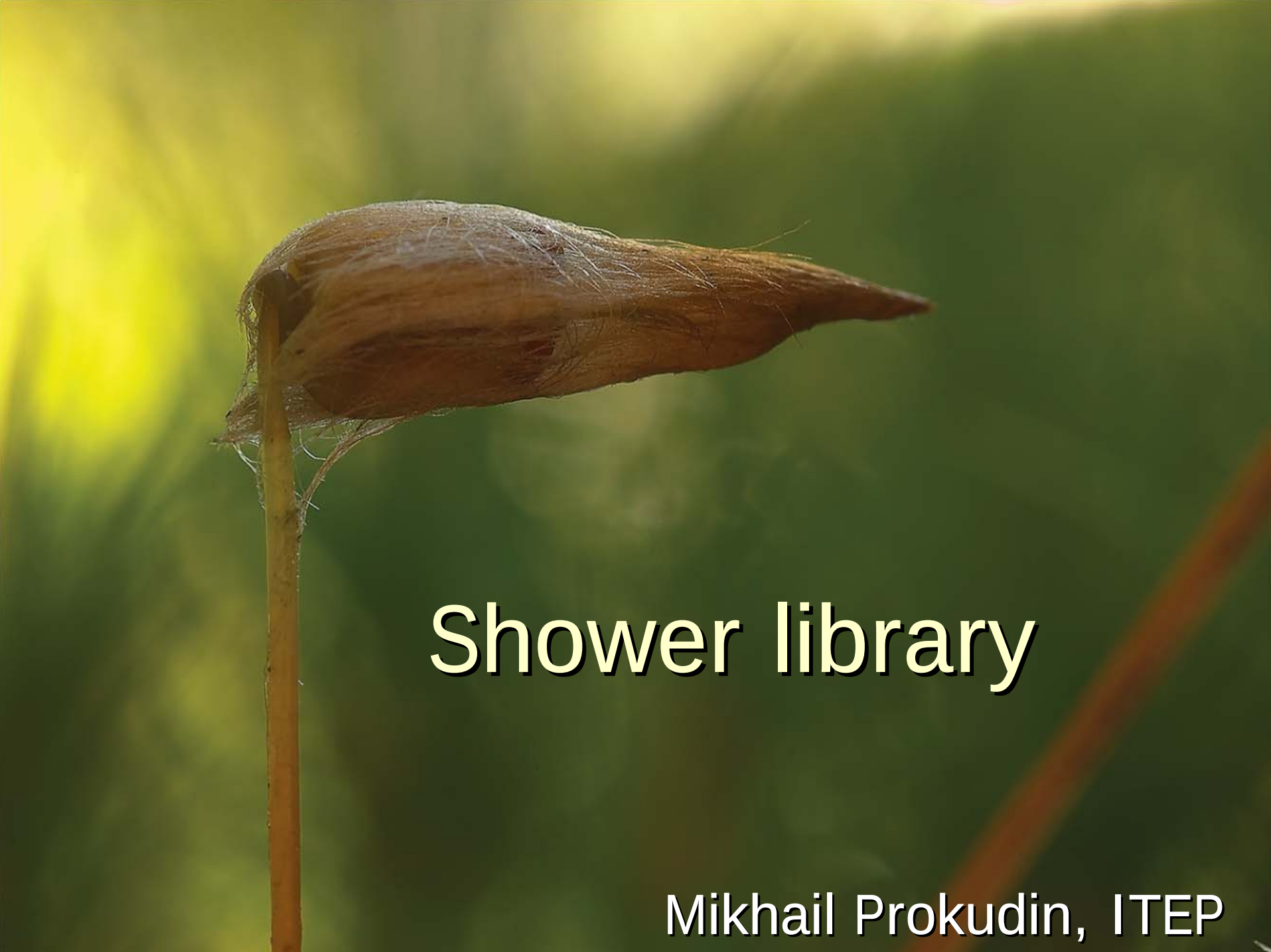


Shower library

Mikhail Prokudin, ITEP

Outline

- Reconstruction procedure
- Shower shape
  - 2 approaches
- Shower library
  - Volume merging
  - Errors
- Results and next steps

Procedure of γ reconstruction

- First approximation
  - energy
    - calibration
  - position
    - S-curves
- Cluster unfolding
  - shower shape
    - shower library

