Vertex finder & Jet clustering

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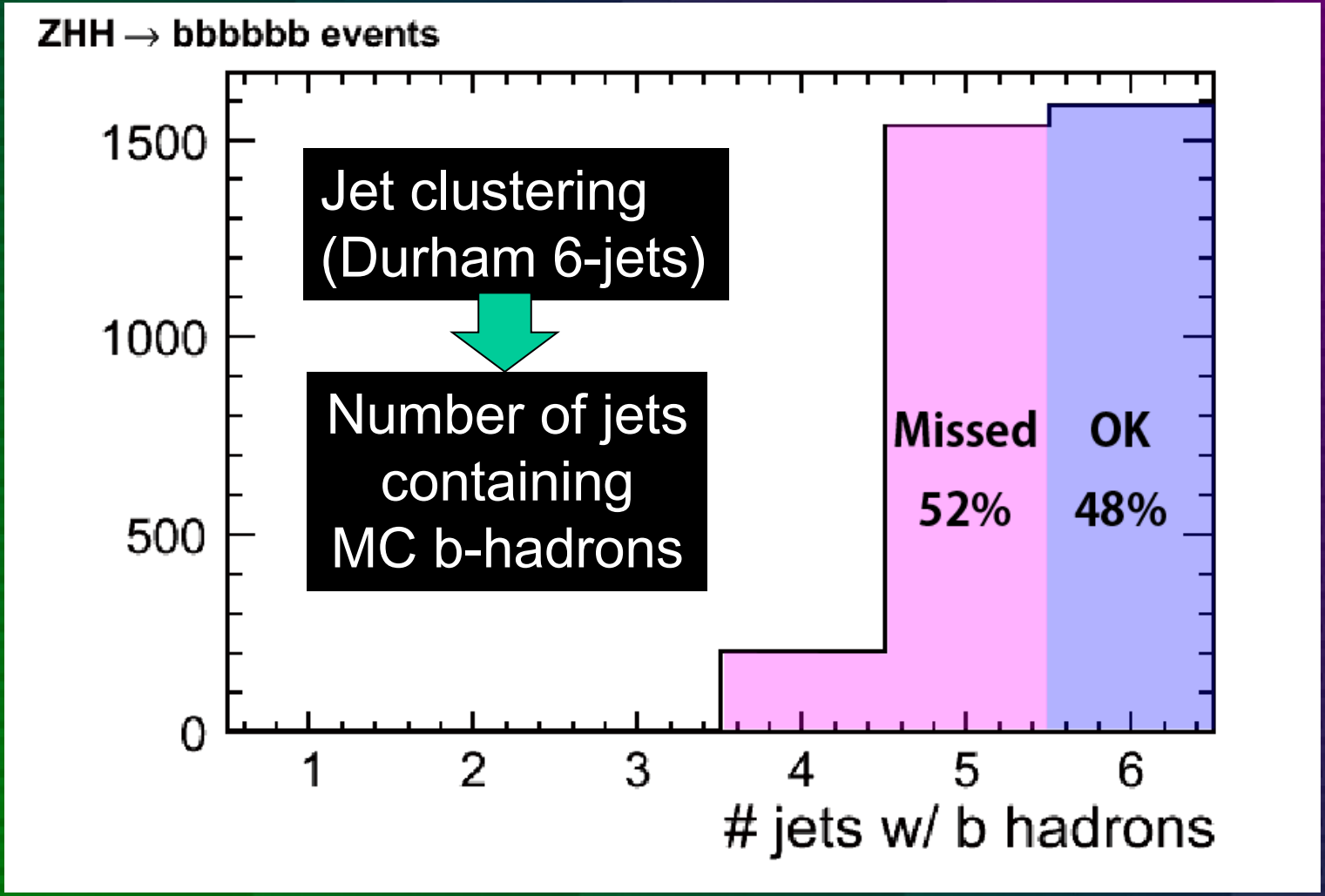
‘# of b jets’ in ZHH



# of b-jets is reduced due to mis-jet-clustering.

Remedy: jet clustering with vtx. info

MC/digitization/tracking/PFA

Reconstructed particles

Vertex finder (w/o jet info) — ZVTOP ? -> Problem!

