Tracks reconstructed with AA and HTF algorithms

A. Rakitin
Lancaster University

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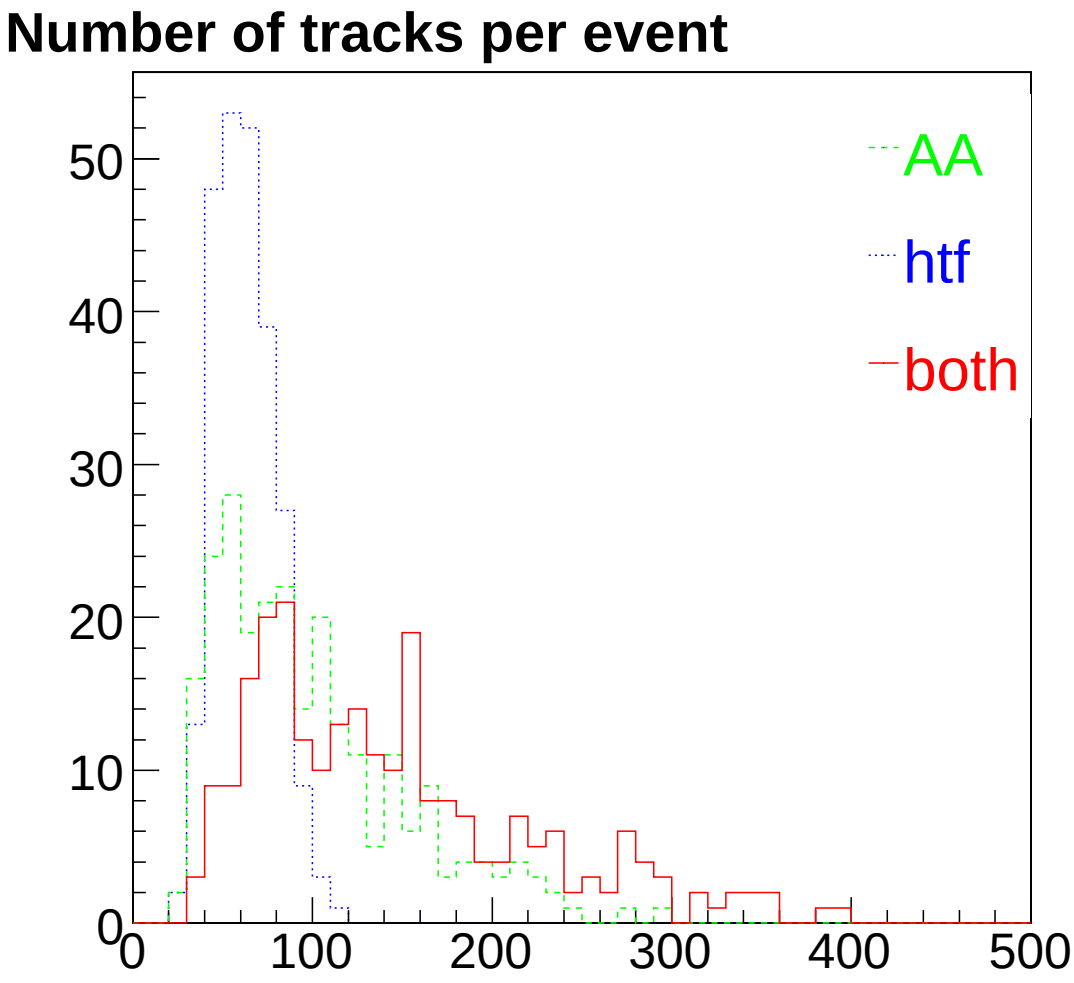
http://www-d0.fnal.gov/~rakitin/d0_private/tex/2007.Aug.09.Tralgo/tr.pdf

