

# FCal TB2003

## Shower profiles: G4/MC - Test beam DATA comparison

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[/afs/cern.ch/user/g/gorbunov/public/prof\\_note.pdf](/afs/cern.ch/user/g/gorbunov/public/prof_note.pdf)

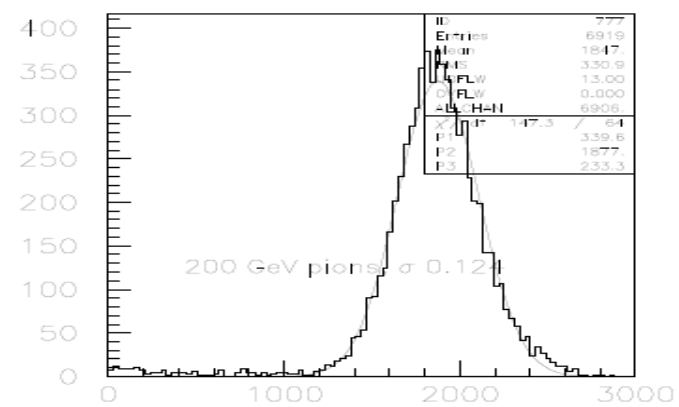
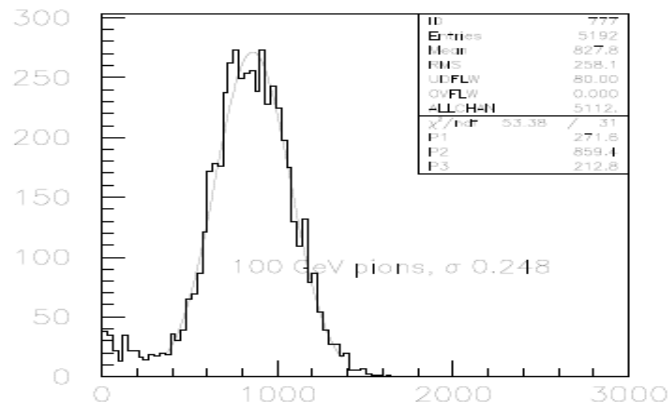
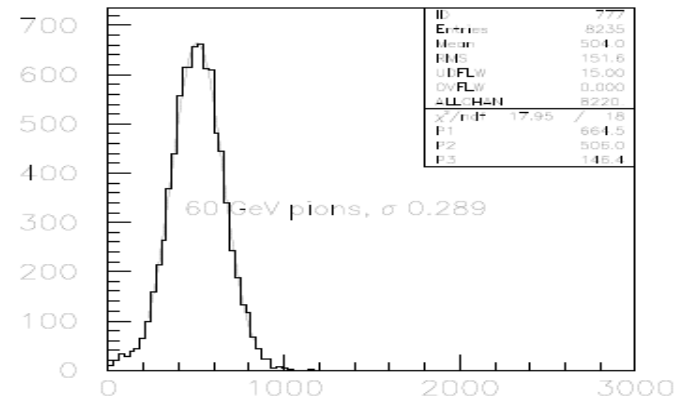
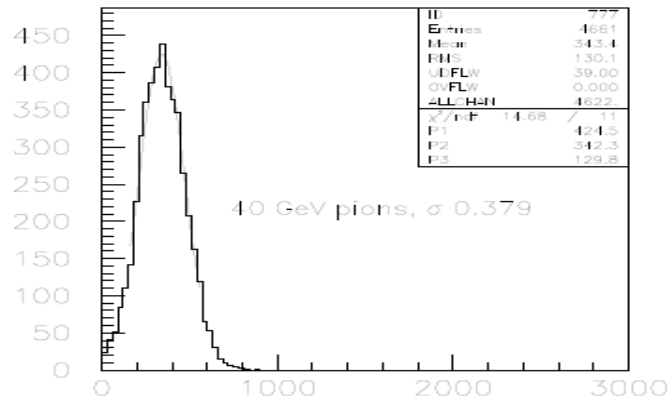
# S/W details

- Athena: Atlas release 9.3.0,
- Geant 4 6.2p01, QGSP 2.6, range cut 30  $\mu$
- MC analysis: LArG4Analysis-00-00-06
- TB03 analysis: LArFCALTBConv-00-00-8, LArFCALTBAna-00-00-03/LArFCALTBRadialDigitCluster by M. Schram, tile amplitude: *parabola fit*
- Same clustering method in MC and data (cylindrical cluster,  $r=8$  cm for electrons,  $r=19$  cm for pions)
- Rough and “smeared” baricenters (tile counting within the radius)