Done

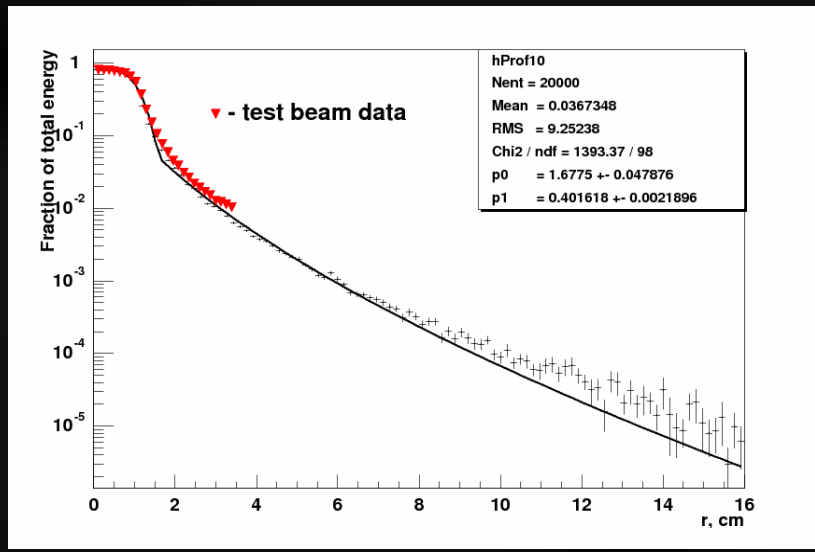
- LHCb like methods
- Pure γ, no background
- Simple and easy to check
- Test site for shower library routines
- Can be done in few month

- ALICE-like methods
- Require much more effort
  - CALO parameters should be fixed?

From September 2006 CBM collaboration meeting

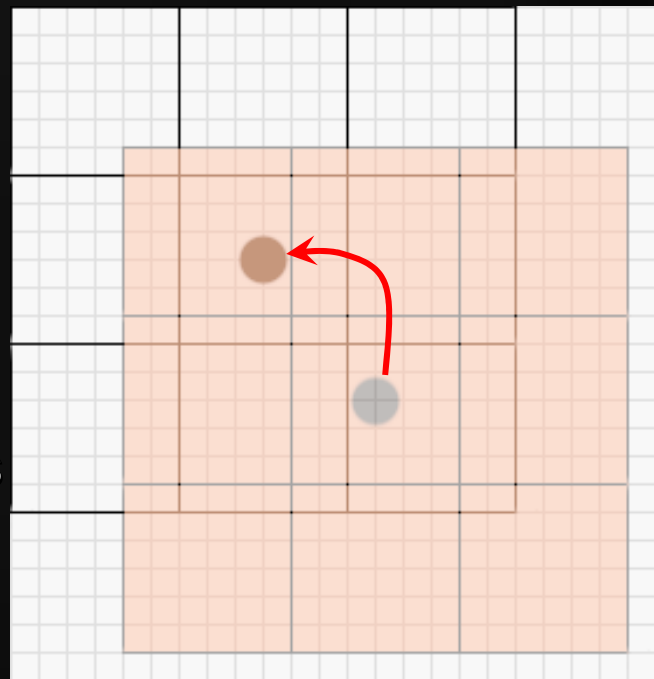
Shower shape

- Analytical formula for shower shape approximation
  - ALICE and PHENIX experience
  - No memory consumption
    - Best for multicore CPU
  - Poor quality for large incident angles
- Shower library
  - Fits exactly to the data
  - Requires a lot of memory
    - (and CPU!)
  - Any incident angle
- Shower width
  - Also needed for fitting procedure
  - Approximation or storing in library?



Shower library

- ECAL with very high segmentation (1x1mm^2 volumes)
  - use one shower multiple times
  - volumes merging procedure
- Transport photons for every:
  - Energy
  - Theta
  - Phi
    - Eightfold decrease due to symmetry
- For low energies we have to generate more showers
    - Larger fluctuations for low energy showers
  - 10k for 0.49 GeV
  - 2k for 16GeV

