High precision measurements of luminosity at future linear colliders and polarization of lepton beams



Single electron reconstruction efficiency in BeamCal



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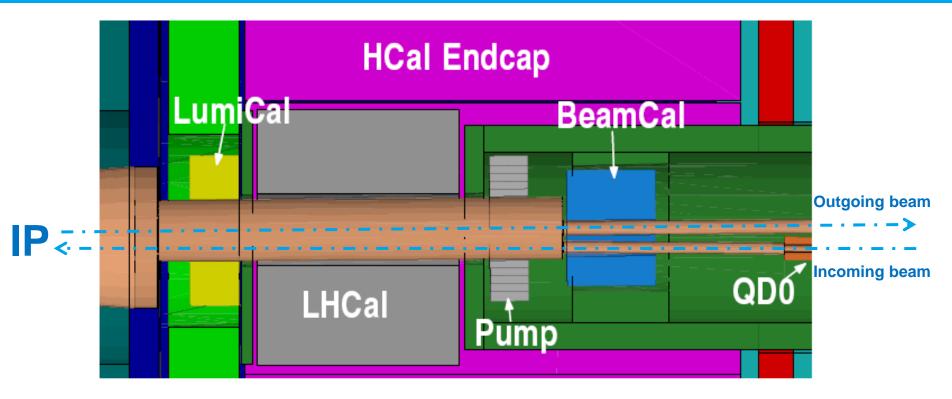


Plan

- > Introduction
- > Algorithm
- > Calibration for clusters
- > Fake rate and reconstruction efficiency
- > Conclusions



Forward Region



Precise luminosity measurement,

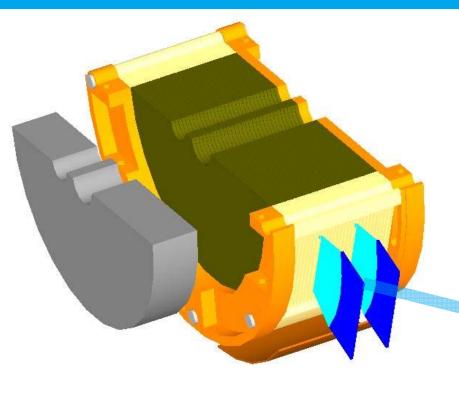
Hermeticity (electron detection at low polar angles),

Assisting beam tuning (fast feedback of BeamCal data to machine)

Challenges: radiation hardness (BeamCal), high precision (LumiCal) and fast readout (both)

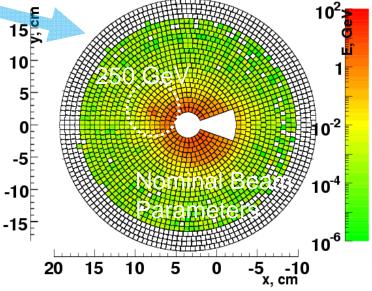
Olga Novgorodova | Tel-Aviv | 3-5 October 2010 | Page 3

Beam Calorimeter



- > Around Beam-pipe
- > 30 Layers
 - Tungsten absorber:
 - Sensor layer GaAs or Di
- > Radii 2...15 cm, depth ~12 cm
- Sensor segmentation 8x8 mm²

Segmentation of sensor layer



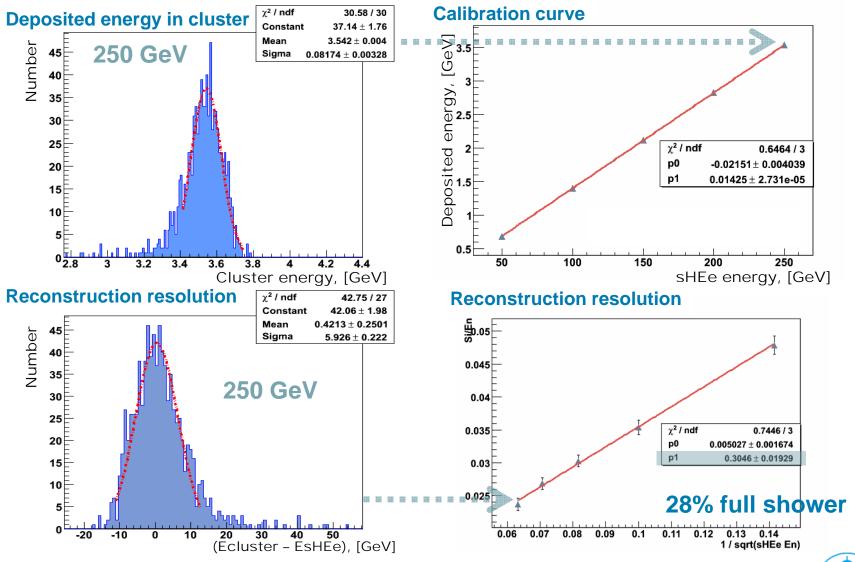


Algorithm

- > sHEe on top of BX search in respect to average of 10 BX
- > 10 BX -> average and fluctuation calculation
- > 10 BX + 1 sHEe
- > Define a cluster:
 - > Towers after 5-th layer with more then 10 consecutive cells
 - Search tower with maximum deposited summary energy
 - > Two or more neighbors towers
 - Exclude all towers correspond to found cluster and repeat searching
- > Reconstruction efficiency and fake rate calculations
- > Algorithm was written for BeCaS files → LCIO to Root format (Madalina)
- > ~ 2.000 BeCaS samples
- > ~ 2.000 Mokka samples

