

Shower Start and Hadronic Profiles Revisited

Benjamin Lutz

16th July 2009

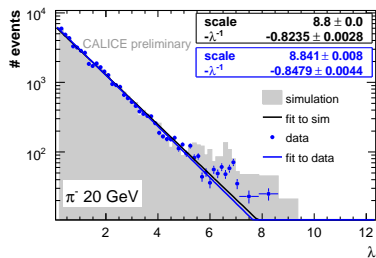


Achieved so far

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- Find layer of shower start.

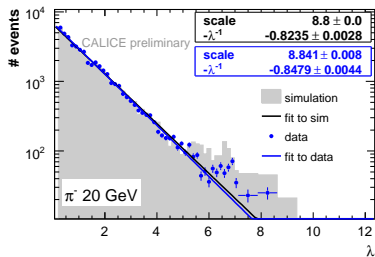
Motivation



Achieved so far

- Find layer of shower start.
- Measure shower start point distribution.

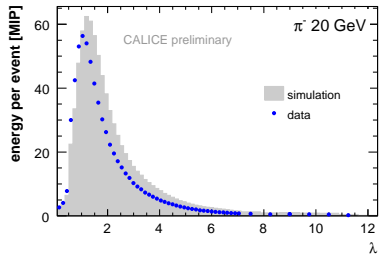
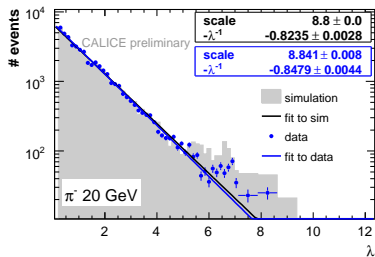
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- Compare to Simulation.

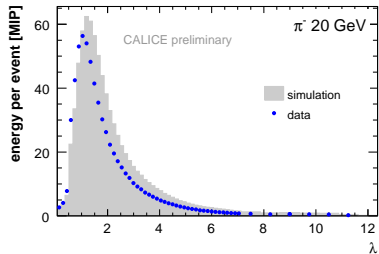
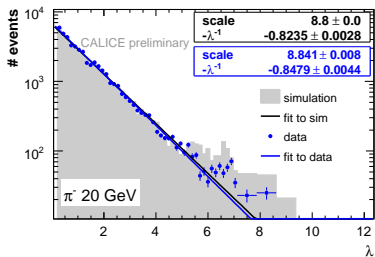
Motivation



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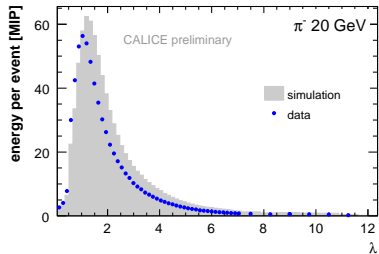
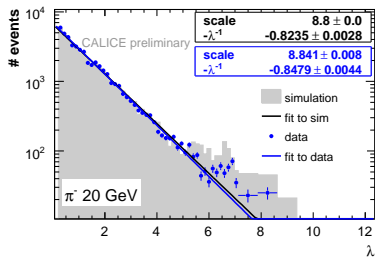
- Find layer of shower start.
- Measure shower start point distribution.
- Compare to Simulation.
- Measure reduced "longitudinal" profile.

Motivation



Open issues

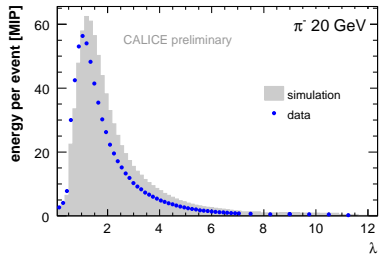
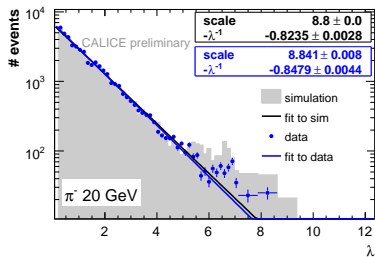
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Open issues

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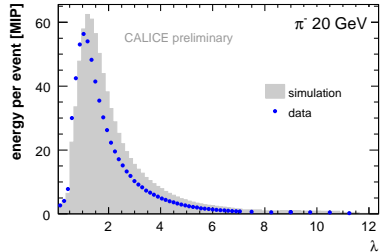
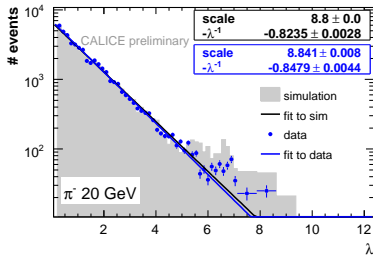
Motivation



Open issues

- Rotation.
 - Layer corresponds to z-range. Where is the start?
 - How to handle varying volume of detector?