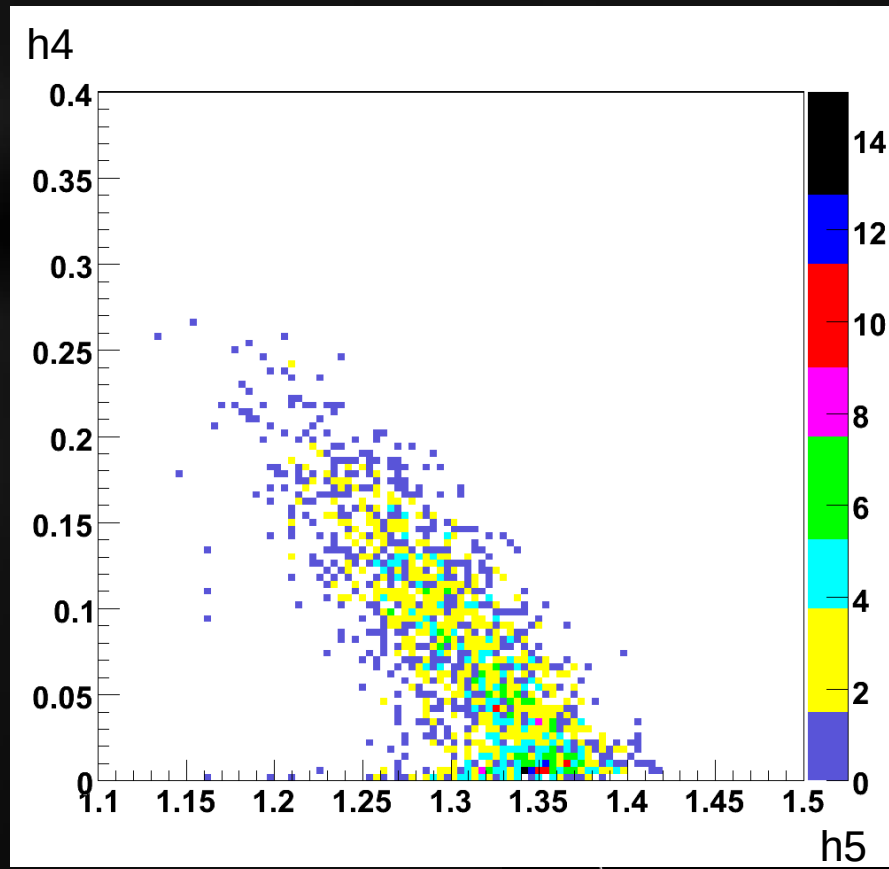


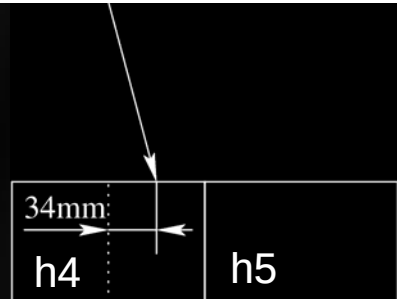
Volumes merging

- During shower library creation
  - Also can store RMS (see next slide)
  - Bigger library size
  - Cell size fixed
    - Different data set for each cell size
  - Cluster size fixed
- During reconstruction
  - More CPU required during reconstruction
  - Information about RMS is lost
    - Need analytical approximation for errors
  - Homogenous dataset
    - Cell size not fixed

