

# PFA studies

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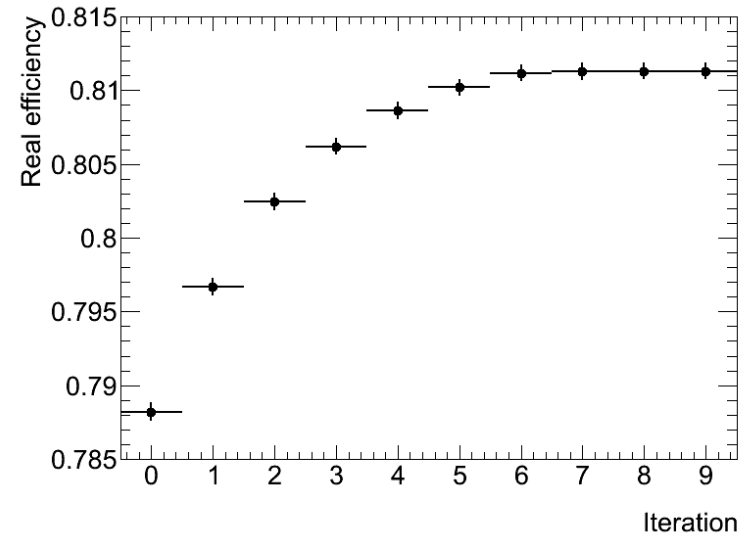
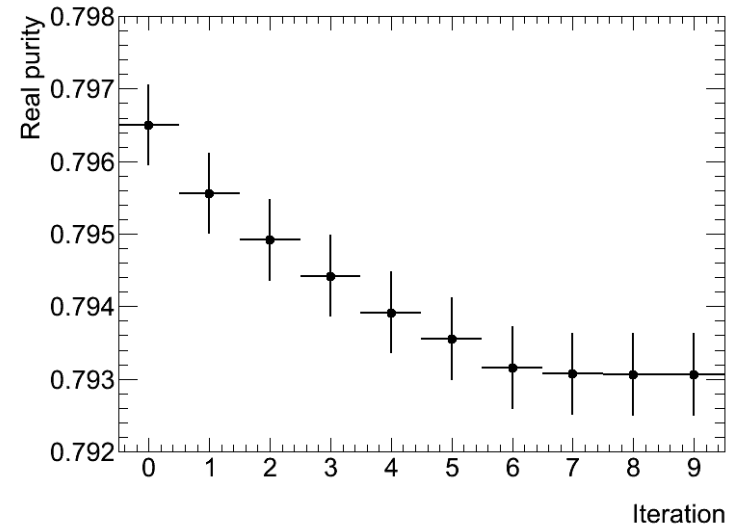
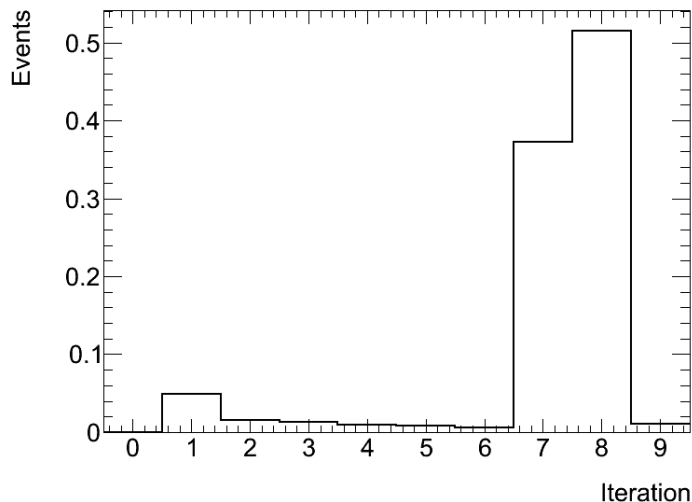
# Introduction

- I study tracks and jets separately:
  - Track: Shower associated to a charged track.
  - Jet: Shower associated to several tracks.
- Efficiency:
  - Truth hit fraction included in a shower.
- Purity:
  - Reconstructed hit fraction belonging to the truth particle.
- Core efficiency/purity:
  - Efficiency and purity defined without accounting the shared hits.
- Real efficiency/purity:
  - Efficiency and purity defined with all hits.