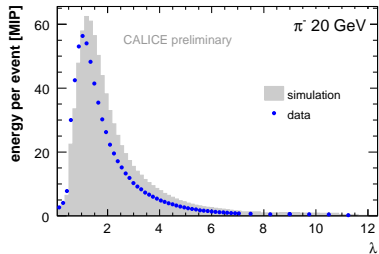
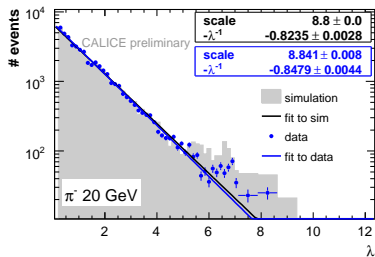
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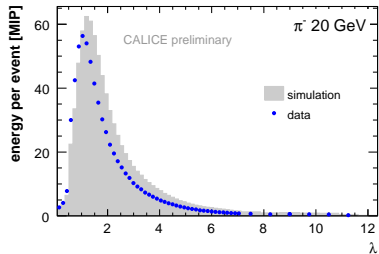
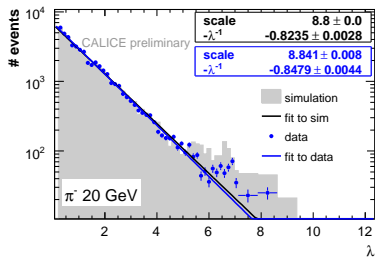
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 - What is its smearing of the reduced profile?

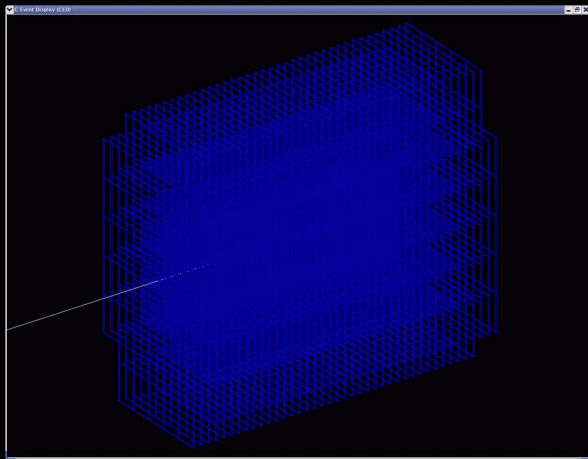
Motivation



Open issues

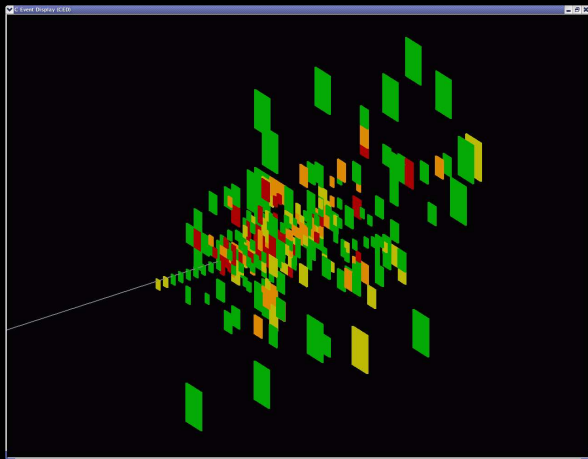
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- Where in x-y-plane does the shower start?