Error treating

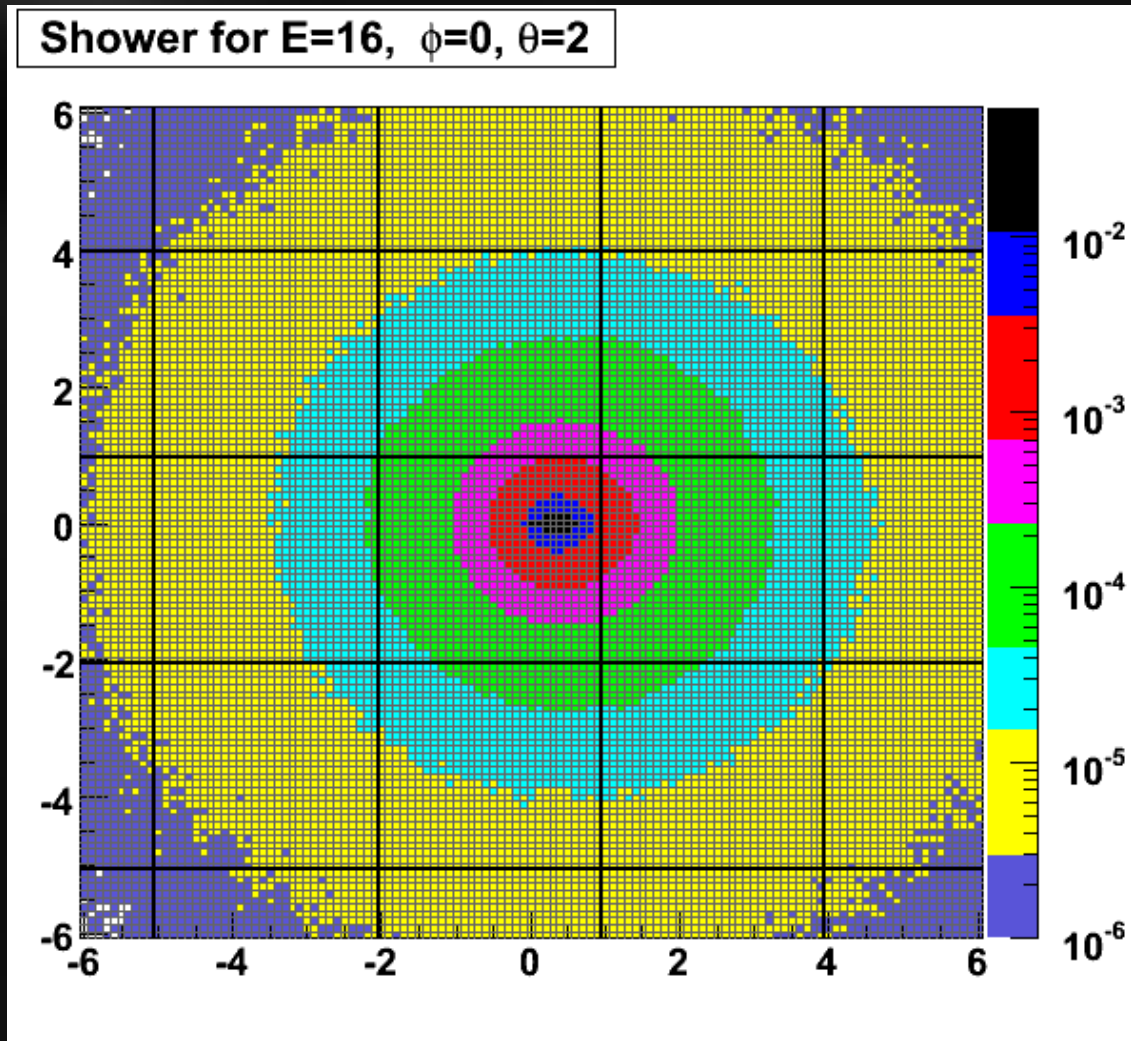
- Energy deposition in cluster cells are not independent
  - RMS value storing
- ALICE and PHENIX
  - Error ~sqrt(E_i)
  - (1-E_i/E_0) for correlation treatment
    - E_0 measured cluster energy