Reconstructed particles + vertices

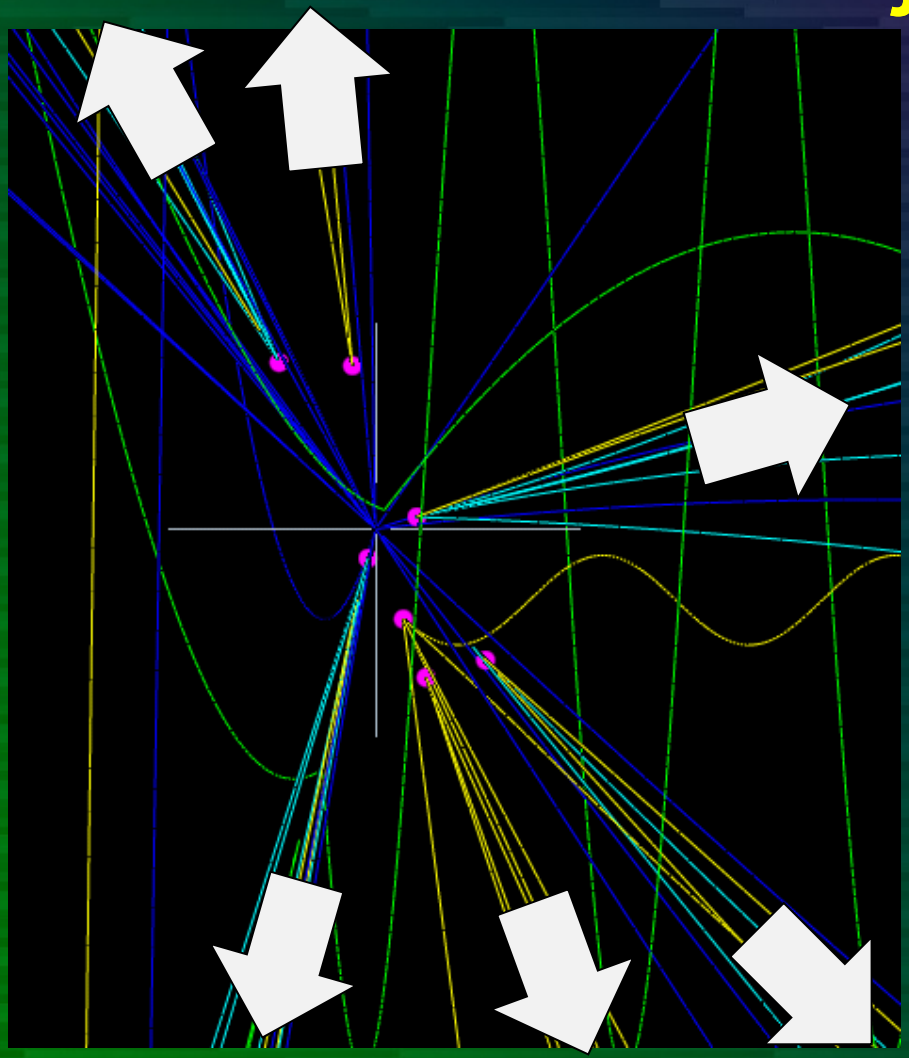
Jet clustering (original) — Using vertex information (How?)

