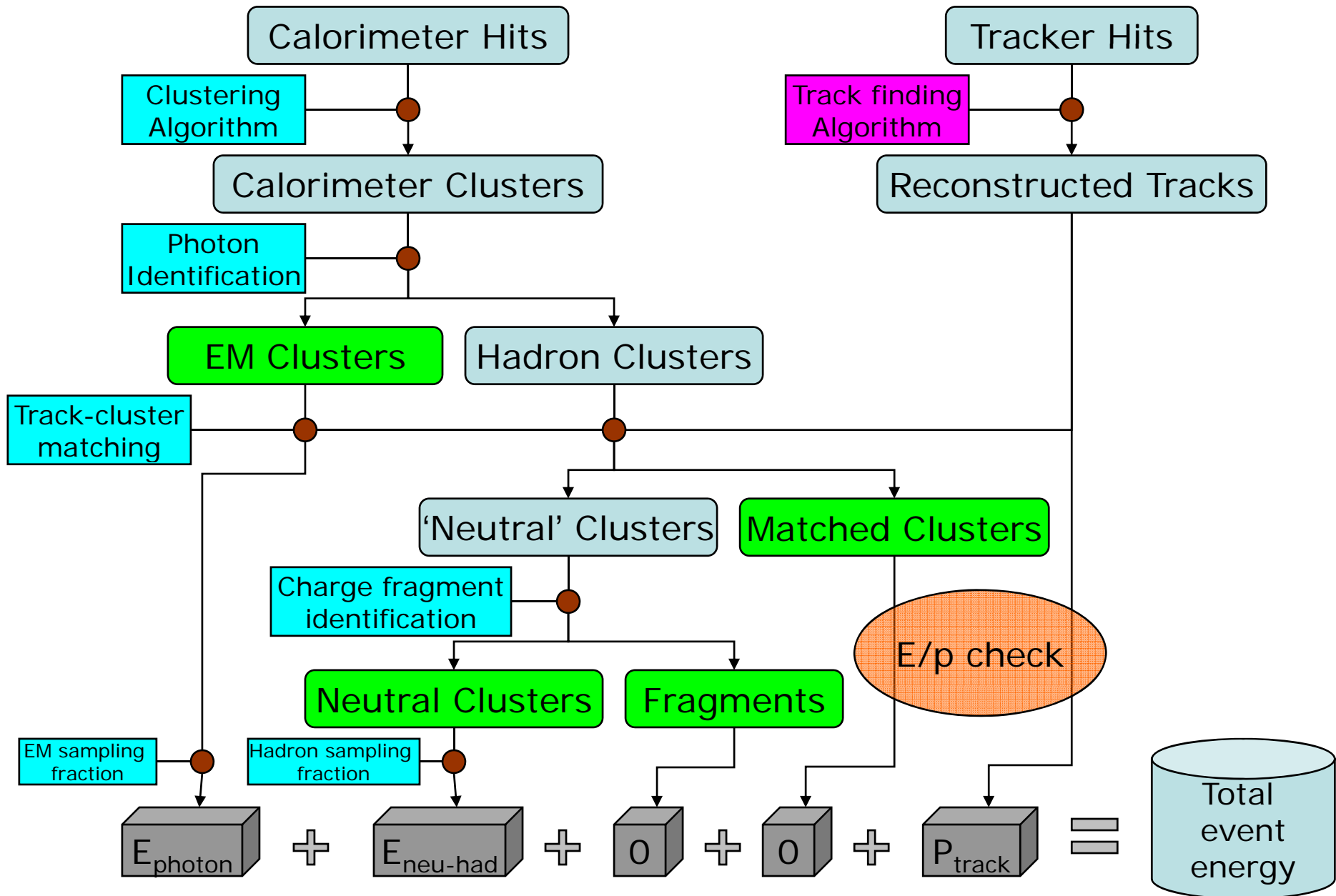


# PFA update

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# PFA outline



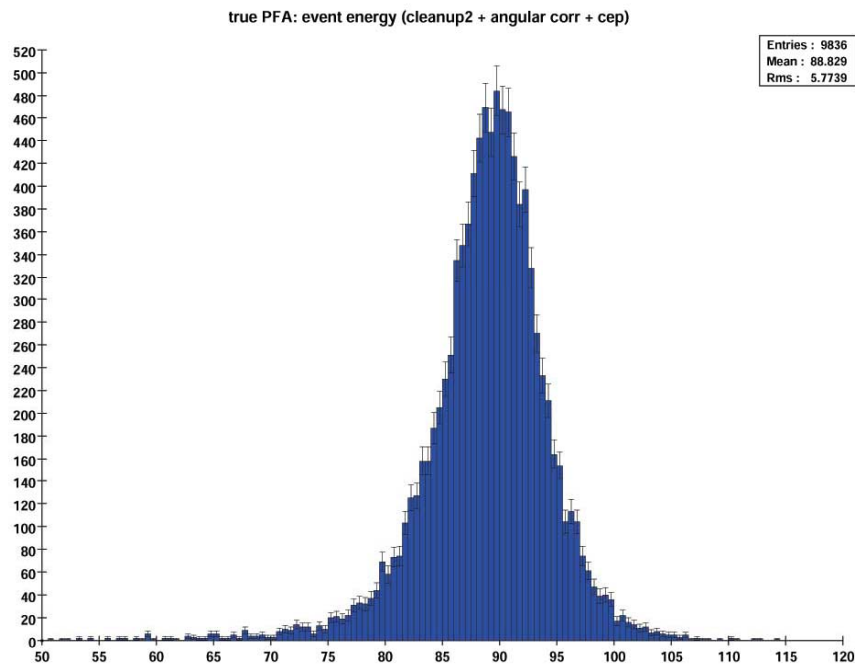
## Work of the last several month: improving PFA at Z-pole

- Since last SiD workshop (10.2006, SLAC), have done the following:
  - Tuned clustering algorithm
    - ECal density threshold: 0.01
    - HCal density threshold: 0.01
    - Improved PFA result
  - Tuned h-matrix cut, and studied track-cluster matching strategy for 'photon' clusters
    - No change in PFA result
  - Used a tighter 'track' selection from MC charged particles
    - No change in PFA result
  - Tuned E/p correction threshold
    - Correct grouping of matched track(s) and cluster(s)
    - Use calorimeter energy, if  $> 2.5\sigma$  in excess of cluster energy observed, comparing to matched track momenta
    - Improved PFA result
- Results reported at SiD calorimeter meeting (11/30/2006)