Clustering Based Shower Start



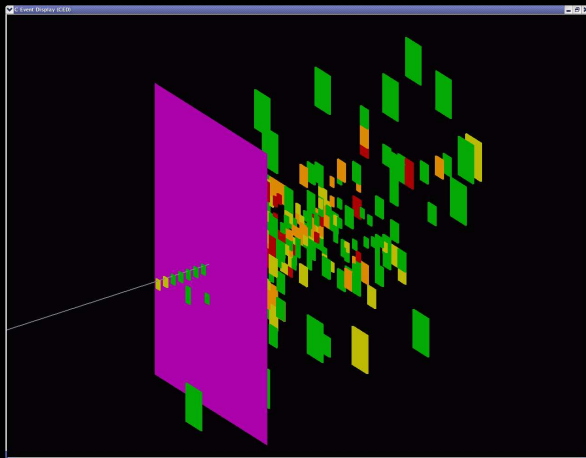
full detector with incoming π

Clustering Based Shower Start



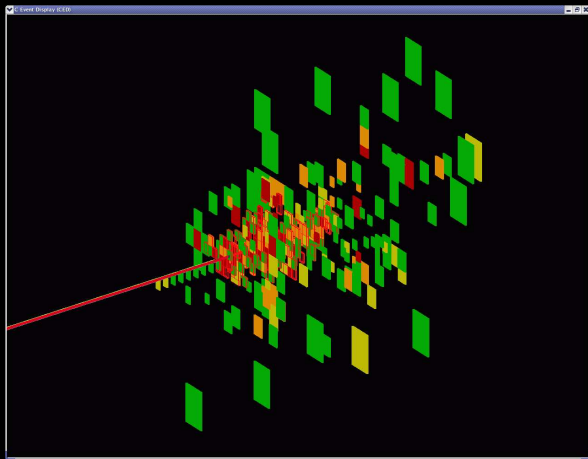
activity in detector

Clustering Based Shower Start



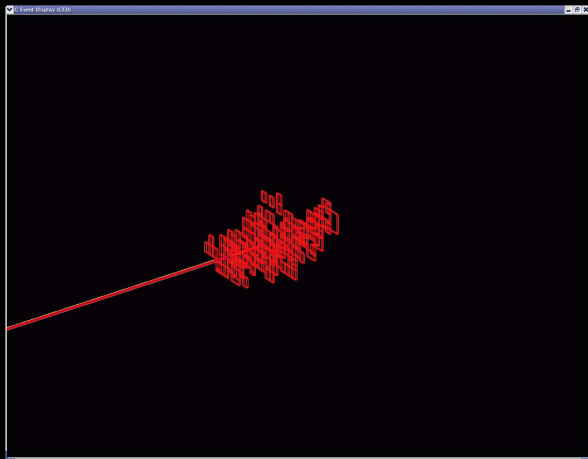
old method: shower start layer

Clustering Based Shower Start



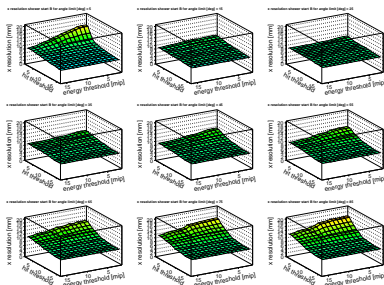
new method: shower start clustering

Clustering Based Shower Start



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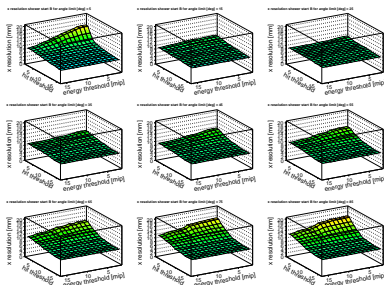
Optimization of the Shower Start Finding



Optimization

- Three parameters to optimize
 - hits in cluster
 - energy in cluster
 - angle of cluster

Optimization of the Shower Start Finding



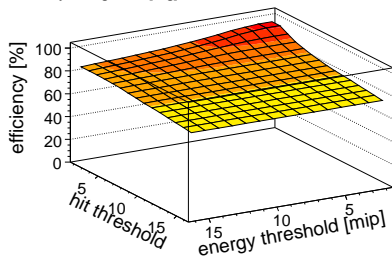
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Observables

Optimization of the Shower Start Finding

efficiency for angle limit [deg] = 35



Optimization

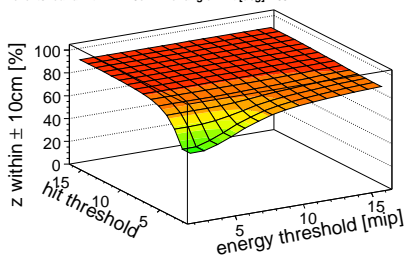
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Observables

- efficiency to find a cluster

Optimization of the Shower Start Finding

events found within $\pm 10\text{cm}$ A for angle limit [deg] = 85



Optimization

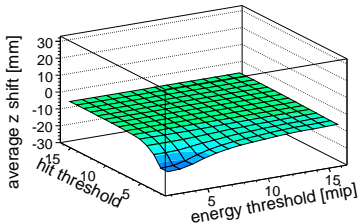
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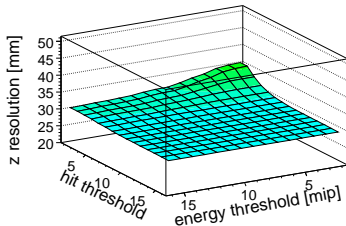
- efficiency to find a cluster
- fraction of reasonably well reconstructed starts ($\pm 10\text{cm}$)