# CPU time issues

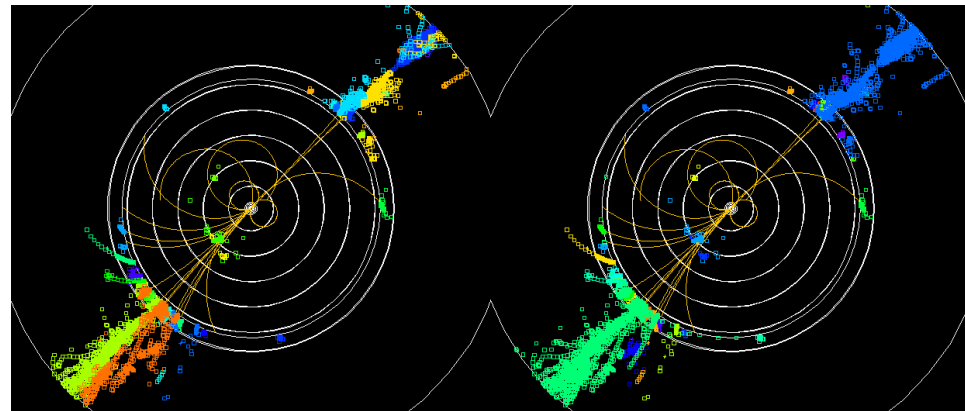
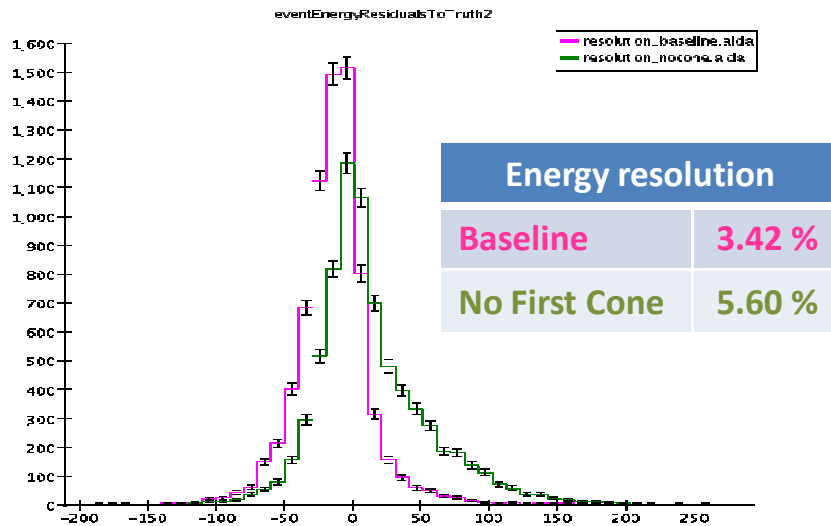
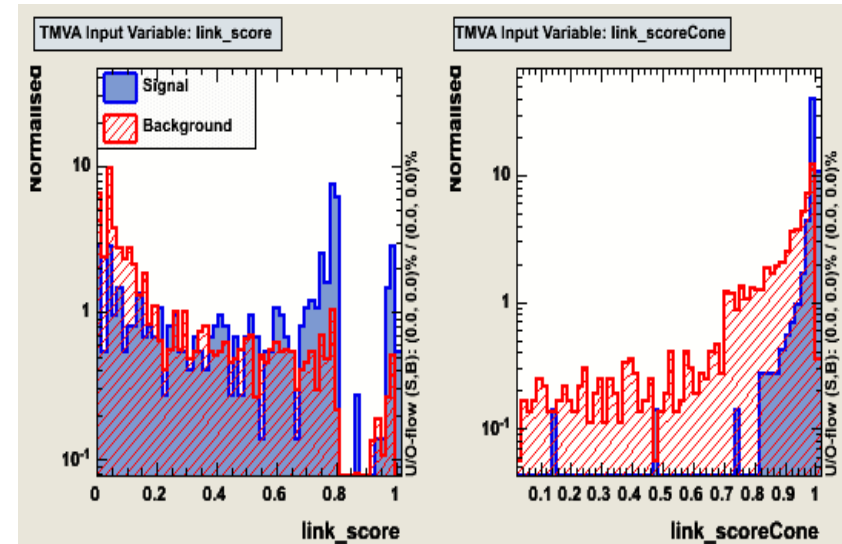
- The algorithm is using up to 7-8 iterations while performance changes get small after 4 iterations

Iterations	CPU time
2	18 s/event
4	22 s/event
10	48 s/event



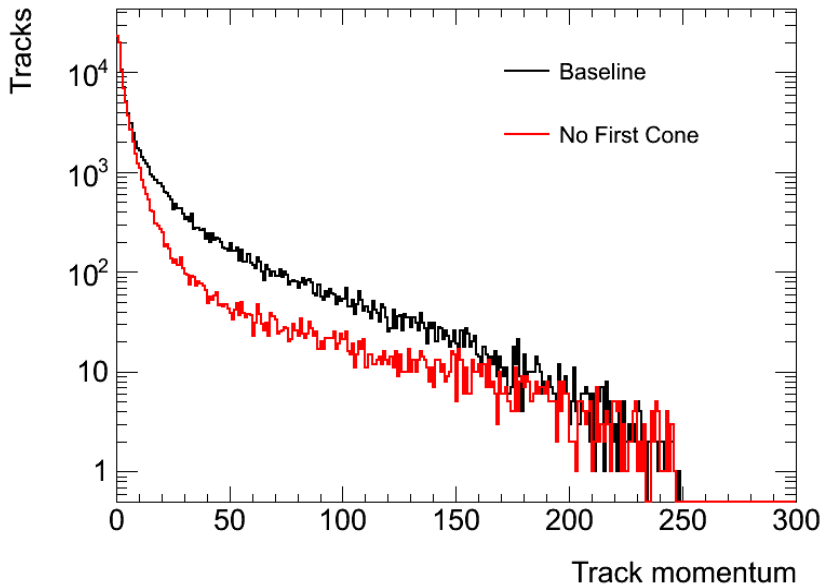
# The first cone algorithm

- The cone algorithm does what it is supposed to do for signal but not for background.
  - Studied the behavior of the PFA without the cone algorithm
  - Studied few variables that might improve the algorithm