# Work of the last several month: improving PFA at Z-pole

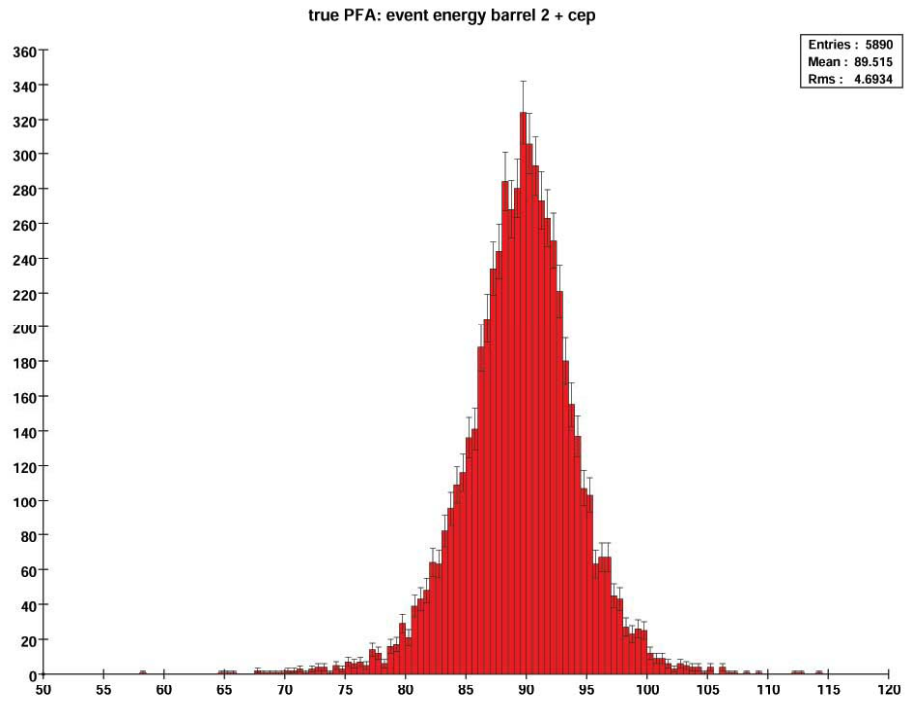
- Recent changes
  - Changed track extrapolation package
    - Helixswim (deprecated in org.lcsim) → Helixswimmer
    - Same PFA result obtained with Helixswimmer
  - Implemented a simple mechanism to include an average energy lost in track extrapolation, within tracking volume and calorimeter volume
    - No effect on PFA
  - Tuned track extrapolation parameters
    - Sample point density
    - Track extrapolation length as a function of track momentum
    - No change in PFA result
  - Tuned fragment identification cuts
    - Small improvement on PFA
  - Improved E/p correction
    - Removed cluster energy requirement (since it doesn't really do anything)
    - Tuned track momentum requirement
    - Changed threshold (4 GeV, was 2.5 sigma)
    - Some improvement on PFA

# Current PFA performance at Z-pole: sidaug05\_np



All events, no cut

Mean 88.83 GeV  
RMS 5.774 GeV  
RMS90 3.638 GeV  
[38.5 %/sqrt(E)]



Barrel events ( $\cos(\theta_{[Q]}) < 1/\sqrt{2}$ )

Mean 89.52 GeV  
RMS 4.693 GeV  
RMS90 3.320 GeV  
[35.1 %/sqrt(E)]

# Progress on PFA at Z-pole

Barrel events

All events

- ALCPG Vancouver workshop (7/2006)

46. %/sqrt(E)

49. %/sqrt(E)

- Last SiD workshop (10/2006, SLAC)

38.2 %/sqrt(E)

41.6 %/sqrt(E)

- SiD calorimeter meeting (11/2006)

35.9 %/sqrt(E)

39.1 %/sqrt(E)

- This workshop (4/2007, Fermilab)

35.1 %/sqrt(E)

38.5 %/sqrt(E)

- 
- Compare to

- LDC (PendraPFA)

30. %/sqrt(E)

- GLD

29.8 %/sqrt(E)

# Using Z-pole tuned PFA at higher energies

## Barrel events

200 GeV

350-360 GeV

500 GeV

- SiD calorimeter meeting (10/2006)

132. %/sqrt(E)

201. %/sqrt(E)

- Last SiD workshop (10/2006, SLAC)

77. %/sqrt(E)

140. %/sqrt(E)

- SiD calorimeter meeting (11/2006)

66.7 %/sqrt(E)

127. %/sqrt(E)

- This workshop (4/2007, Fermilab)

? %/sqrt(E)

? %/sqrt(E)

- 
- Compare to

- LDC (PendorPFA)

37. %/sqrt(E)

57. %/sqrt(E)

75. %/sqrt(E)