Optimization of the Shower Start Finding

z shift shower start A for angle limit [deg] = 85



z resolution shower start A for angle limit [deg] = 85



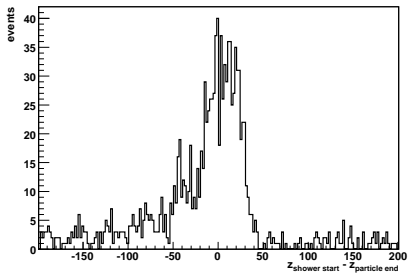
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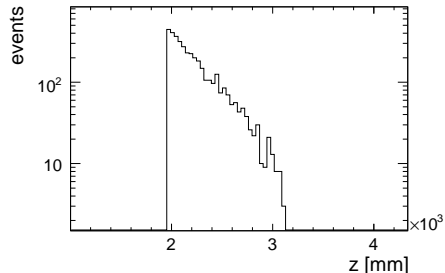
Observables

- efficiency to find a cluster
- fraction of reasonably well reconstructed starts ($\pm 10\text{cm}$)
- mean position a resolution

Example 30GeV π^+



shower start z position



Rotation

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- one layer averages over several z-positions

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- detector volume varies over z

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Profiles in a Rotated Detector

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Profiles in a Rotated Detector

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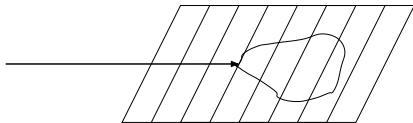
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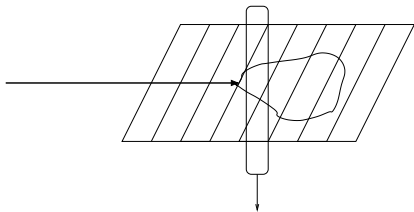
How to cope with

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- normalize properly
- be aware of biasing regions

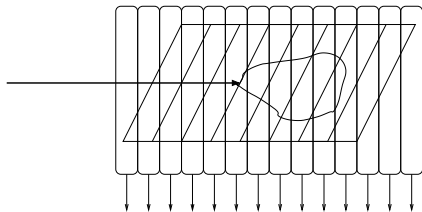
Some Words About Normalisation



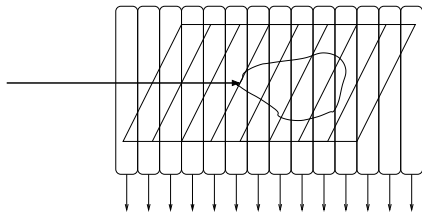
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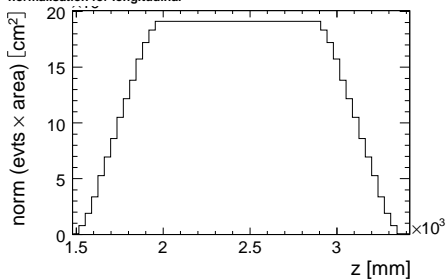
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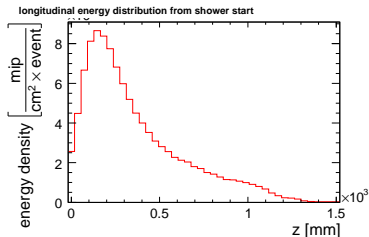
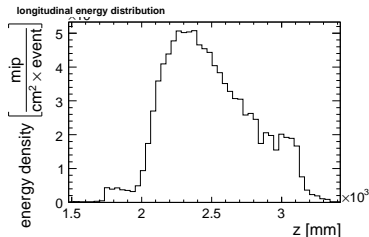
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normalisation for longitudinal

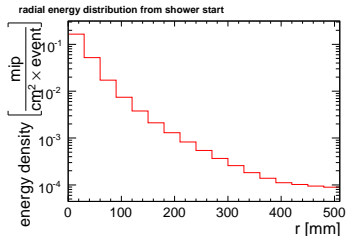
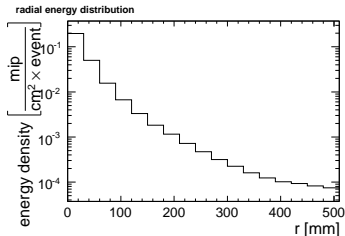


First Look at "new" Profiles



- low statistics (10k)
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- normalization needs crosschecks

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- corrected profiles for rotated detector
- code development for
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Conclusions & Outlook

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Outlook

- differential profiles
- code improvement for normalisation
- compare data and simulation
- analyze leakage exploiting
 - new shower start
 - code capabilities