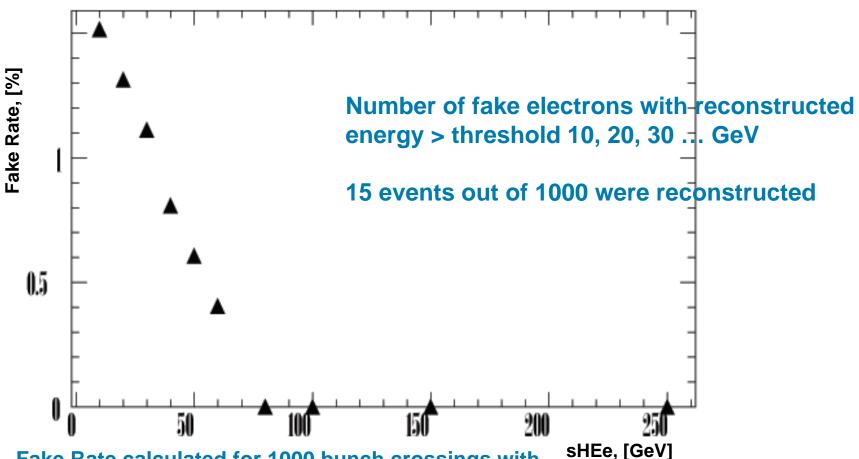


Calibration



Fake rate

sHEe - single high energy particle



Fake Rate calculated for 1000 bunch crossings with applying an reconstruction algorithm for sHEe.



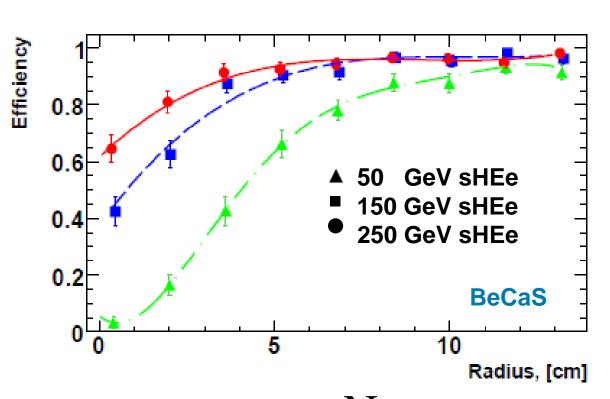
Efficiency of Electron Reconstruction - BeCaS

Efficiency analysis
The analysis was done with
signal files generated in
BeCas.

Electrons of higher energies or at higher radii are better reconstructed.

~40 BX Statistics

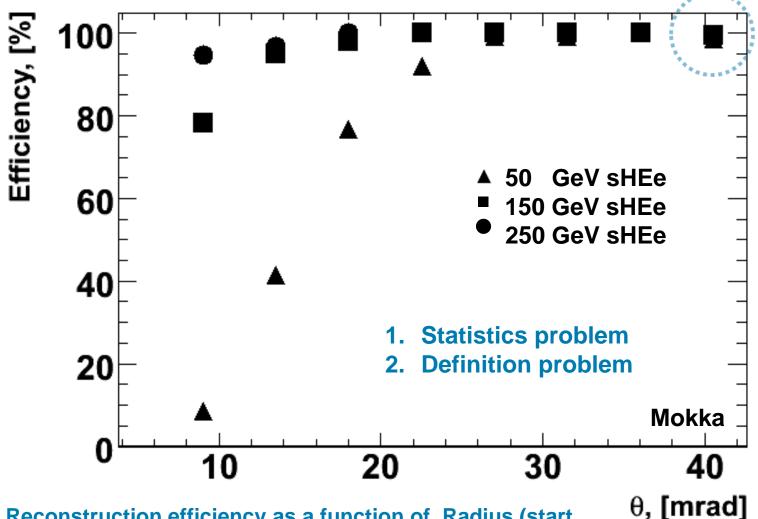
Nominal Beam Parameters



$$Efficiency = \frac{N_{Reconstructed}}{N_{Generated}}$$



Efficiency of Electron Reconstruction



Reconstruction efficiency as a function of Radius (start from beam-pipe) for 50, 150, 250 GeV sHEe with nominal beam parameters.



Future

- > High Statistics will be generated together with Aura
- > Reconstruction Efficiency as 2D plot
- > Marlin Reconstruction Process
- > SB-2009