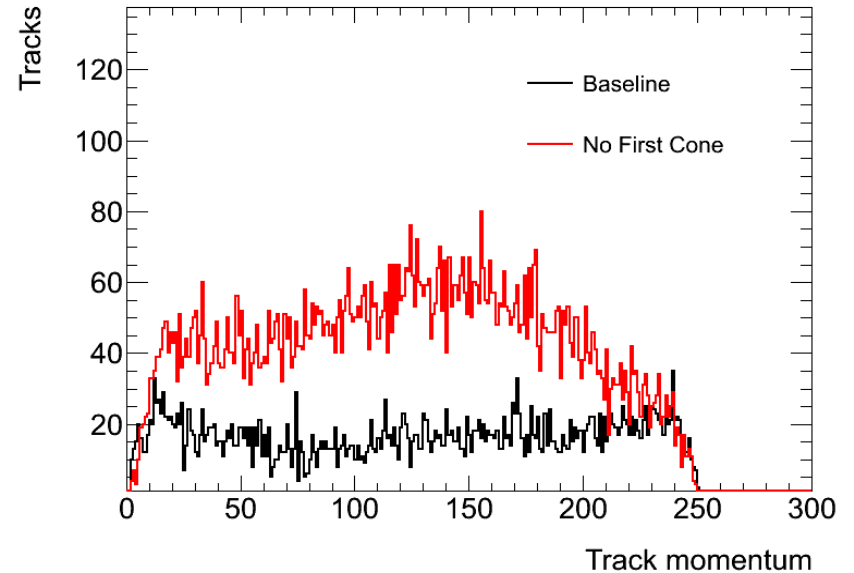


# The first cone algorithm

## Tracks



## Jets



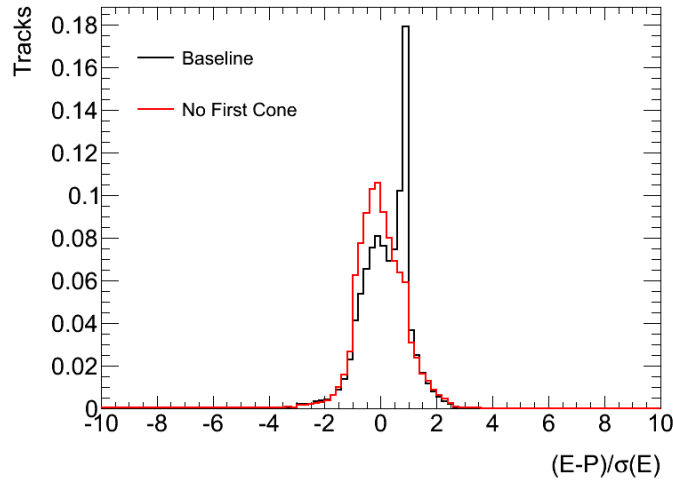
- Without the first cone algorithm:
  - Number of jets increase by a factor of  $\sim 2.5$
  - Tracks above 15 GeV are basically merged into jets ( $\sim 80\%$ )

# The first cone algorithm

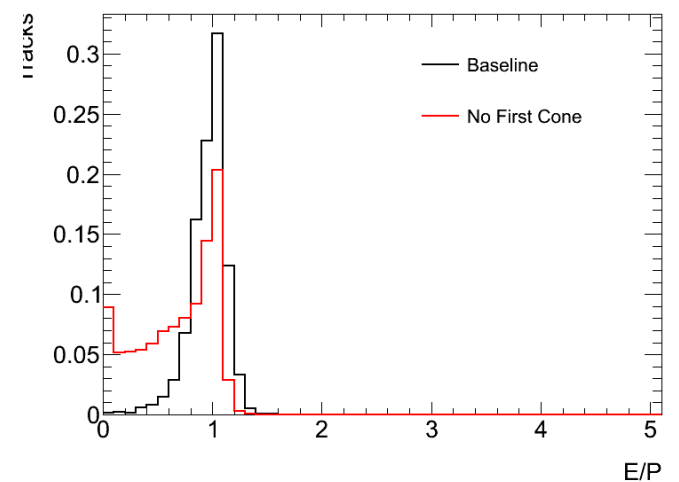
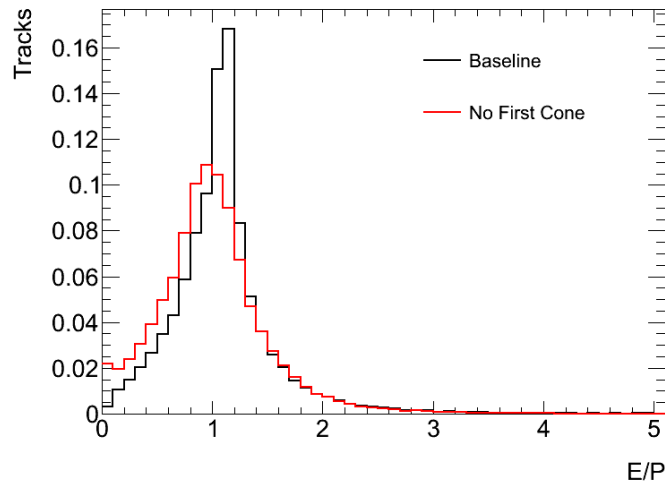
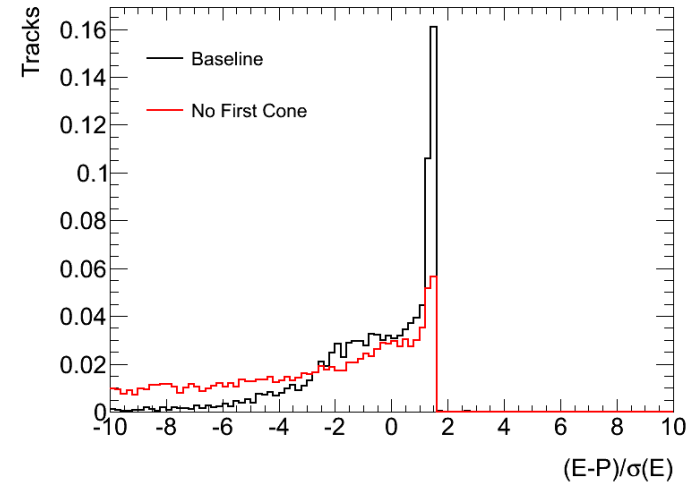
Only looking at tracks, it seems that removing the cone is good