# Event selection, calibration

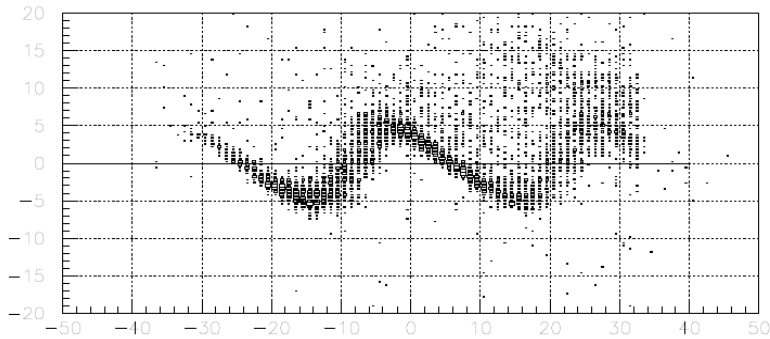
- Pions: require FC2 and FC3 be negative
- Multiple track rejection: BPC
- Pions: FCal 2 and 3 weight=2

# Energy resolution



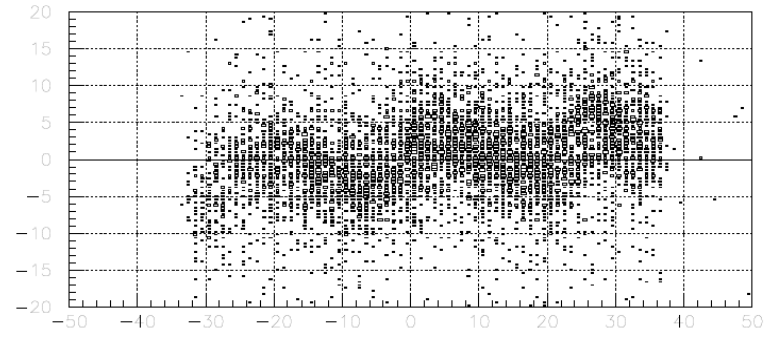
# Baricenter reconstruction

DATA 200 GeV electrons



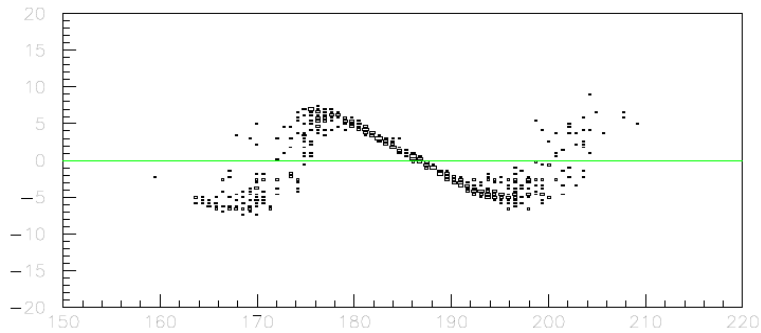
baricenter X – BPC vs bpc, FC1

DATA 200 GeV pions