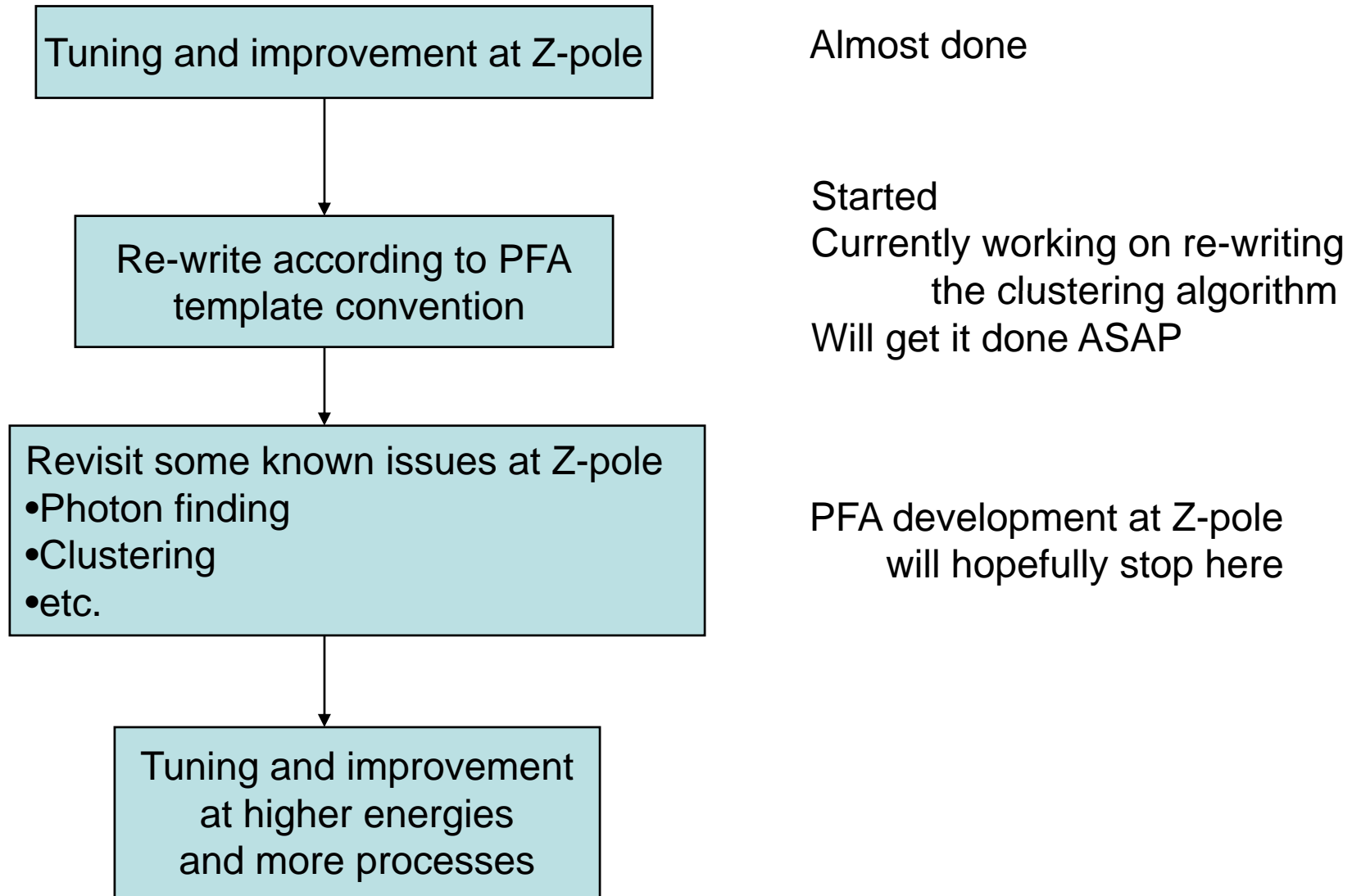
- GLD

~45 %/sqrt(E)

~68 %/sqrt(E)

