Subject: Re: Tracking + Truth Match Problem
Posted by Gianluigi Boca on Wed, 02 Jan 2013 21:59:01 GMT
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dear Klaus,
I think I understood the problem. It is not a bug as I initially thought, but rather it is related to tracks going rather forward and therefore releasing only a few hits in the axial STT OUTER layer.
For a reason rather long to explain, such tracks are found twice.
This undesirable feature will be corrected in the new way of doing the track finding that I am working on (a new way of finding the initial clusters to use in the track finding).
If absolutely necessary I could do an ad hoc patch to eliminate the problem, but I would prefer to solve it in the new scheme directly

cheers Gianluigi

Klaus Goetzen wrote on Thu, 22 November 2012 09:24Dear all,

I'd like to report about a problem I found in simulated event concerning tracking and MC truth match.

The first issue is, that I find from time to time track objects, which appear multiple times in the event. I noticed it on the pid-level, but already after the reco level, these objects are present. This might look like this (analysis level; displayed quantities are: track number in event, 4-vector, charge, PID probabilities, MC truth match index)

trk:0 (-1.06059,0.495762,2.45283;2.72148) -1 PID:0,0,1,0,0 MC:8
trk:1 (0.142945,-0.639217,0.900123;1.12193) 1 PID:0,0,1,0,0 MC:4
trk:2 (0.193793,0.341487,1.30556;1.37045) 1 PID:0,0,0,1,0 MC:6
trk:3 (-0.26782,0.799728,2.97571;3.09607) -1 PID:0,0,1,0,0 MC:7
trk:4 (1.00258,-0.368745,5.14993;5.26141) -1 PID:0,0,0,1,0 MC:3
trk:5 (1.00118,-0.368159,5.14244;5.25377) -1 PID:0,0,0,1,0 MC:3

or this

trk:0 (-0.550406,0.169454,0.525641;0.792111) -1 PID:0,0,1,0,0 MC:8
trk:1 (-0.0351313,0.275942,-0.119804;0.333483) -1 PID:0,0,1,0,0 MC:7
trk:2 (0.0599226,0.085189,0.0741163;0.189264) -1 PID:0,0,1,0,0 MC:7
trk:3 (0.0599226,0.085189,0.0741163;0.189264) -1 PID:0,0,1,0,0 MC:7
trk:4 (0.0599226,0.085189,0.0741163;0.189264) -1 PID:0,0,1,0,0 MC:7
trk:5 (0.0599226,0.085189,0.0741163;0.189264) -1 PID:0,0,1,0,0 MC:7
trk:6 (5.92574,0.770891,34.7574;35.2676) 1 PID:0,0,1,0,0 MC:5
trk:7 (-0.078541,-0.0528536,3.60024;3.60419) -1 PID:0,0,0,1,0 MC:3
trk:8 (-0.250432,-0.622125,7.483;7.51429) 1 PID:0,0,1,0,0 MC:4
trk:9 (0.251804,0.0933929,1.55109;1.58035) 1 PID:0,0,0,1,0 MC:6

What one can see is, that in the frist event tracks 4 and 5 are very similar, having also the same MC index 3. This might be due to tracks broken into tracklets, which are treated as different tracks.

On the other hand, in the second event, there are 4 identical track objects (tracks 2-5), which seem to be true clones.

The second issue is, that there are mutiple reco tracks having the same MC truth index. This might be due to the upper issue, where the clones or very similar tracks have the same index. But I also observe events like the following:

trk:0 (0.607878,0.248934,1.06207;1.25657) -1 PID:0,0,1,0,0 MC:8
trk:1 (0.196574,-0.357057,0.765892;0.87875) 1 PID:0,0,1,0,0 MC:4
trk:2 (0.594232,0.99658,2.77834;3.01412) 1 PID:0,0,0,1,0 MC:6
trk:3 (-0.0748785,-0.0292746,0.268576;0.313172) 1 PID:0,0,0,1,0 MC:3
trk:4 (-0.914007,-0.203599,3.14832;3.28759) -1 PID:0,0,0,1,0 MC:3
trk:5 (-0.338518,-1.15738,3.99636;4.17666) 1 PID:0,0,1,0,0 MC:5

Here tracks 3 and 4 have quite different 4-vectors, nevertheless the MC index is the same (3) in both cases.

I tried to investigate the effect of the multiple tracks issue by removing tracks with 4-vectors deviating by less the 10E-5 in each component by hand.

The results of an analysis of 1000 D+ -> K- pi+ pi+ (+ c.c.) events are shown in the two attached plots. The blue histogram shows all combinations, the red one is the full MC truth matched part.

FIG 1: Combinatorics with original track list. A very spiky histogram is the result.

FIG 2: Combinatorics of the same 1000 events with removed double tracks. The shape looks reasonable now. Also note, that the number of combinations is only roughly 25% of those above.

I'd like to ask the (tracking?) experts to take a look to that issue, having a very significant impact on analysis results.

Cheers,
Klaus