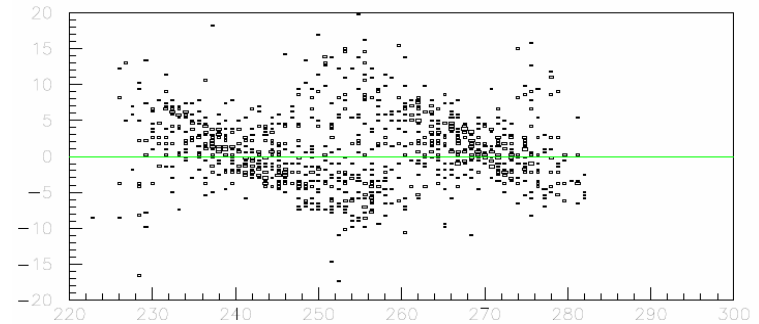
baricenter Y – BPC vs bpc, FC1

MC, 200 GeV electrons



baricenter – Xtruth vs Xtruth

MC, 200 GeV pions

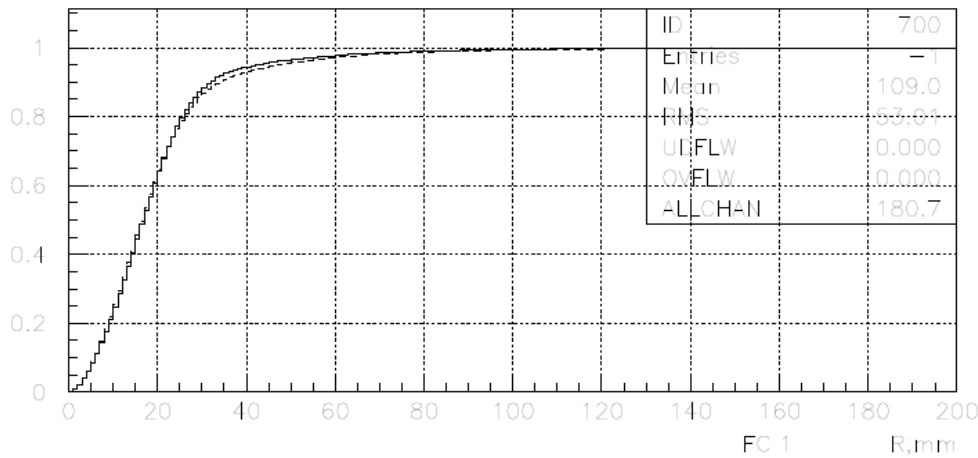
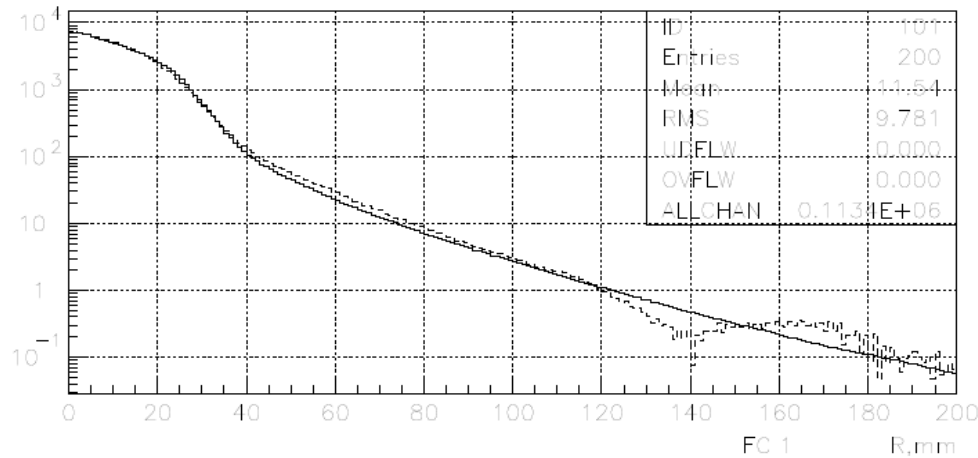


baricenter X – Xtruth vs Xtruth

# Radial shower profiles

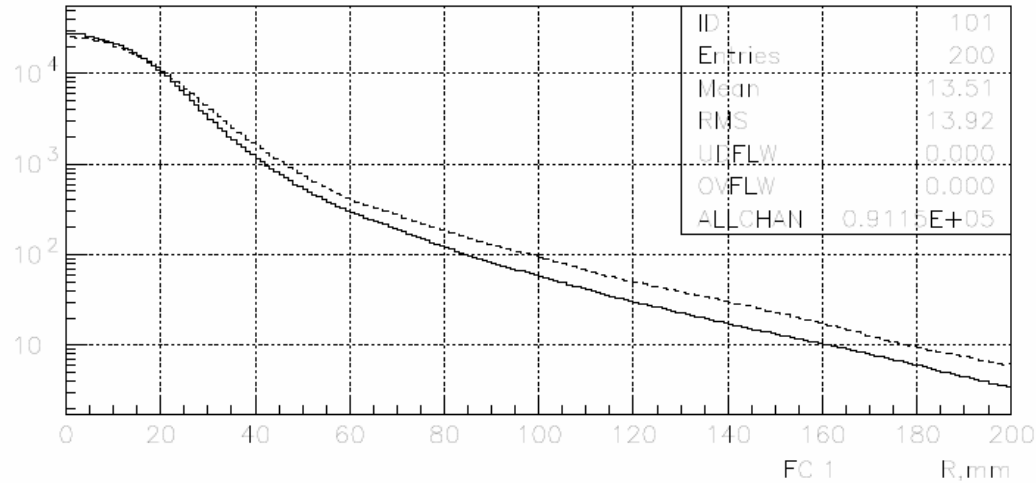
MC/DATA comparison, electrons 200 GeV, smeared, w.r.t. MCtruth/BPC