Opposite conclusion when looking at jets:  
Bad merging of tracks into jets

## Tracks



## Jets

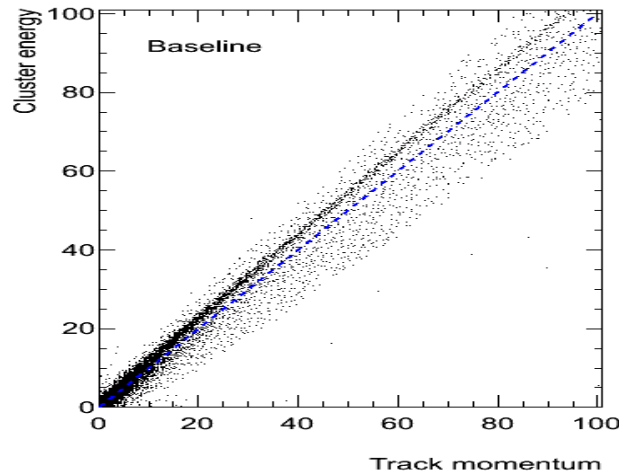


# The first cone algorithm

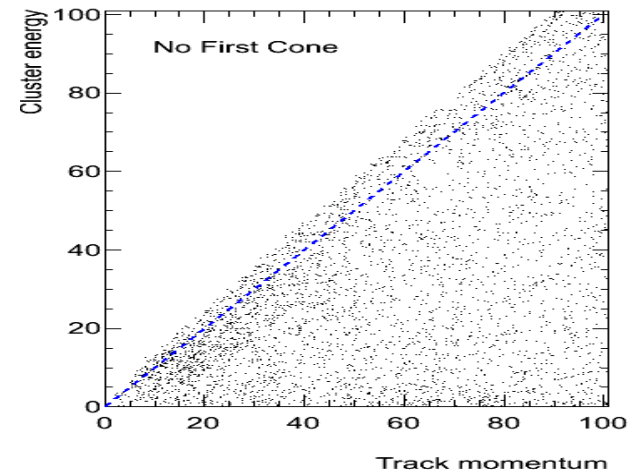
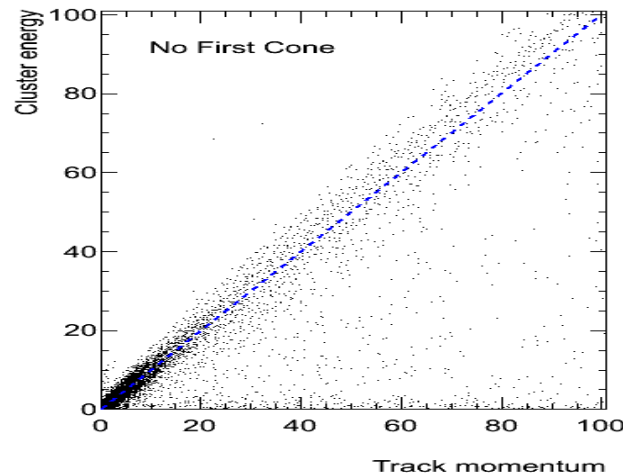
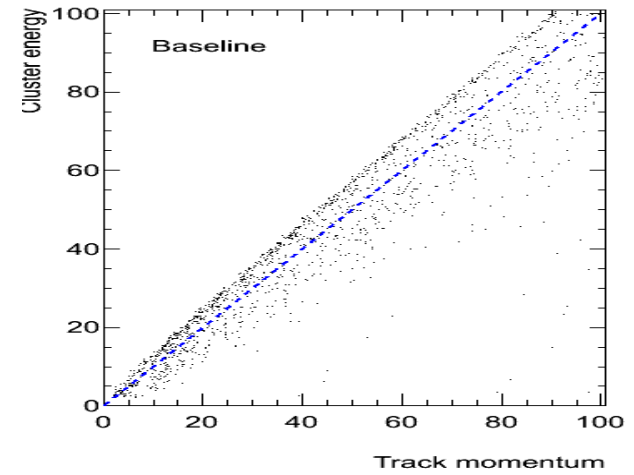
Main component agrees better with the diagonal without the cone.

