Fake-tracks investigation continued

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http://www-d0.fnal.gov/~rakitin/d0_private/tex/2007.Nov.15.Tralgo/tr.pdf

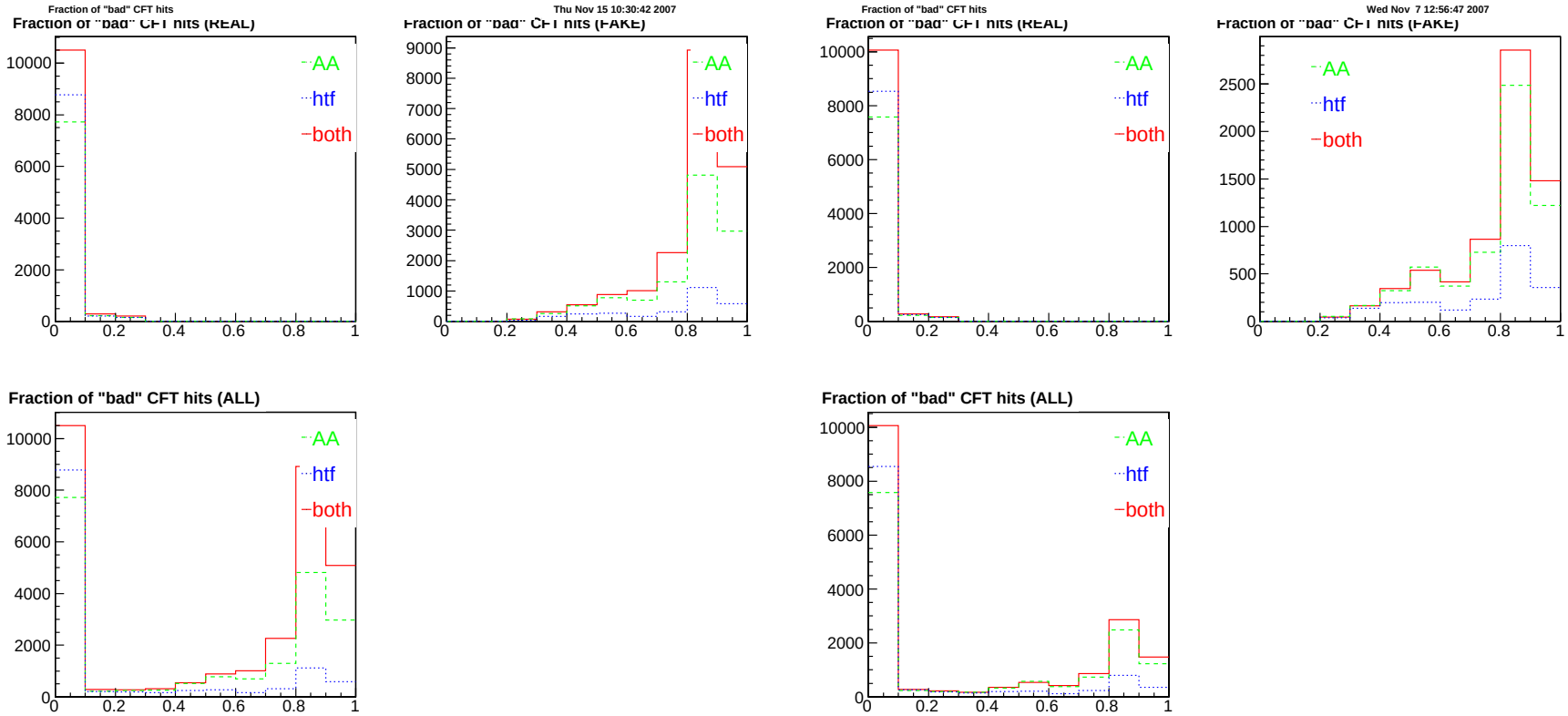
Disclaimer

- This talk is a comparison of my results from two months ago to new ones, obtained by Guennadi
- Guennadi applies better treatment to CFT misses
- Previously 2 CFT misses were allowed, now only one...