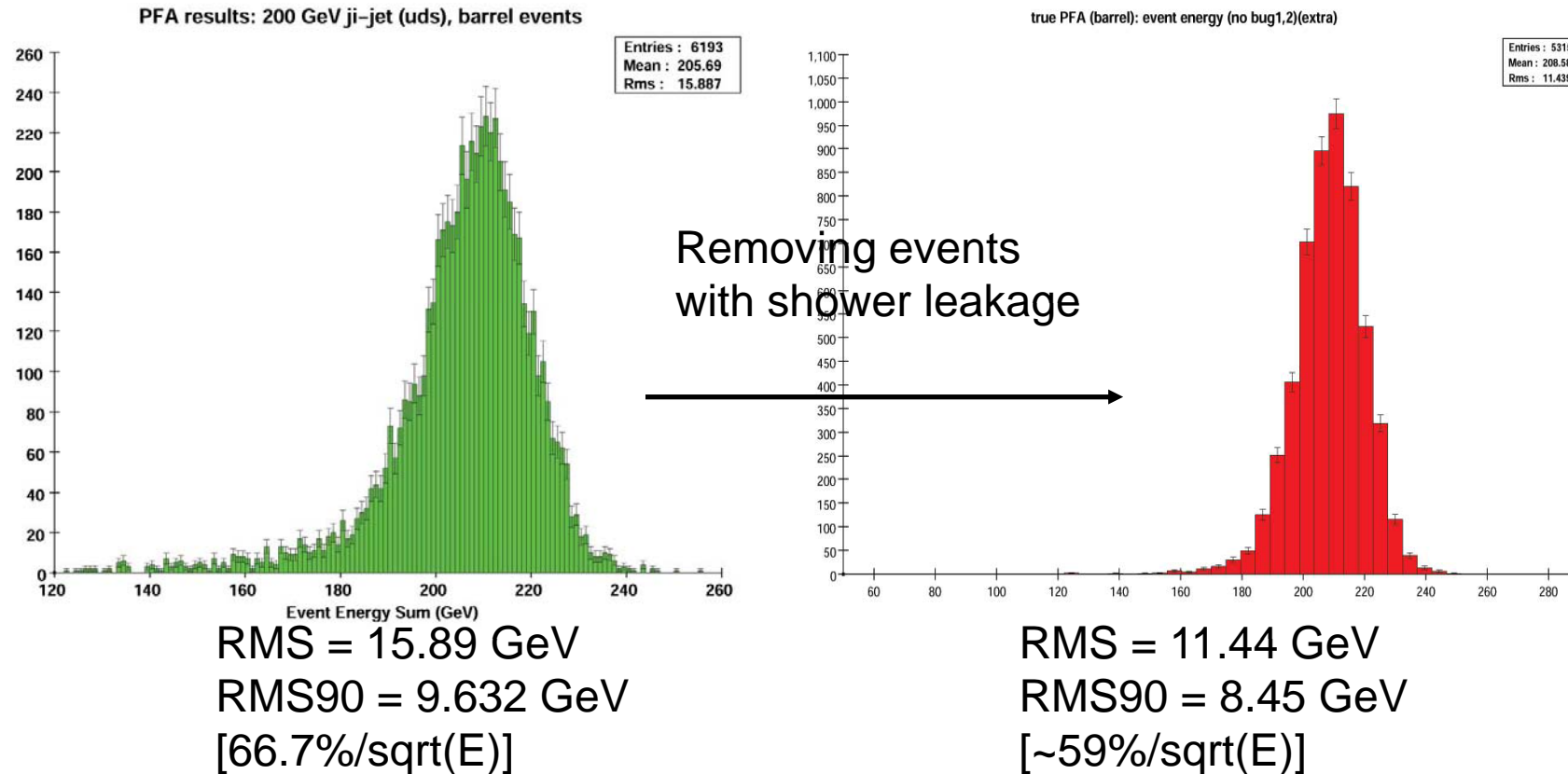
~85 %/sqrt(E)

