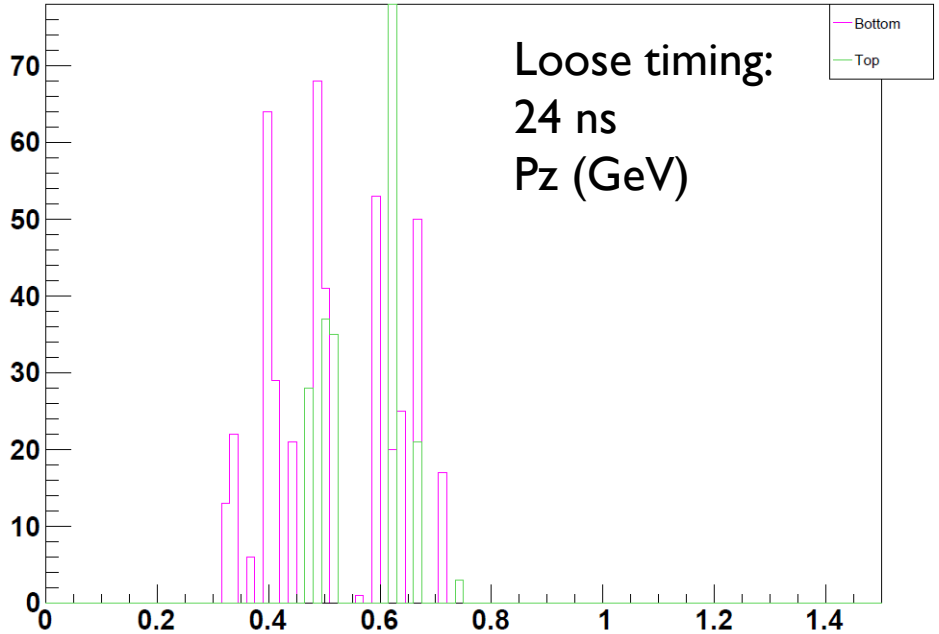


ASYMMETRY: SELECTION A, STAGE 4 + SELECTION B









CONCLUSIONS

- Bump-hunt-like cuts make the asymmetry mostly go away (reduce it to what is seen in MC)
- Loosening timing cuts recovers very few good tracks that match bare clusters (<1%)