Outline

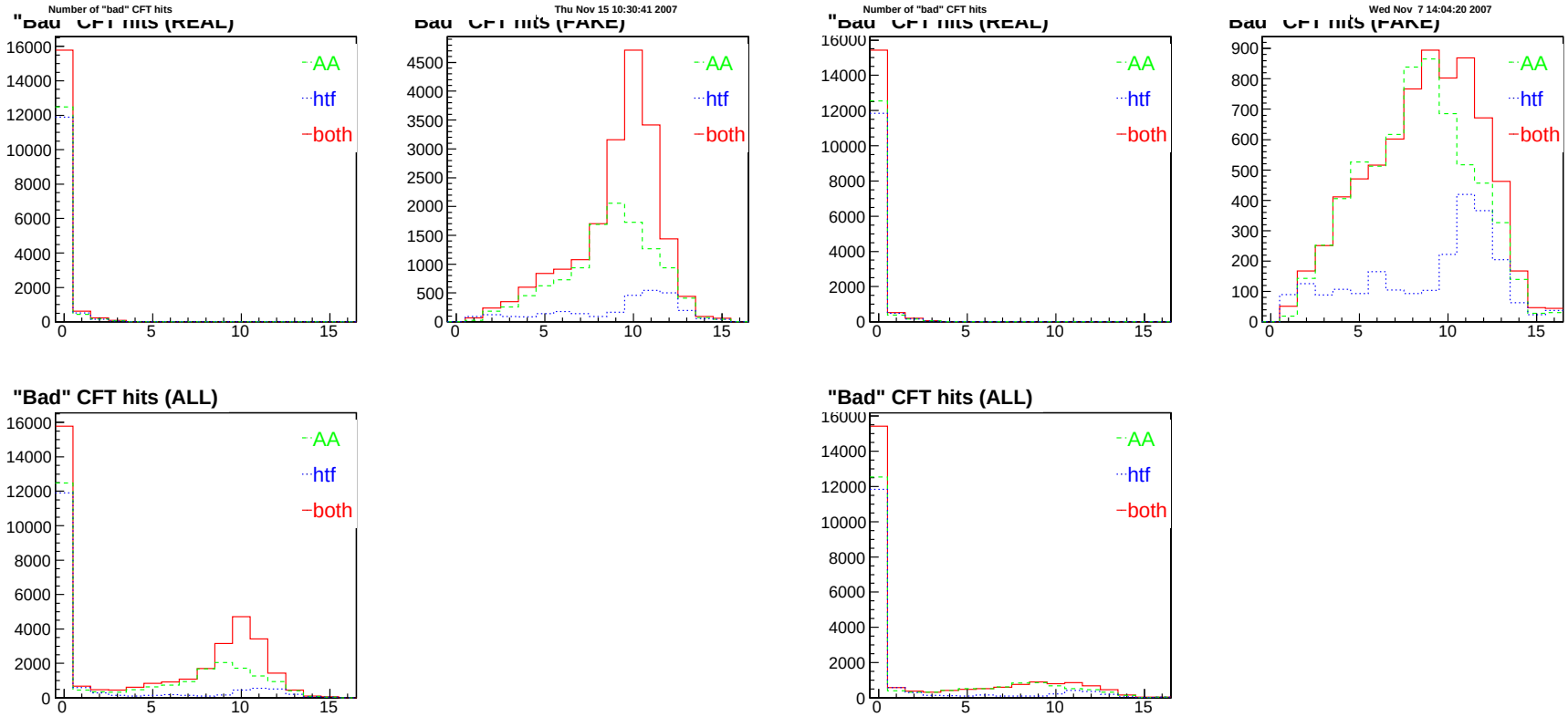
- We used one of Mike Hildreth's high-luminosity MC files
  /prj_root/1403/www_algo/mikeh/qcd_minbias_smtmod/dest/d0reco/
  d0reco_p20.08.02_NumEv-0_poiss15_mcp17_00015_07103224449
  to look at AA and HTF tracks separately
- Created three TMB files (250 events each):
  - Reco'ed with AA only
  - Reco'ed with HTF only
  - Reco'ed with HTF+AA (standard reconstruction)
- For each track looked at MC information for SMT and CFT hits
- Determined MC particle which made the track as the particle which left the majority of hits
- Identified "bad" hits coming from other particles (of from nowhere)
- Called tracks with $> 25\%$ bad CFT hits - "fake"
- Bad SMT hits do not participate in this definition
- All the other tracks are real
- Tracks with zero denominator (i.e. numCFThits==0, i.e. SMT-only tracks) are real too
- Plotted a few distributions for fake/real tracks reco'ed with AA/HTF

Fraction of “bad” CFT hits



- In this plot we see a problem - many tracks with high fraction of “bad” CFT hits
- Both AA and HTF create such tracks
- Based on this plot we cut at > 25% “bad” CFT hits to distinguish real and fake tracks
- The threshold seems to be the same for AA, HTF and their combination