Jets (with tracks/vertices in each jet)

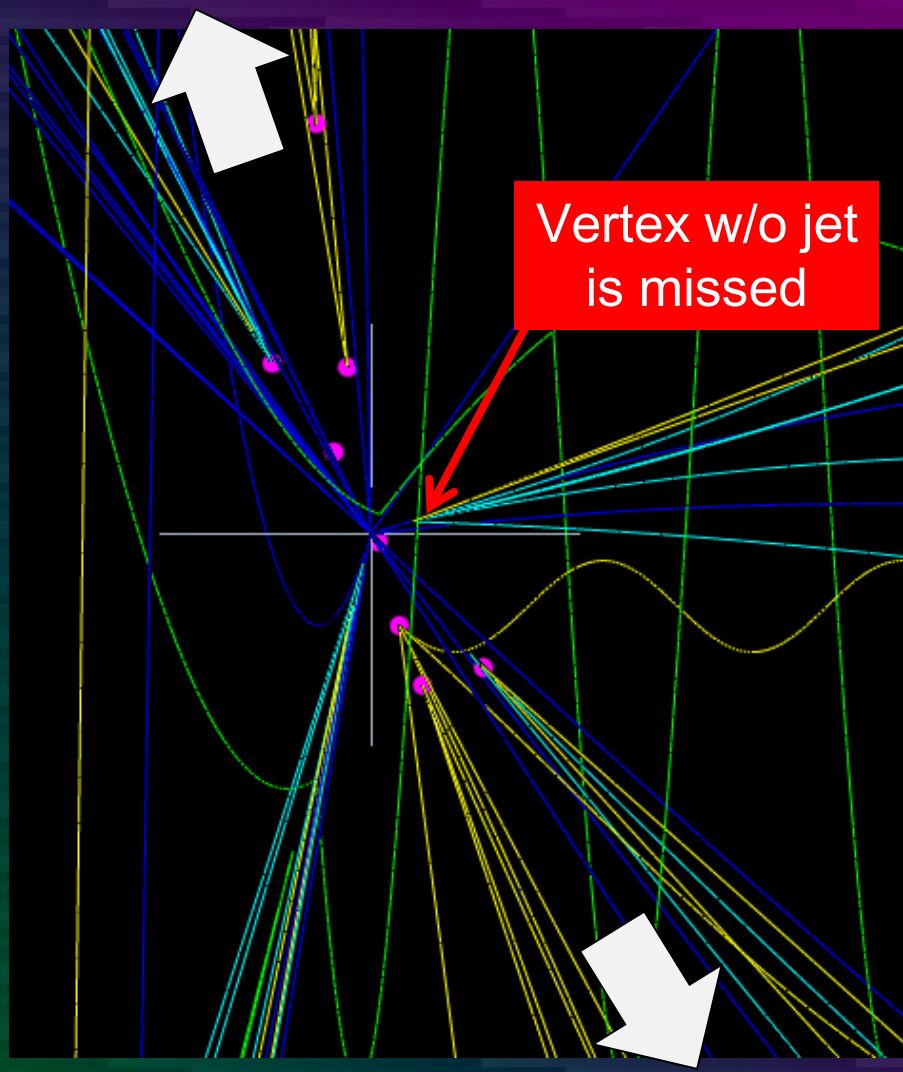
LCFIVertex

- Additional vertex finder?
- Neural-net based b-&c- tagging
- Quark charge identification