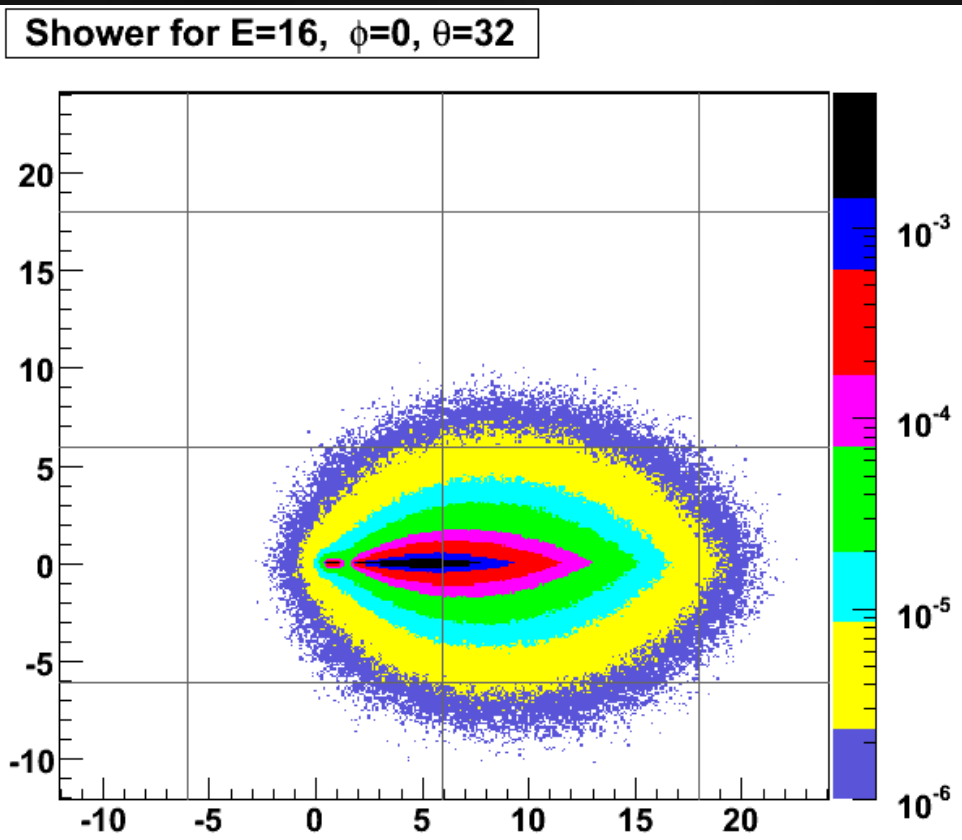


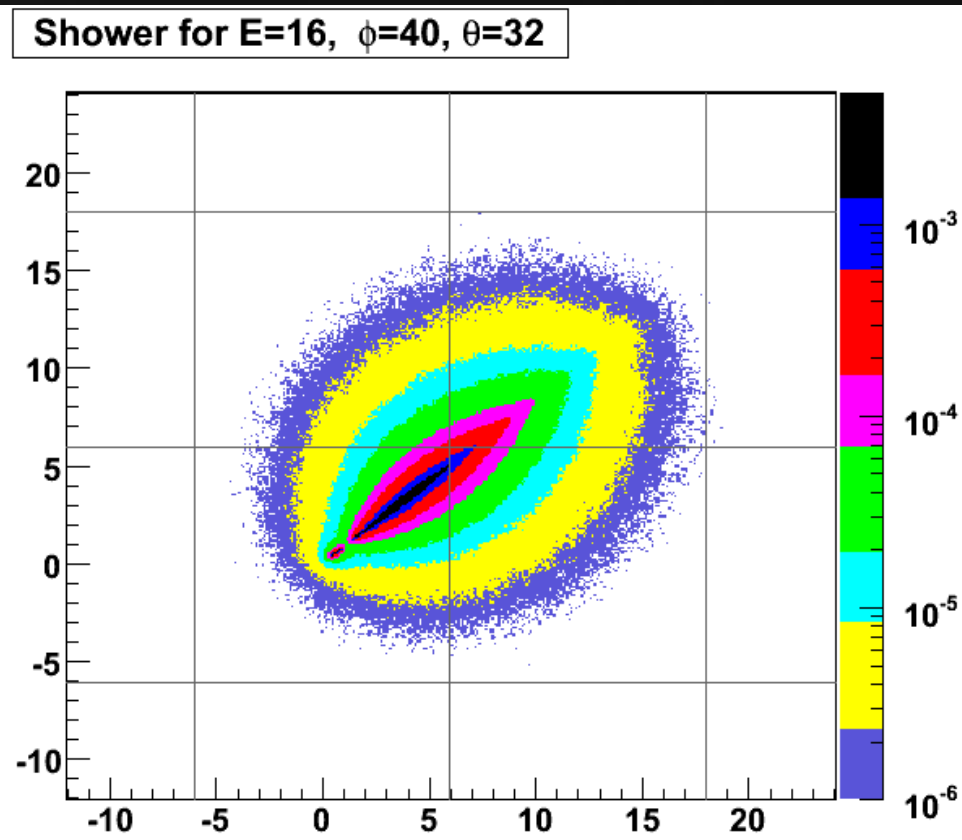
Shower library

- 170 Mb disk space
- 300 Mb in memory
- Energy: 0.49, 1, 2, 4, 6, 9, 12, 16 GeV
- Theta: 2˚, 3.5˚, 5˚, 6.5˚, 8˚, 9.5˚, 11˚, 13˚, 16˚, 20˚, 24˚, 28˚, 32˚
- Phi: 0˚, 10˚ , 20˚, 30˚, 40˚



Next steps for shower library





- Rotation on fly
  - classical trade CPU vs. memory
    - Memory-CPU bottleneck
- Approximation
  - Are there any?