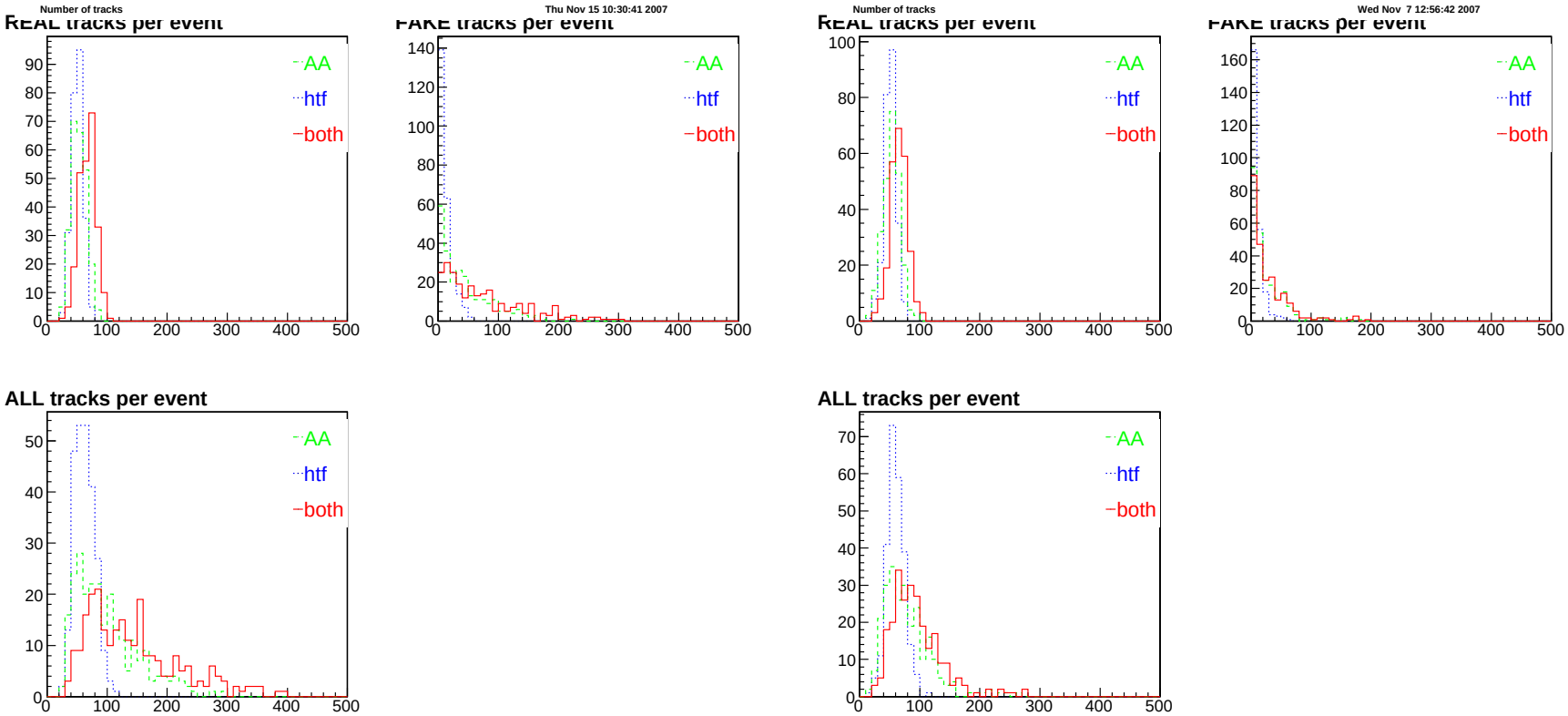
Number of “bad” CFT hits



- The cut on *fraction* of “bad” CFT hits separates tracks with high *number* of “bad” CFT hits quite well