Outline

- I used one of Mike Hildreth's high-luminosity MC files
  /prj_root/1403/www_algo/mikeh/qcd_minbias_smtmod/dest/d0reco/
  d0reco_p20.08.02_NumEv-0_poiss15_mcp17_00015_07103224449
  to look at AA and HTF tracks separately
- Created three TMB files (246 events each):
  - Reco'ed with AA only
  - Reco'ed with HTF only
  - Reco'ed with HTF+AA (standard reconstruction)
- Defined short tracks (Ken Bloom's definition, as I took it from Konstantin):
  (numCFTHits>0 && numCFTHits<=10)
  && (eta>-1. && eta<1.)
  && (numSMTHits > 5) // good SMT-measured
  && (misses) // in the last 4 CFT layers
  && (pT > 0.5 && pT < 5.) // well measured, pT>5 are fakes
  && (numAttTracks > 2); // V-tracks are likely to be fakes
- Here numAttTracks is a number of tracks attached to the same vertex

Number of tracks



- AA produces more tracks than HTF

Number of tracks

Algorithm	Short tracks	All tracks with $\|\eta\| < 1$	All tracks
AA	223	9515	24219
HTF	7	5766	15281
Both	221	12958	35313

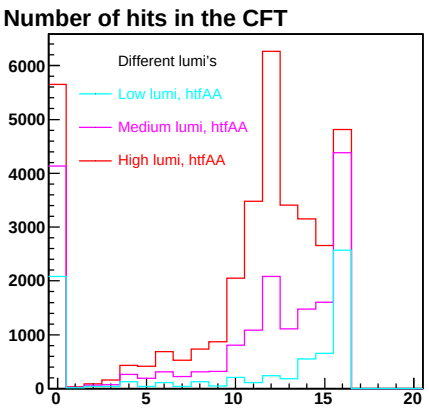
- AA produces a lot more short tracks than HTF

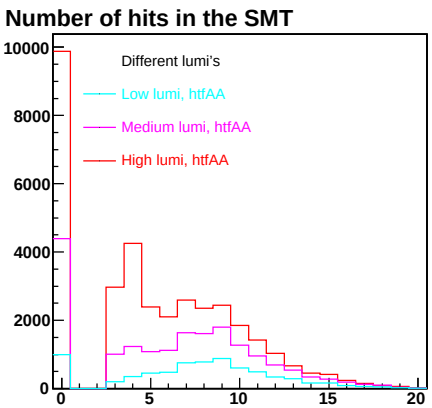
CFT hits:

Info from Mike H.'s tmb fi les:

poiss15, poiss10, poiss5

We see well-known spike at 12...

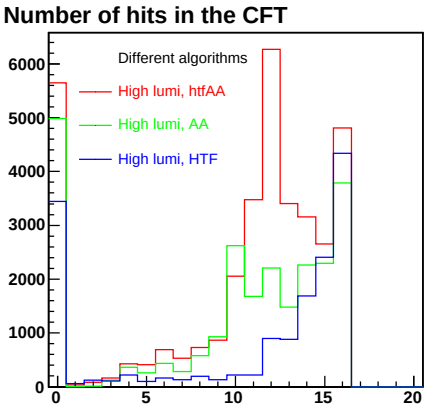


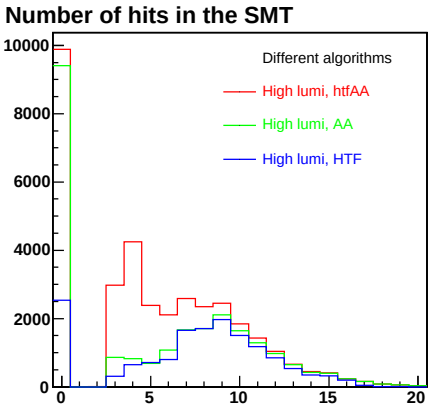


Info from one poiss15 fi le only:

HTF, AA, HTF+AA

There is no spike at 12 for HTF and AA???





There is no answer so far...

Number of tracks:

Look at the number of tracks for fi rst 10 events for AA, HTF and HTF+AA:

Event number	AA	HTF	AA+HTF
1	168	90	267
2	41	55	82
3	45	43	58
4	56	48	62
5	70	71	99
6	88	49	124
7	40	50	72
8	76	54	99
9	73	75	117
10	279	101	383

The last row is a bit troublesome...