200 GeV Electrons, FCal1

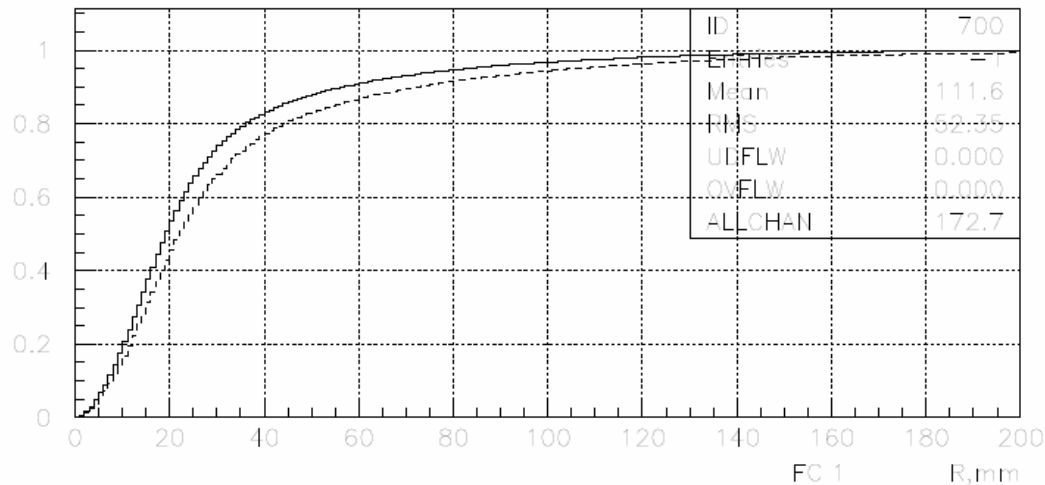


# Radial shower profiles

MC/DATA comparison, pions 200 GeV, smeared, w.r.t. MCtruth/BPC



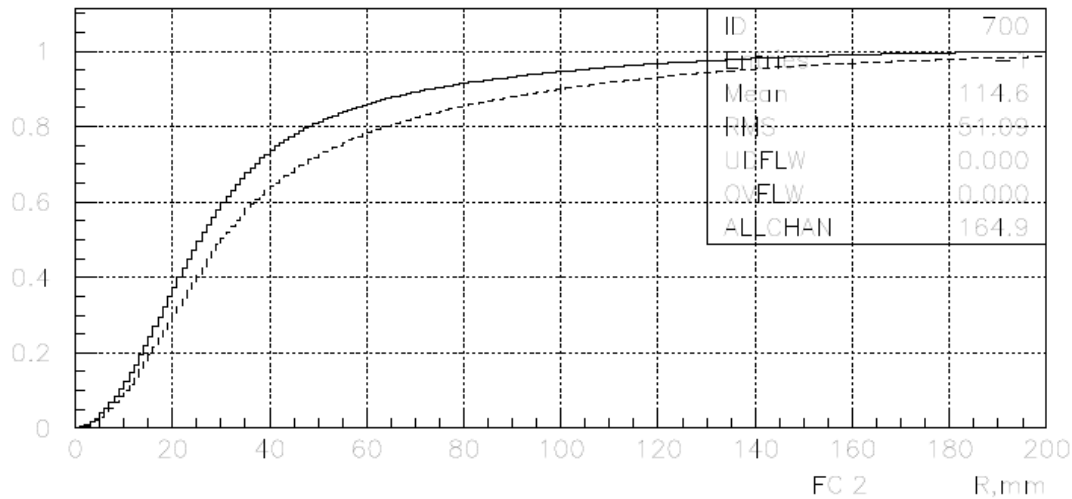
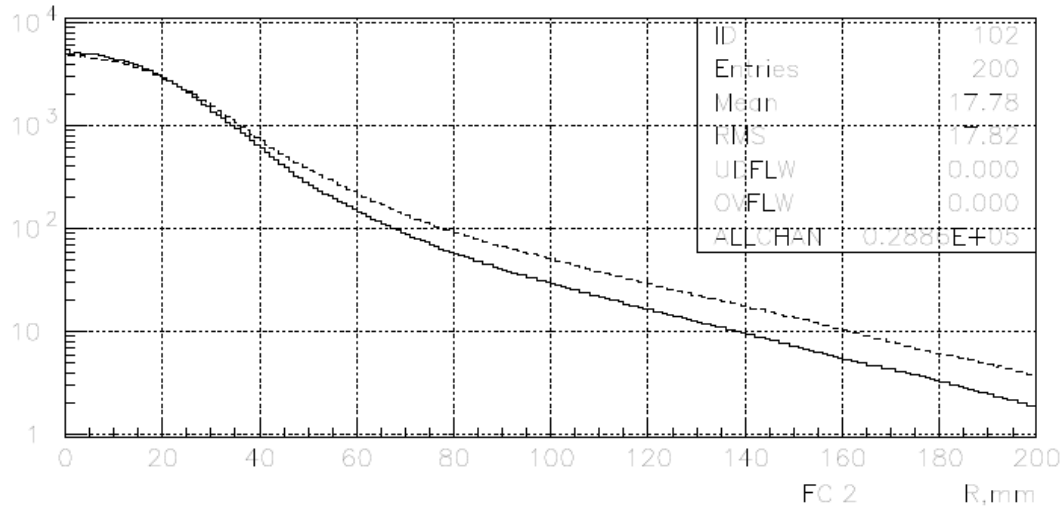
200 GeV Pions, FCal1