Number of tracks

- Using this defi nition of fake/real tracks plot the number of tracks per event



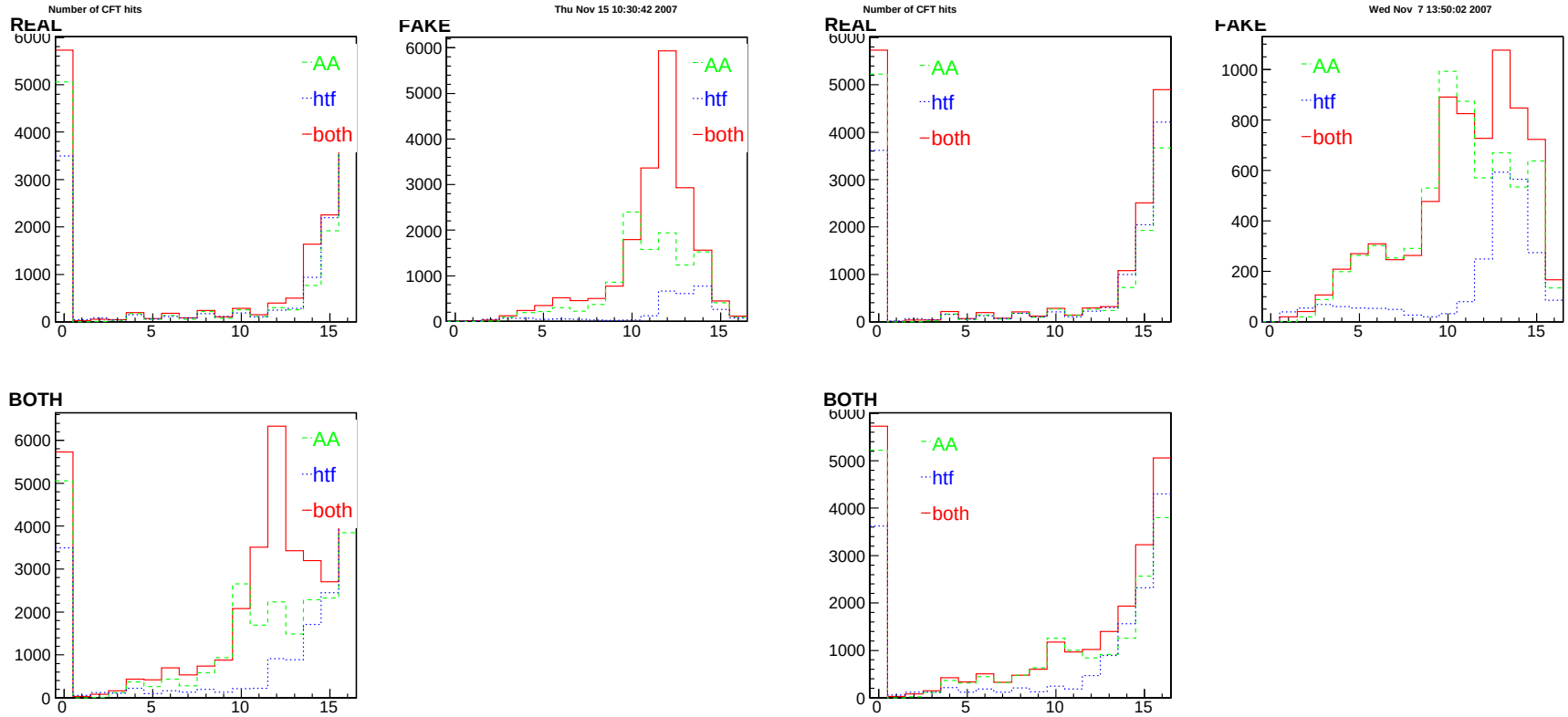
- AA produces more tracks than HTF
- AA produces more fake tracks than HTF

Number of tracks

Algorithm	Real tracks	Fake tracks	All tracks	Real tracks ($\|\eta\| < 1$)	Fake tracks ($\|\eta\| < 1$)	All tracks ($\|\eta\| < 1$)
New results						
AA	13179	6362	19541	4449	2821	7270
HTF	12565	2306	14871	4633	895	5528
AA+HTF	16237	7196	23433	5755	3199	8954
Old results						
AA	13158	11432	24590	4557	5237	9794
HTF	12622	2921	15543	4762	1144	5906
AA+HTF	16717	19129	35846	6013	7462	13475