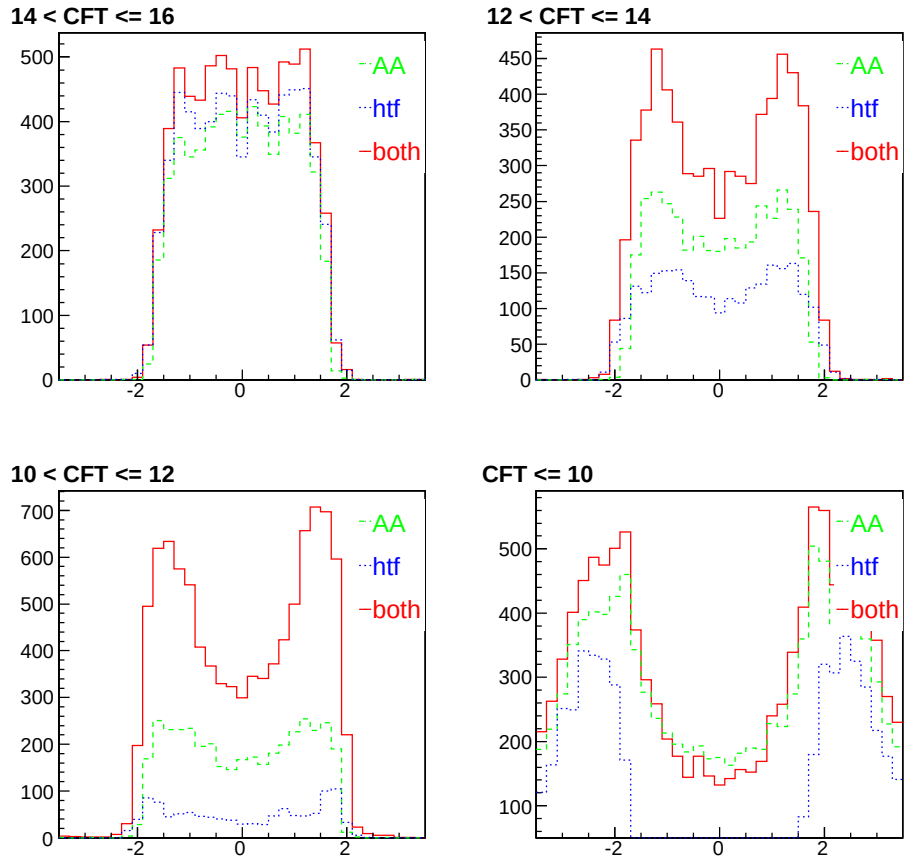
Further investigation:

I divide tracks into categories according to number of CFT hits:

- CFT <= 10
- 10 < CFT <= 12
- 12 < CFT <= 14
- 14 < CFT <= 16

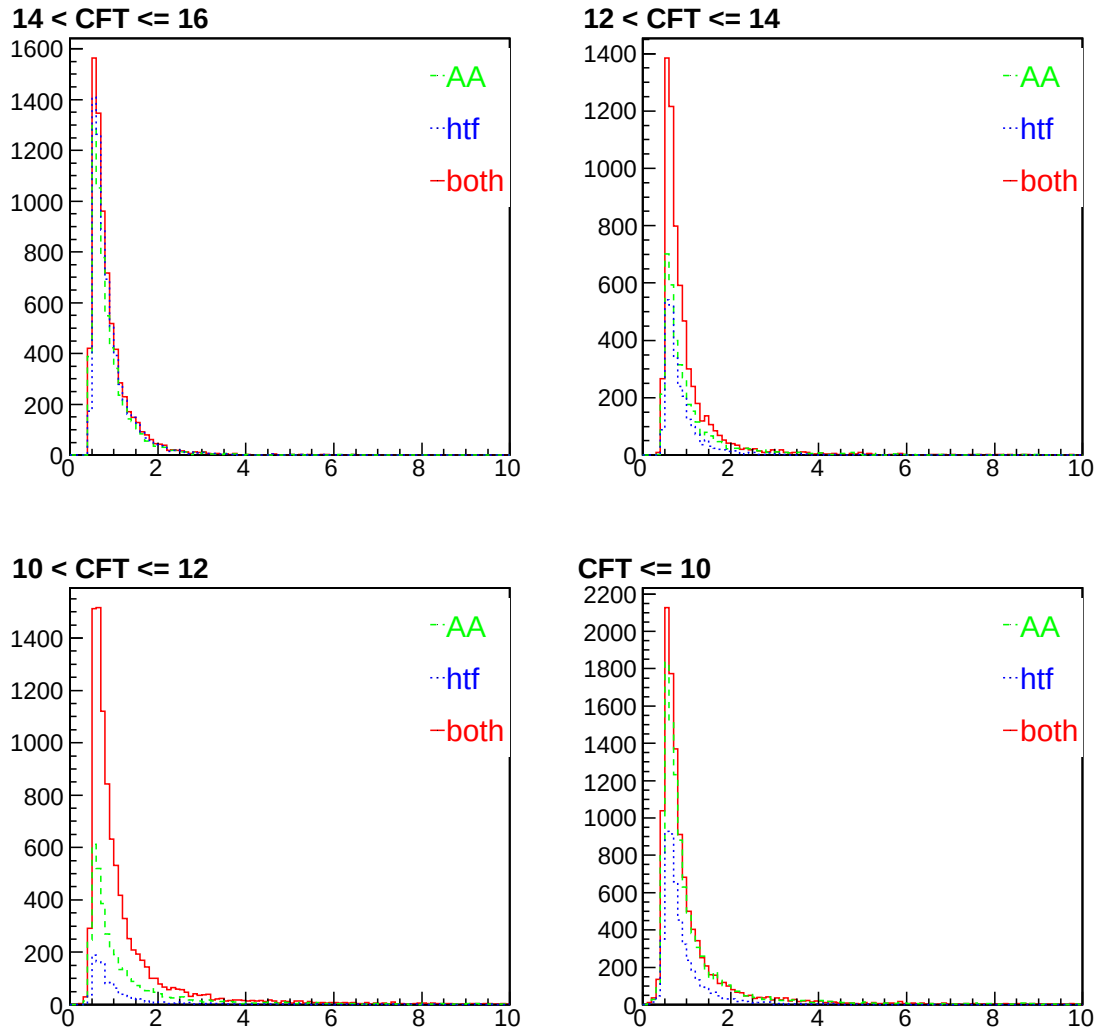
and plot p_t, η and CFT hitmask for these categories

η distribution:



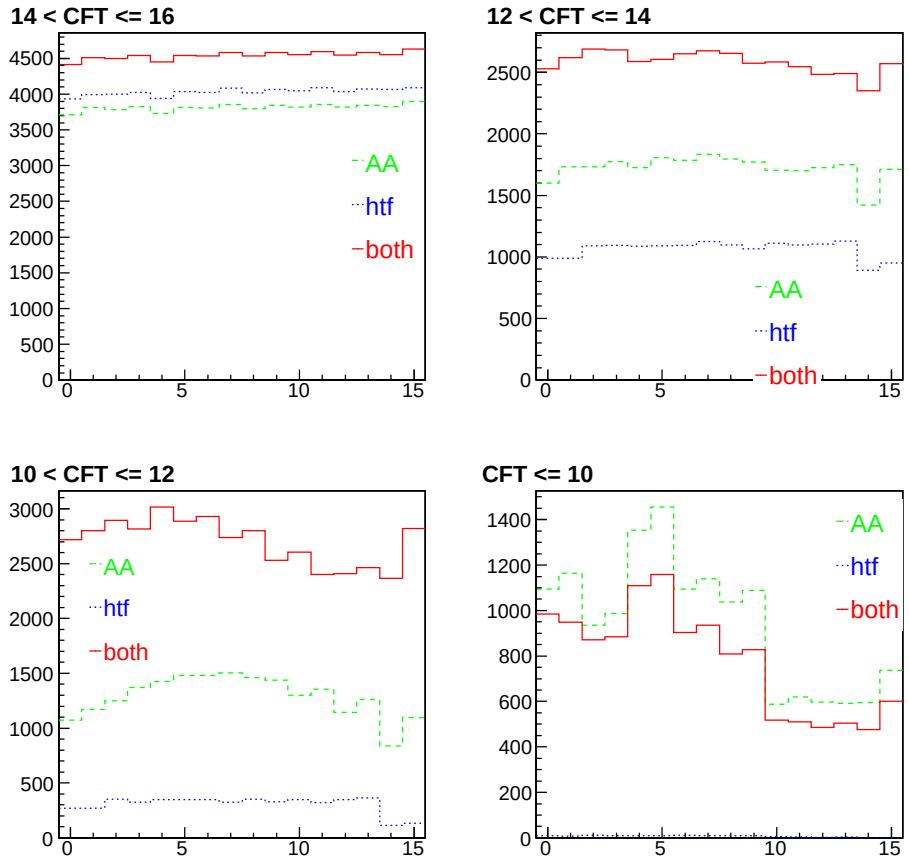
- Tracks with low number of CFT hits (<= 10) tend to be in the forward/backward regions
- AA produces a small amount of such tracks in central region
- HTF produces no such tracks in central region at all

p_t distribution:



- p_t distributions look as expected

CFT hitmask in central region $|\eta| < 1$:



- HTF tends to have misses in the end of the track
- AA tends to have misses more spread around

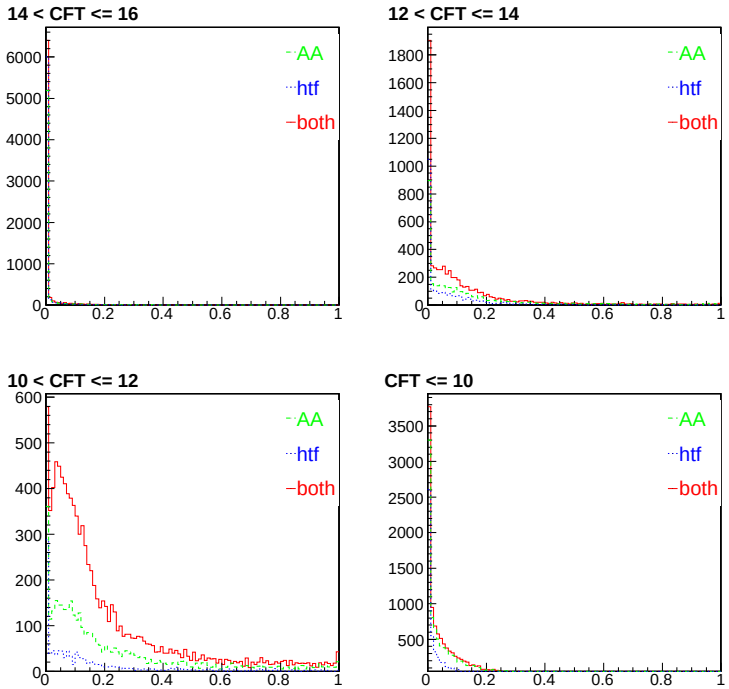
PDG ID for tracks:

I matched ChargedParticles to MCparticles form McKineChunk by looking for a minimum of

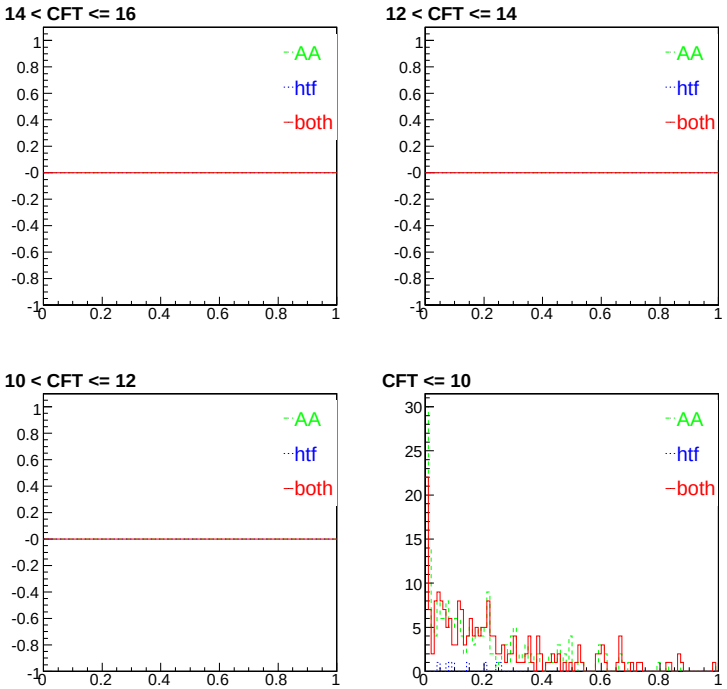
$$\chi^2 = \left(\frac{p_t^{ChP} - p_t^{MC}}{p_t^{ChP}}\right)^2 + (\Delta\phi)^2 + \left(\frac{\eta^{ChP} - \eta^{MC}}{\eta^{ChP}}\right)^2$$