Area below the diagonal gets populated:  
Bad merging of tracks into jets

**Tracks**



**Jets**

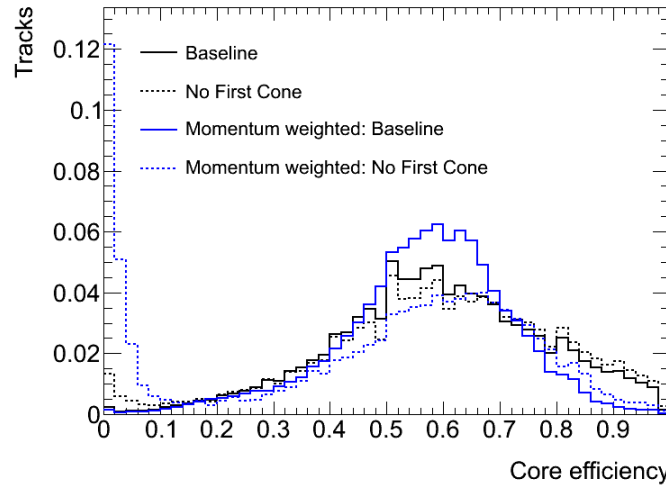


# The first cone algorithm

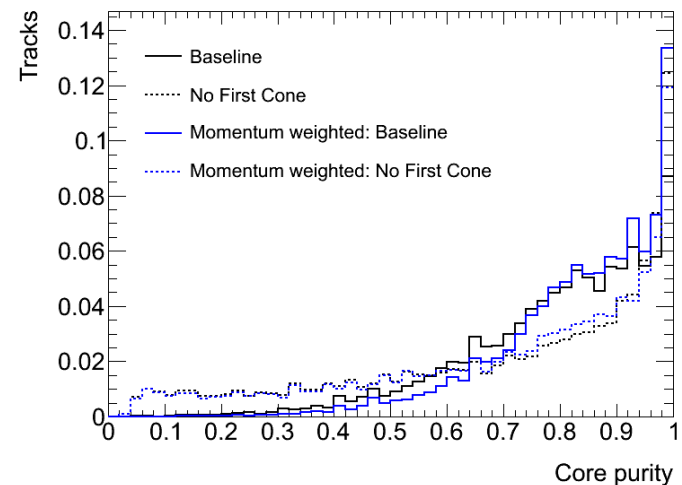
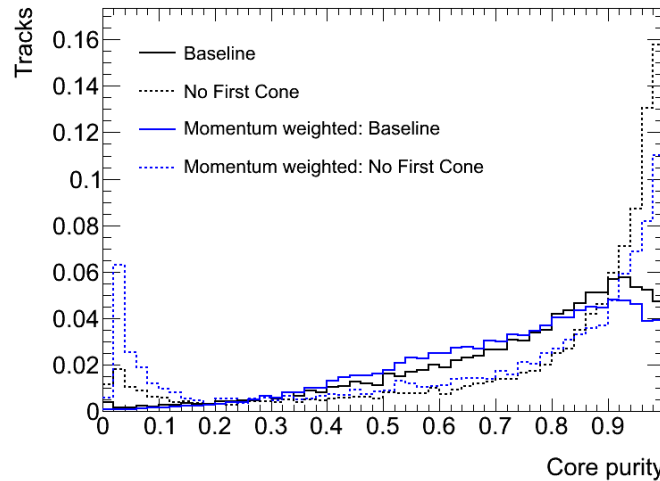
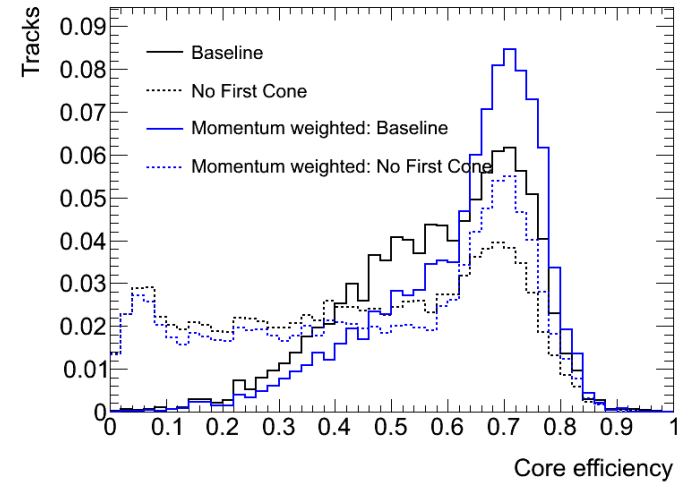
On average better efficiency and purity when the cone algorithm is dropped

Large tails at low efficiency and purity appear:  
Bad merging of tracks into jets