# Plan

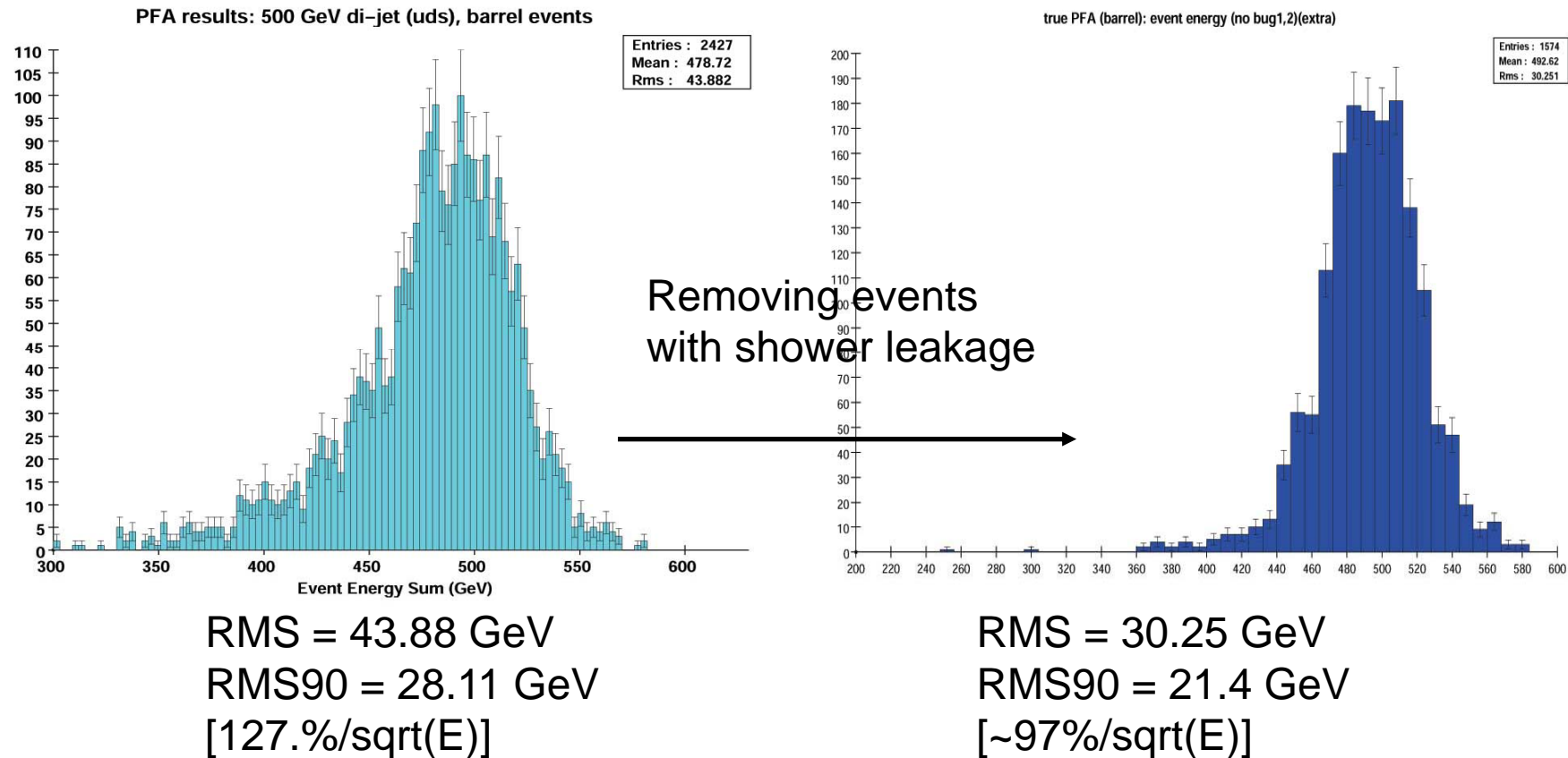




# Shower leakage: di-jet at 200 GeV



# Shower leakage: di-jet at 500 GeV



- Shower leakage affect PFA performance at high energy
- Events with heavy shower leakage could be identified by hits in the muon detectors
- Use hits in the muon detectors to estimate shower leakage?

# Summary

- Some progress on PFA performance
  - Started re-writing my PFA according to template convention
  - Some algorithms will be revisited after the re-writing – PFA at Z-pole will be done by that time (hopefully with good performance)
  - Will try to improve PFA performance at higher energy after Z-pole is done
- 
- Shower leakage could be a problem at high energy