# Radial shower profiles

MC/DATA comparison, pions 200 GeV, smeared, w.r.t. MCtruth/BPC

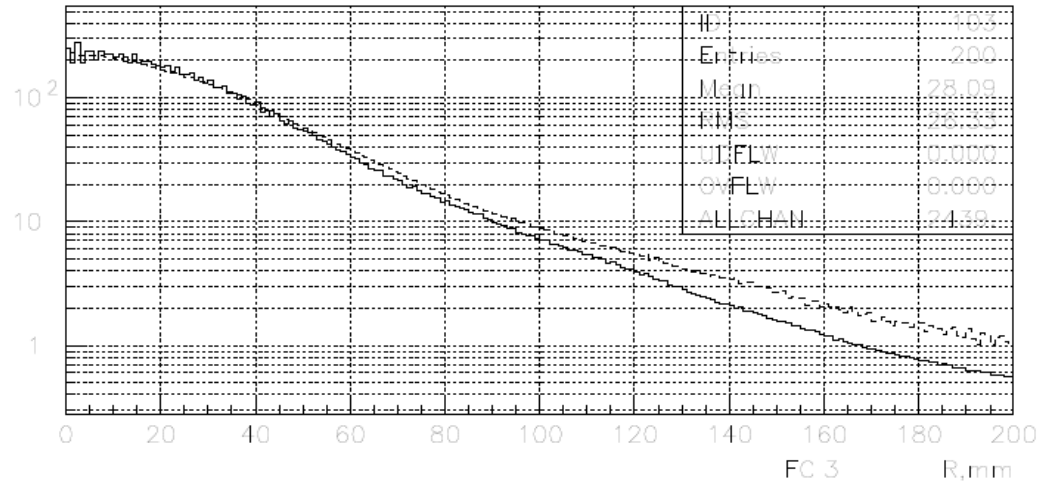
200 GeV Pions, FCal2



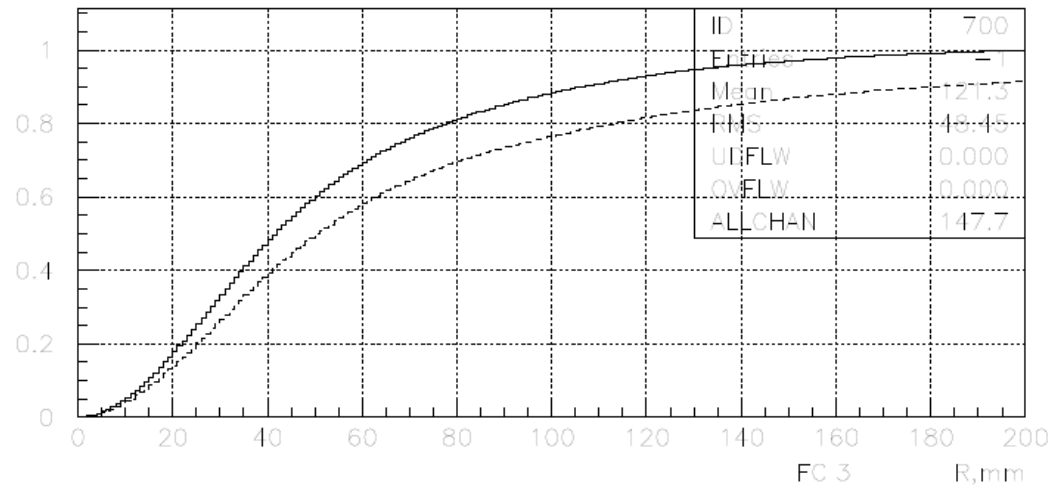


# Radial shower profiles

MC/DATA comparison, pions 200 GeV, smeared, w.r.t. MCtruth/BPC

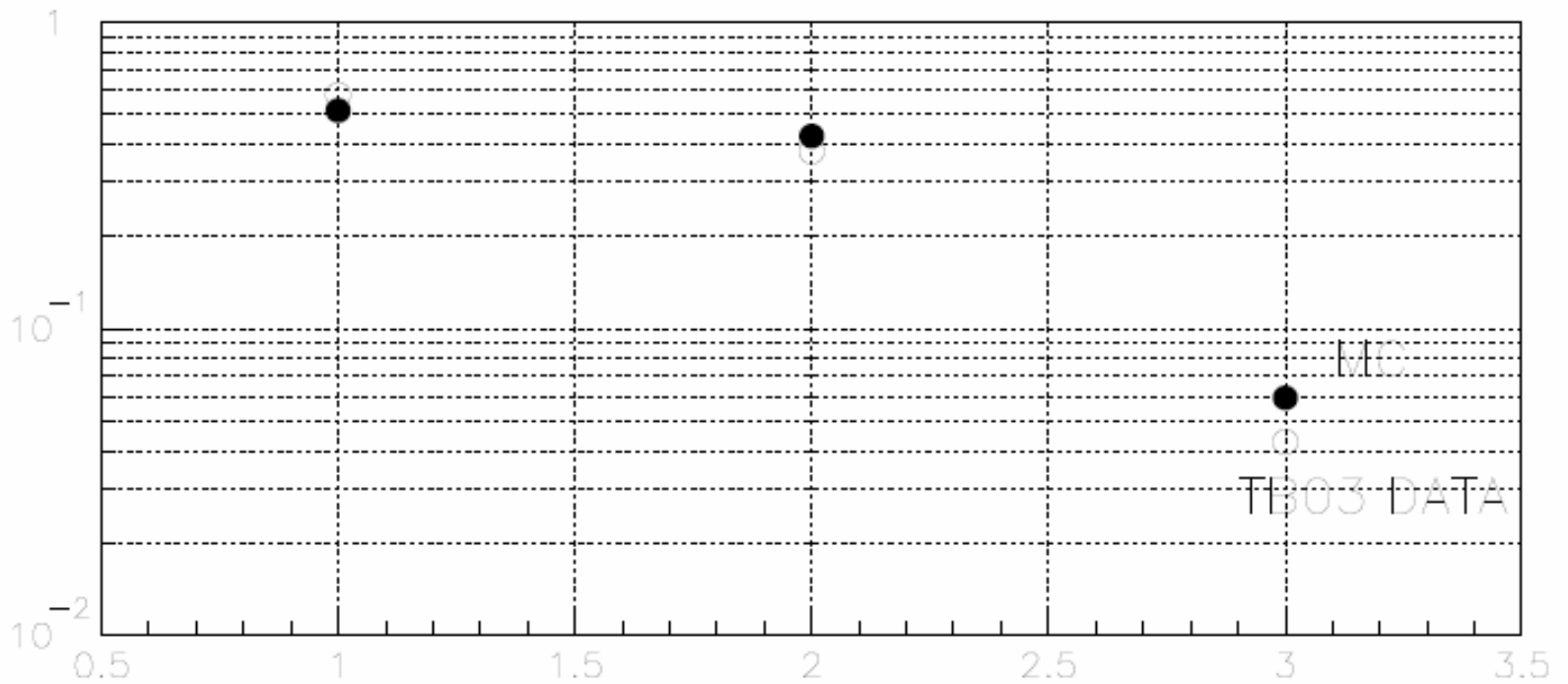


200 GeV Pions, FCal3



# Longitudinal shower profiles

200 GeV Pions



# Conclusions

- Reasonable resolution for the parabola fit method
- The radial profiles are quite well reproduced by MC for electrons. Pions: satisfactory agreement for FCal1 and poor for FCal2,3 (no noise in MC?, poor description in G4 for tungsten?)
- The tile geometry causes systematical distortion in the baricenter determination. Can be corrected?

# Further work (towards October)

- Apply “smearing” for total energy and resolution calculations
- Full signal fit (try VE approach and/or OFC). Channel-to-channel corrections
- Separate baricenter determination for pions in the three FCal modules. Cluster radius optimization