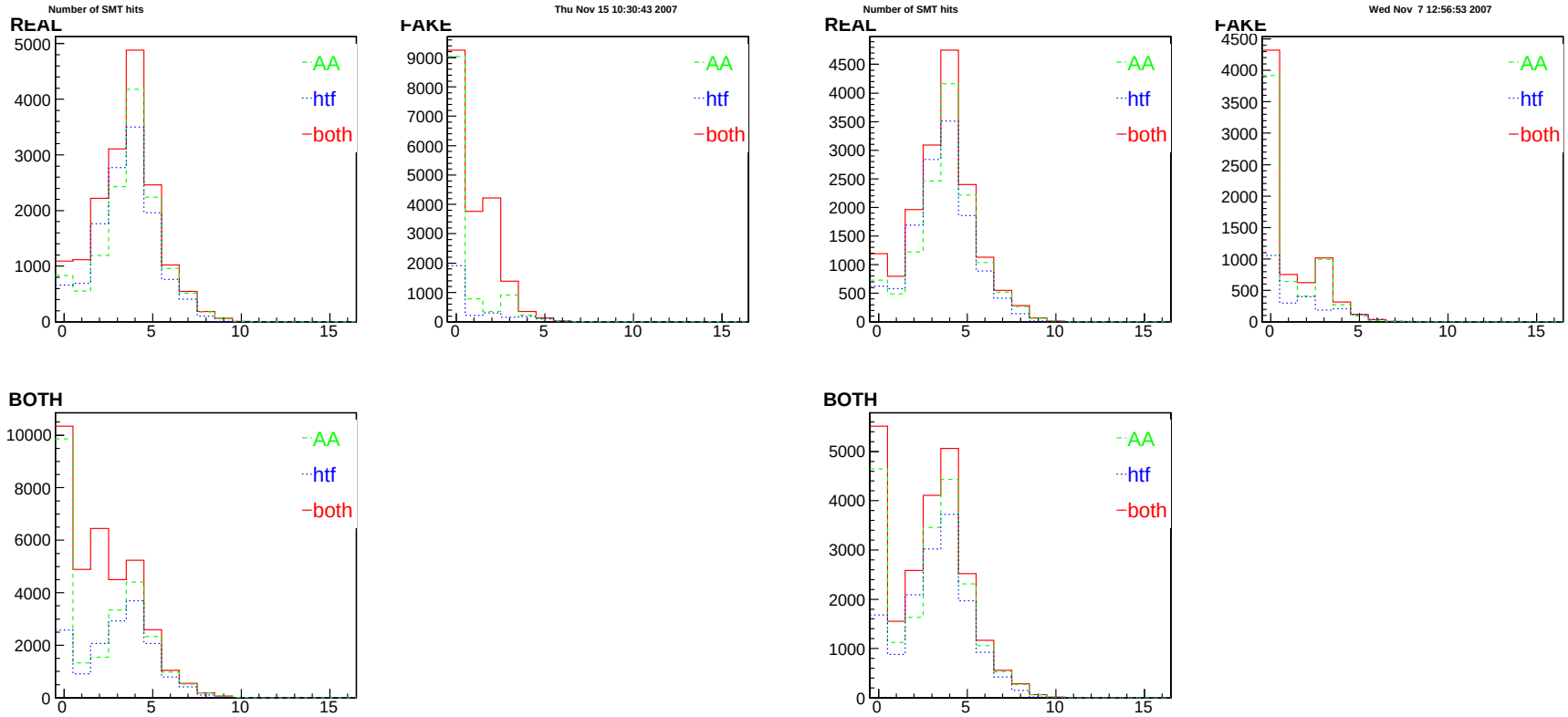
- Number of fake tracks produced by AA+HTF is higher than number of fake tracks produced by AA and HTF separately
- The percentage of fake tracks was very high – 53% (AA-only – 46%, HTF-only – 19%)
- Now the percentage dropped to 31% (AA-only – 33%, HTF-only – 16%)
- The number of fakes produced by AA dropped by 45%
- The number of fakes produced by HTF dropped by 20%
- The number of fakes produced by HTF+AA dropped by 60%

CFT hits:



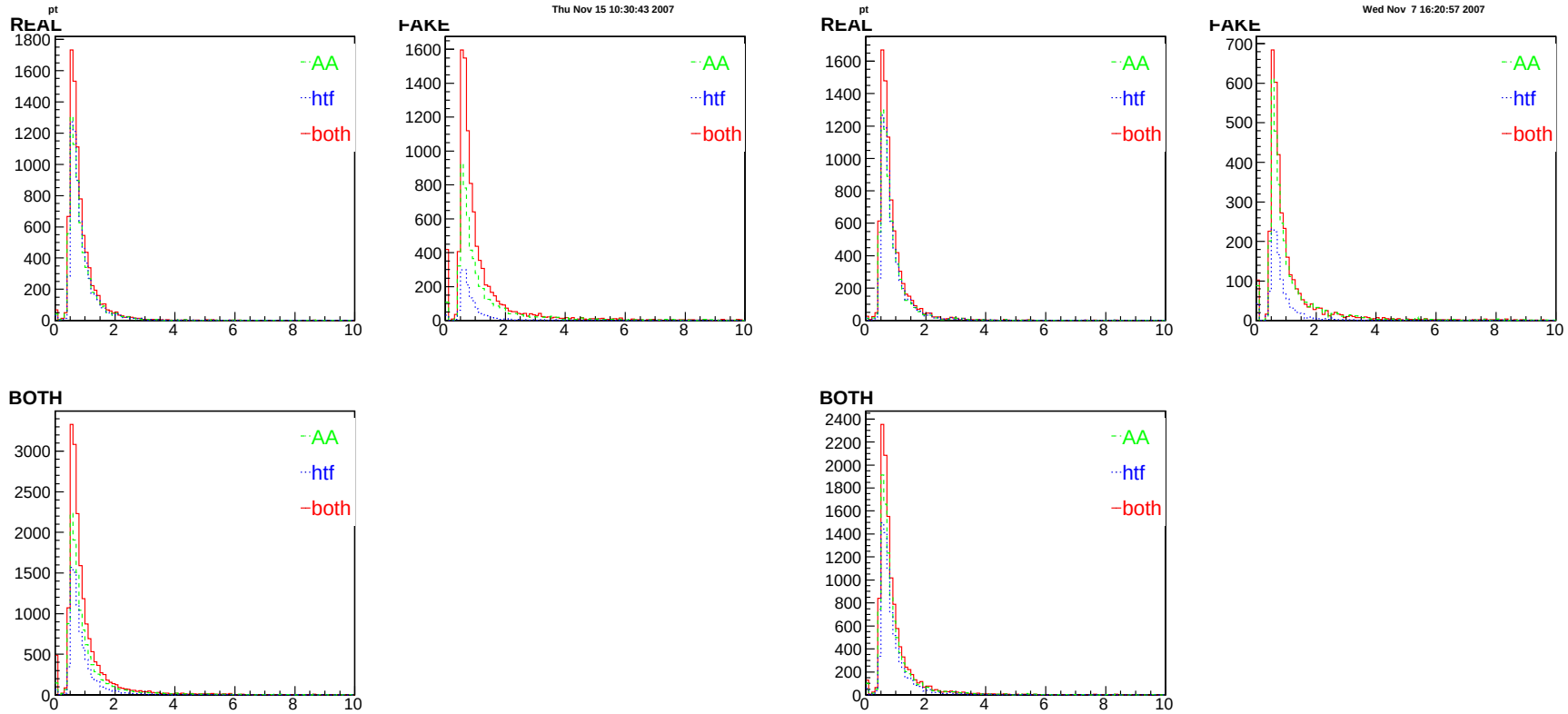
- Well-known spike at 12 disappeared

SMT hits:



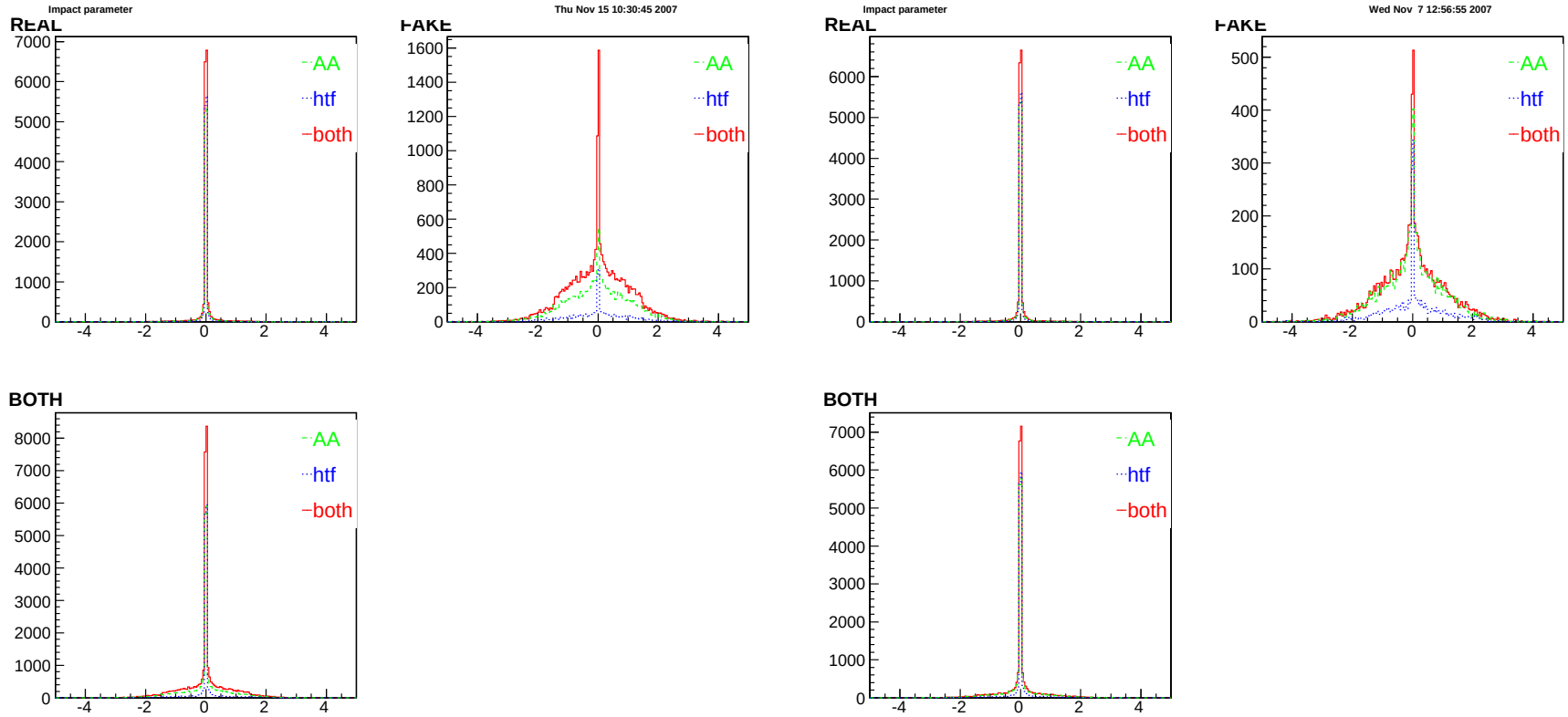
- Fake tracks have < 3 SMT hits (i.e. mostly CFT-only)