## Tracks



## Jets



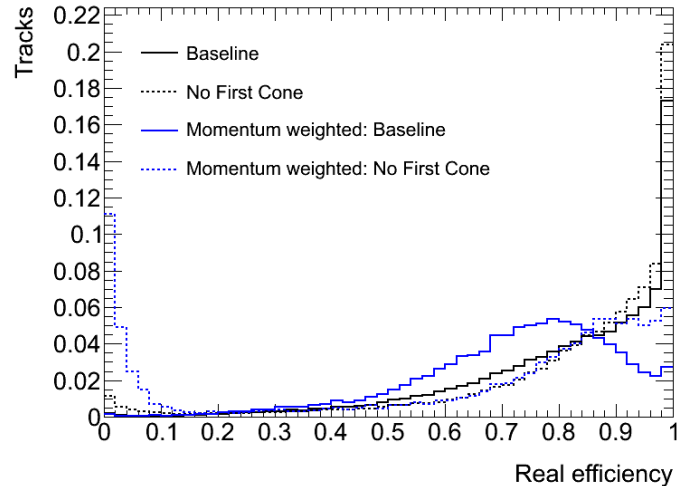


# The first cone algorithm

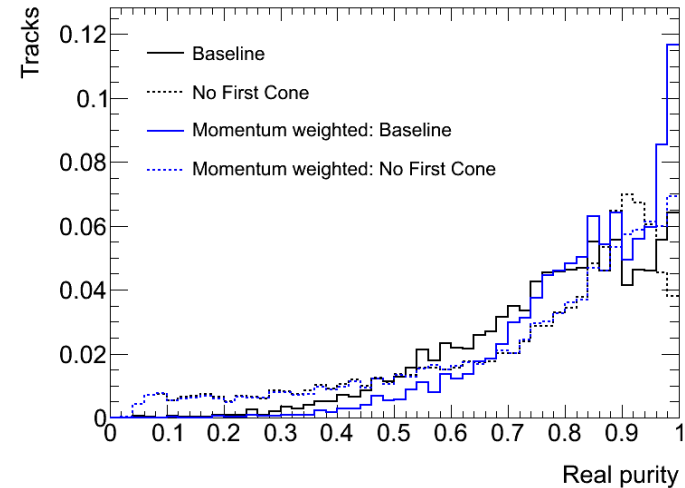
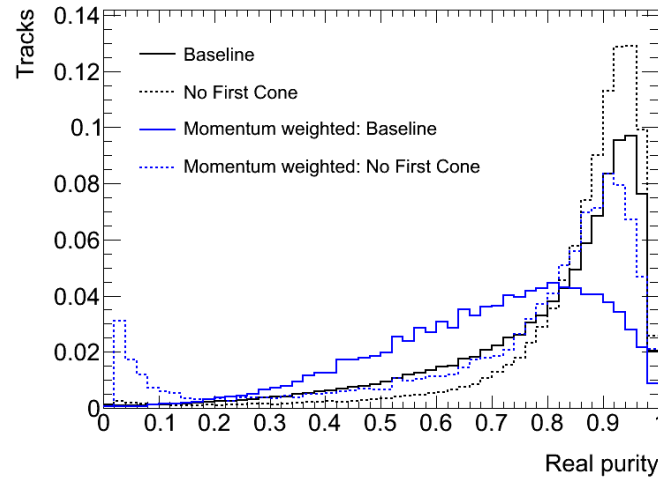
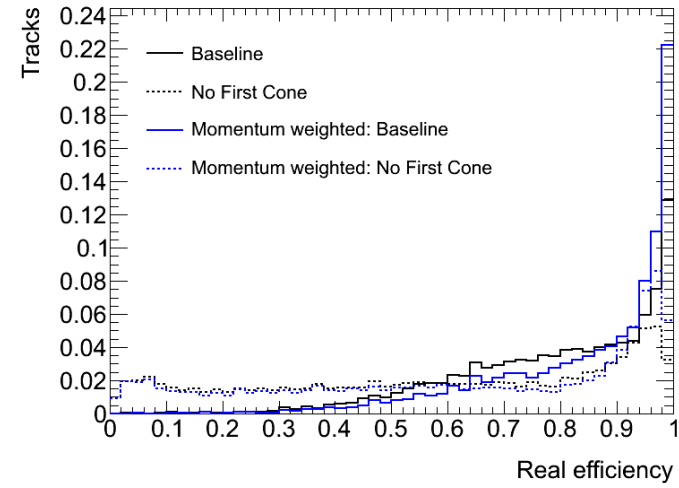
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## Tracks