- Every track has a match (may be with bad χ^2)
- I call the tracks with $\chi^2 > 0.5$ non-matched

All tracks



Short tracks



AA				HTF				AA+HTF			
PDG ID	Short	All $\lvert\eta\rvert < 1$	All	PDG ID	Short	All $\lvert\eta\rvert < 1$	All	PDG ID	Short	All $\lvert\eta\rvert < 1$	All
-11	0.5	0.4	0.8	-11	0.0	0.3	0.7	-11	0.0	0.4	0.8
321	2.5	4.4	5.1	22	0.0	2.3	3.2	12	0.5	0.3	0.3
-211	21.6	31.2	30.2	-211	0.0	34.8	34.2	321	3.2	4.4	4.8
-321	2.5	4.2	4.5	211	28.6	34.5	34.3	-211	20.7	30.0	29.4
-2212	3.5	2.3	3.0	-321	0.0	5.3	5.4	211	23.4	28.9	29.7
211	26.6	29.5	30.7	-2212	0.0	2.8	3.5	22	8.5	6.1	7.1
2212	12.6	9.8	7.6	2212	28.6	9.3	6.9	-2212	2.1	2.4	2.9
22	6.5	6.4	6.6	2112	0.0	2.4	1.9	2112	12.8	6.6	5.0
2112	11.6	6.1	4.5	321	0.0	5.7	6.1	111	3.7	2.2	2.6
111	3.5	2.1	2.2	111	42.9	0.9	1.1	-321	2.1	4.1	4.3
130	2.5	1.2	1.5	-3122	0.0	0.0	0.0	2212	12.2	11.0	8.0
11	0.5	0.4	0.7	-13	0.0	0.2	0.2	130	3.2	1.2	1.7
13	1.5	0.3	0.3	11	0.0	0.3	0.6	-3122	0.0	0.0	0.1
-2112	2.0	0.8	1.3	-2112	0.0	0.4	0.6	3122	0.5	0.1	0.2
3122	0.0	0.1	0.2	130	0.0	0.4	0.8	-2112	1.6	1.0	1.4
12	0.5	0.3	0.2	13	0.0	0.2	0.2	-13	2.1	0.3	0.2
3112	0.0	0.1	0.0	12	0.0	0.0	0.1	11	1.1	0.4	0.8
-13	1.5	0.2	0.2	3112	0.0	0.0	0.0	13	2.1	0.3	0.3
-3122	0.0	0.0	0.0	3222	0.0	0.0	0.0	3112	0.0	0.1	0.0
310	0.0	0.0	0.1	310	0.0	0.0	0.0	310	0.0	0.0	0.1
-12	0.0	0.0	0.0	-3312	0.0	0.0	0.0	3222	0.0	0.0	0.0
-14	0.0	0.0	0.0	3122	0.0	0.1	0.1	3212	0.0	0.0	0.0
3212	0.0	0.1	0.0	-12	0.0	0.0	0.0	-12	0.0	0.0	0.0
-3222	0.0	0.0	0.0	-14	0.0	0.0	0.0	-3312	0.0	0.0	0.0
-3112	0.0	0.0	0.0	3212	0.0	0.0	0.0	-3222	0.0	0.0	0.0
3222	0.0	0.0	0.0					-14	0.0	0.0	0.0
14	0.0	0.0	0.0					16	0.0	0.0	0.0
16	0.0	0.0	0.0					-3112	0.0	0.0	0.0

- All/Short tracks from AA/HTF+AA are mostly pions and protons :-(
- All tracks from HTF are mostly pions and protons
- Only 7 Short tracks from HTF - again 4 of them are pions and protons

Conclusion:

- There is no spike at 12 in CFT hit distribution for AA-only and HTF-only algorithms
- AA produces more tracks than HTF
- AA produces a lot more **short** tracks than HTF
- HTF produces no low-CFT (<= 10) tracks in central region
- HTF tracks tend to have misses in the end of the track
- AA tracks tend to have misses more spread around
- Short tracks (from AA) are mostly pions and protons