p_t distribution:



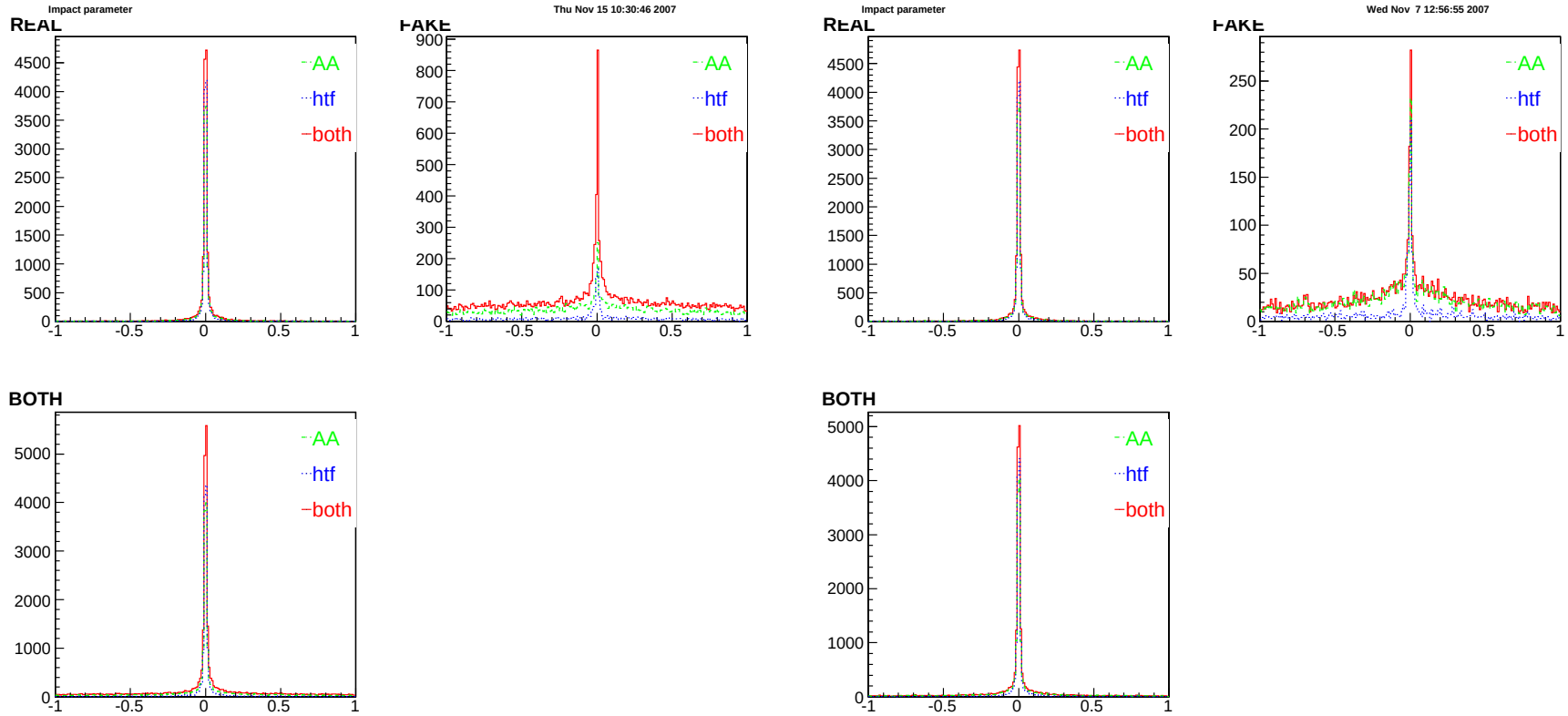
- Fakes have higher p_t

Impact parameter distribution:



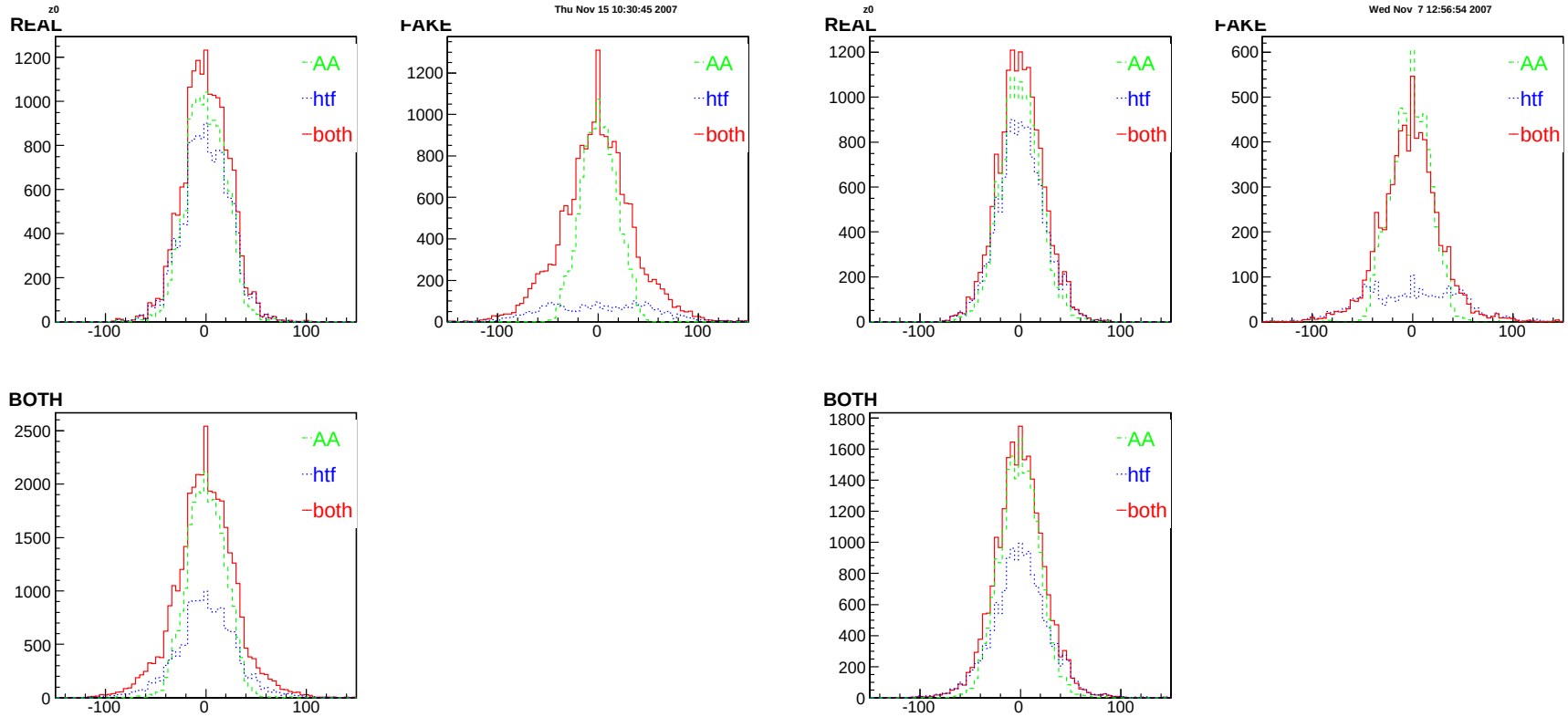
- Fakes have much broader impact parameter (d_0) distribution
- So, one can separate fake and real tracks by imposing corresponding cut

Impact parameter distribution:



- Same plots zoomed in
- Let's make a cut on impact parameter d_0 e.g $|d_0| < 0.1$ (not really optimized)

z_0 distribution:



- Fakes have much broader z_0 distribution because of HTF part

Conclusion:

Observed facts:

- We defi ne “fake” tracks as tracks having > 25% bad CFT hits
- Bad SMT hits do not participate in this defi nition
- There was 53% of such tracks
- Now this number dropped to 31%
- Number of fake tracks dropped by 60% (45% for AA-only, 20% for HTF-only)
- Well-known spike at 12 CFT hits disappeared