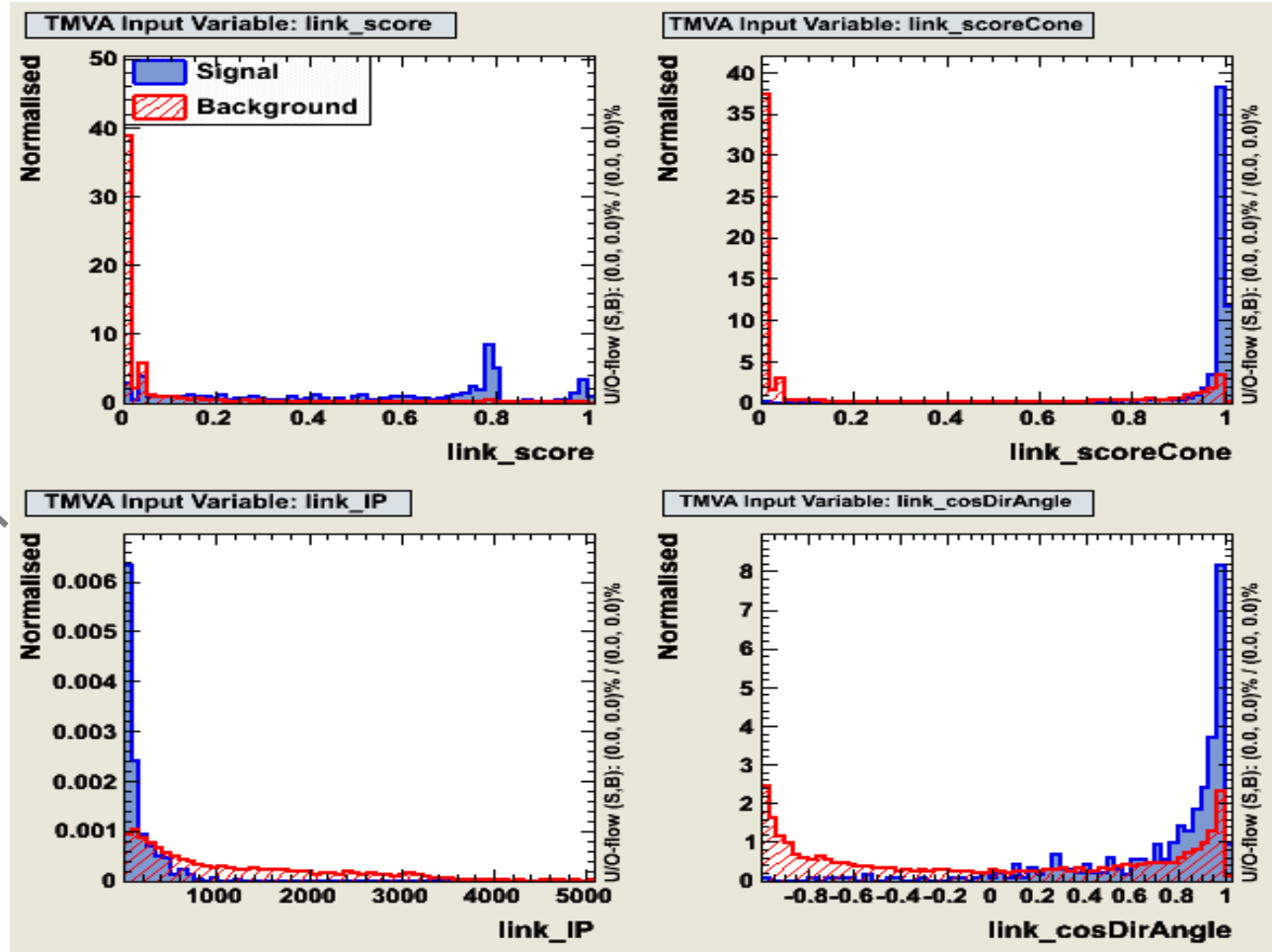
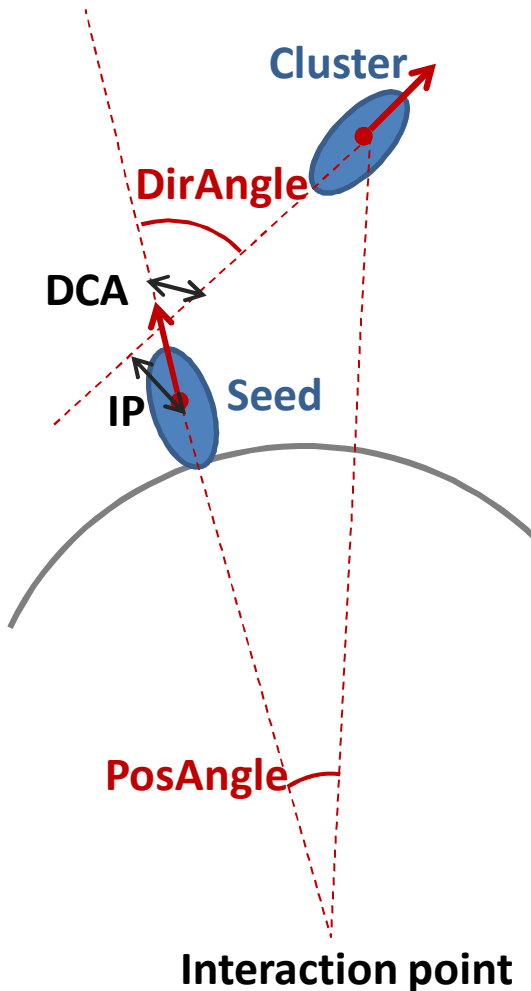