ZVTOP and jet direction



6-jet clustering



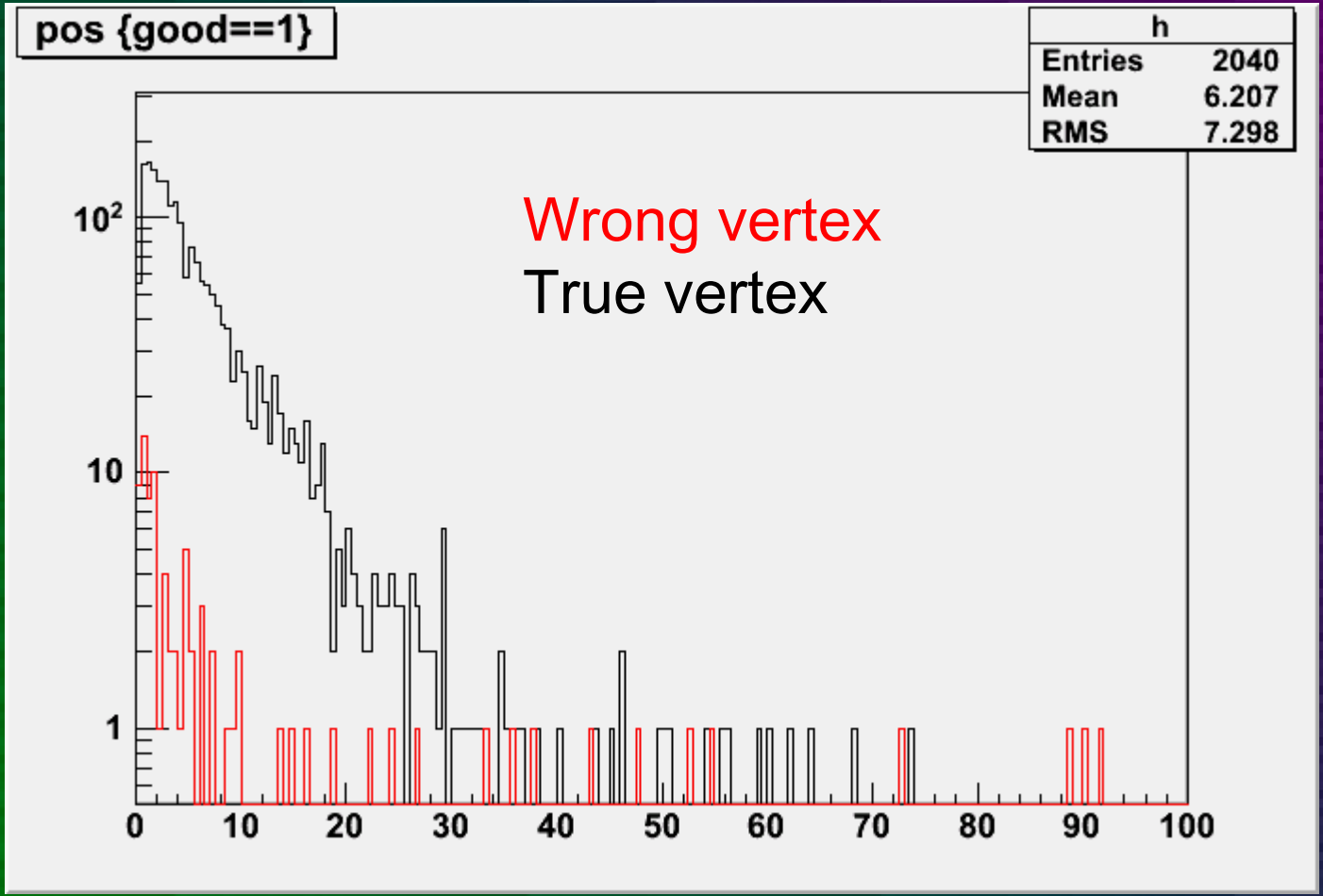
2-jet clustering

Need dedicated (or modified) vertex finder for jet clustering

Buildup vertex finder

- Original
- Procedure
  1. Remove primary tracks (< 5 σ to IP)
  2. Obtain χ^2 for every pair of remained tracks
  3. Selection (mass, direction, χ^2)
     1. Mass < 10 GeV
     2. deltaMass < deltaEnergy
     3. Not opposite direction
     4. Chi2 < 9
     5. Vertex distance from IP: > 0.3 mm
  4. Attach tracks (using same criteria above)
  5. List all remained pair (ordered by #tracks, prob)