## Jets



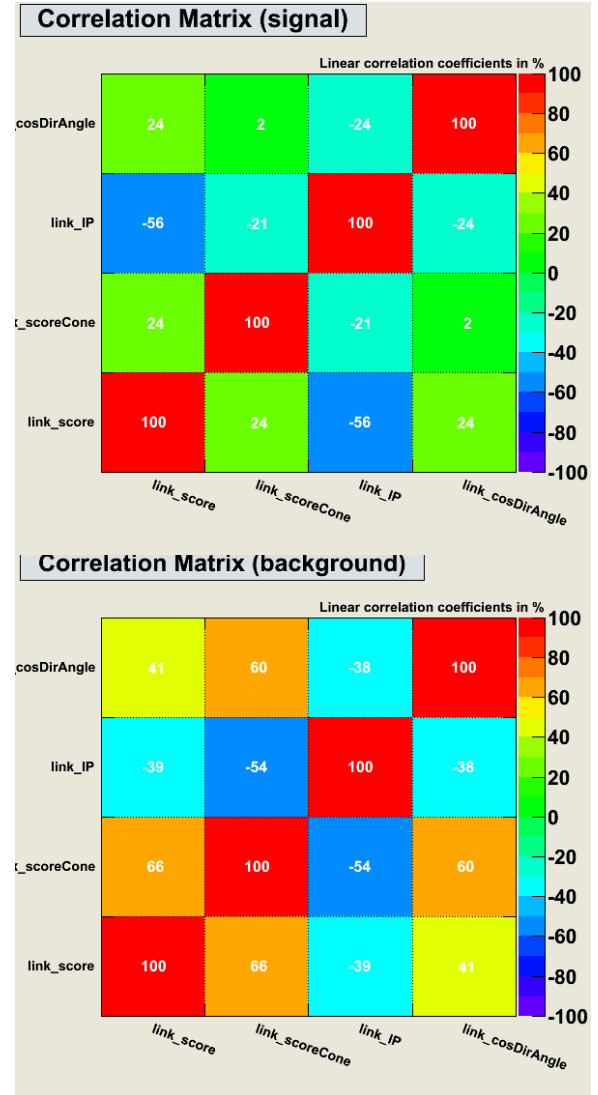
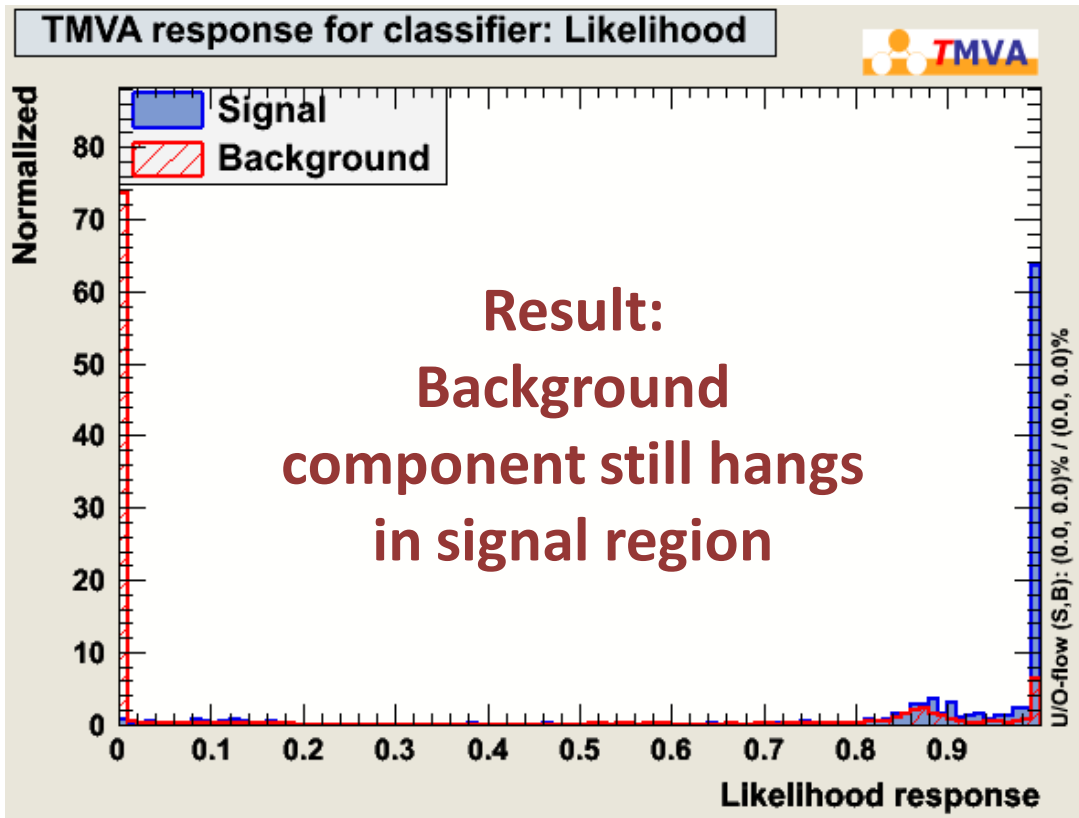
# The first cone algorithm

Tried to define a likelihood using geometrical variables.



# The first cone algorithm

Correlation (especially for background events) are rather strong



# Plans

- Understand the behavior of jet merging.
- Try an algorithm change:
  - Allow cluster sharing when building the showers.
  - Come up with a criteria to solve ambiguities later.