347 bbhh->bbbbbb events

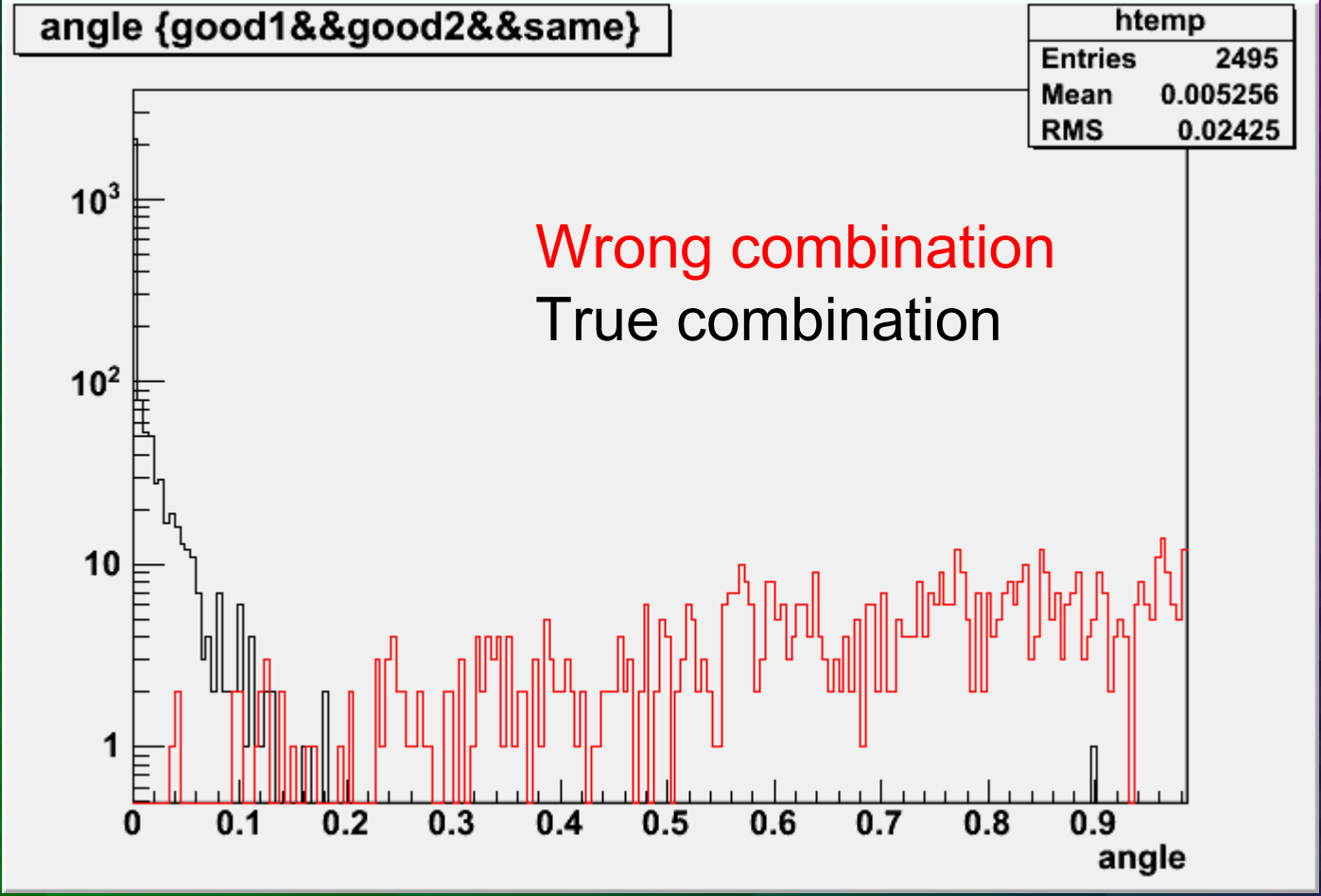


Good = 2040, bad (not from B-semistable) = 90

Selection of vertex

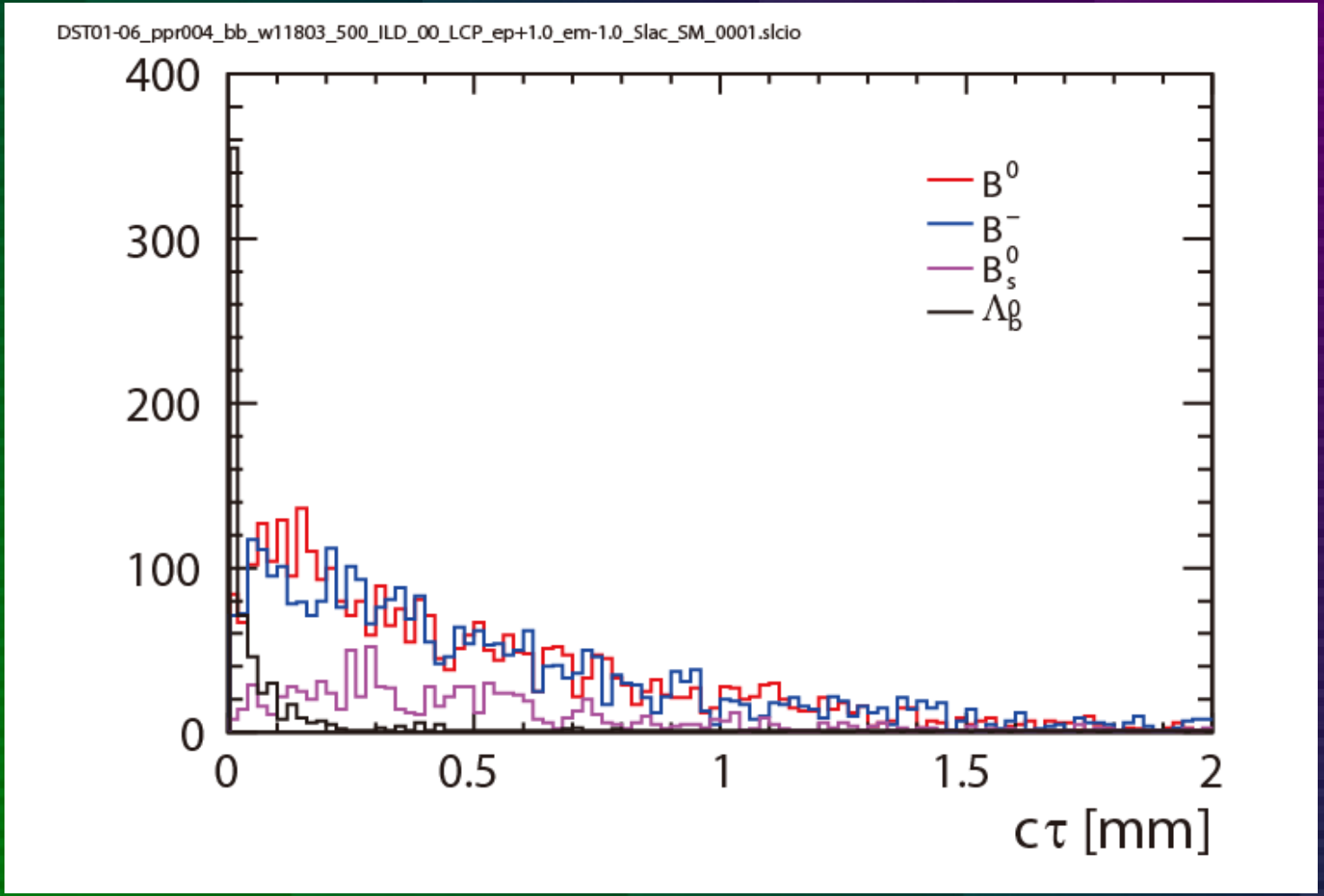
- Mass - Remove 498 +- 10 MeV (to remove K0s)
  - Bad vertices: 90 -> 78
- Pos > 30mm
  - Bad : 62(69%) Good : 1974 (97%)
  - Purity: 97%
- Not efficient in simple cuts – neural net?
  - Probability
  - deltaMass / deltaEnergy
  - Position, Mass (further)

Combining vertices



Well separated – at 0.2 ?

Problem – b baryons



B baryons decay immediately (ctau should be ~400um)

Plan

- Jet clustering using this vertex finder
  - Should be cleverer than last year version
  - Must be finished in next week (I will go to Fukui from 3/1)
- Combining to flavor tagging
- Report in ALCPG if any improvement seen