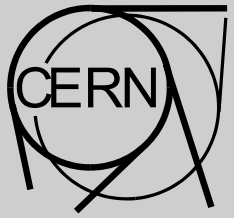

LAr Reconstruction: Data vs MC (parabola)

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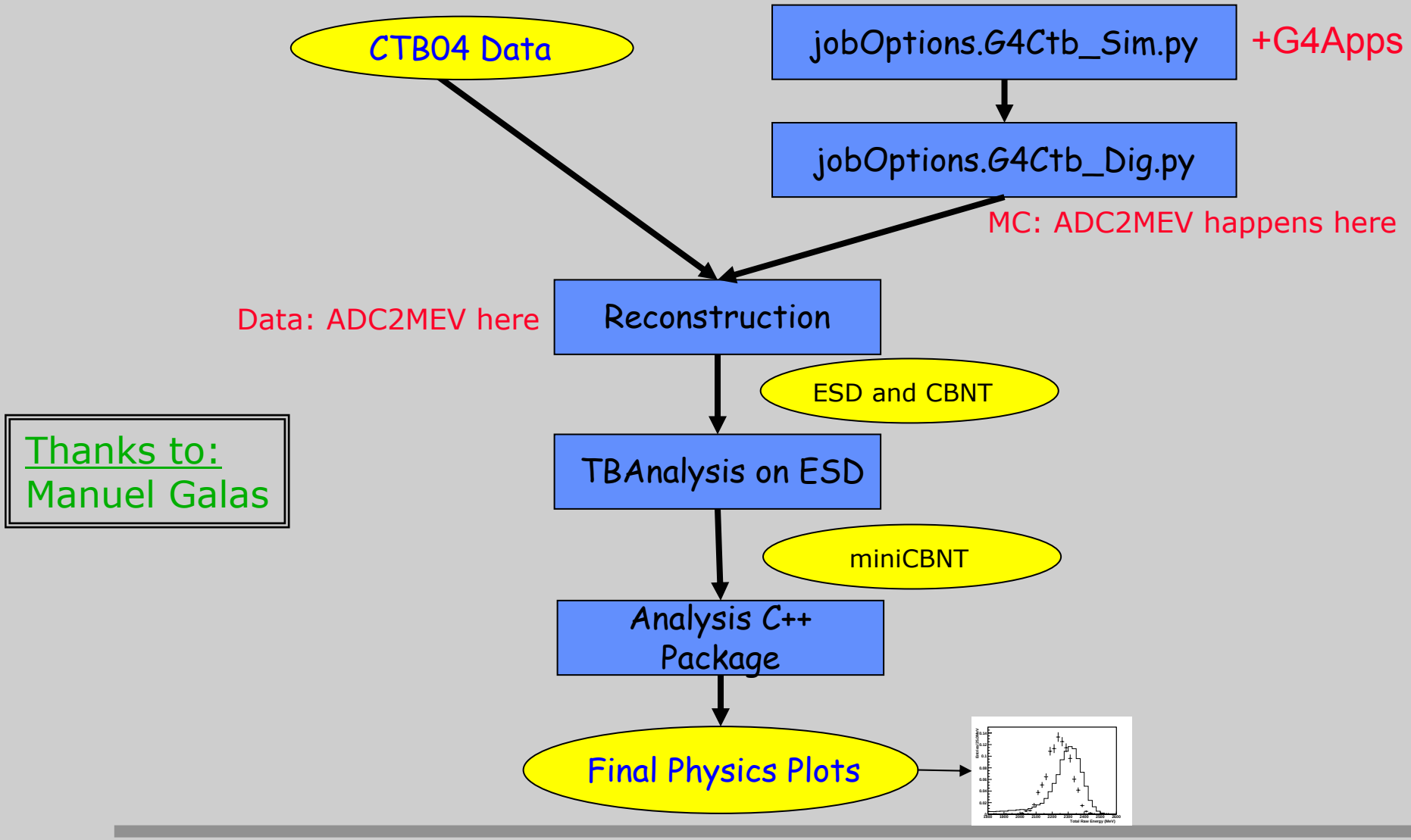
With
Manuel,Isabelle,Martin,Karina,Walter,…

LAr H8 Meeting, CERN,
5-April-2005

Motivation

- Go through a full MC vs Data analysis within Athena (preparation exercise)
- Find differences and understand what is missing from the MC before we have a realistic comparison with data (complicated)
  - To avoid "apples and oranges" comparisons
  - To avoid inducing systematics in the Data Analysis due to incomplete MC simulation (profiles, Charge coll, ADC2MeV)
- Ambitious: try to make some Data vs MC comparison plots and draw some prelim conclusions
  - Example: the parabola reconstruction of the ADCpeak.

Program Flow (release 10.0.1):



Thanks to:
Manuel Galas

Analysis

- Run: 1000947 50GeV electrons
  - Aug.Material scan, but this run has no extra material
- Parabola Energy reconstruction
  - 50MeV "cubicADCcut" in LArRawChannelSimpleBuilder.cxx
  - μA2MEV numbers from EMTB
- EMTB 3x3 clustering
- No cluster corrections, No Long. weigths
- No shower cuts yet. Cut only on Tile Energy and phi
- MC
  - New "pythonized" version (powerful)
  - Charge collection corrections
  - Tried to get "correct" beam profile …
  - ADC2MEV in Digitization step (careful to choose parabola)

ADC2MEV (Data vs MC)

$$E_{rec} = \mathrm{ADC2MEV} \cdot \left[\mathrm{ADCpeak} - \overline{\mathrm{PEDESTAL}}\right]$$

	ADC2DAC	DAC2Volt	Volts2μA	μA2MeV
How:	Ramps	38.147 uA/Volt	Injection Resistor	$(t_{drift}*W)/e$ * 1/SF
PS (EMB1)		38.147/R=0.114 nA		1250
S1 (EMB1)		12.62 nA		370.3703
S2 (EMB1)		37.58 nA		370.3703
S3 (EMB1)		37.58 nA		370.3703

MC ADC2MEV(PS) = 7.0
MC ADC2MEV(S1) = 2.5
MC ADC2MEV(S2) = 12.0

Data ADC2MEV(PS) ~ 7.2
Data ADC2MEV(S1) ~ 2.4
Data ADC2MEV(S2) ~ vary 10.0,12.0,16.0

How to go to the visible energy for Data: an example (S.P.)

EMTBeam Reconstruction :

$|\eta| < 0.8$

1250 MeV/μA Presampler

370.37 MeV/μA Accordion

$|\eta| > 0.8$

1176.47 MeV/μA Presampler

328.947 MeV/μA Accordion

Presampler :

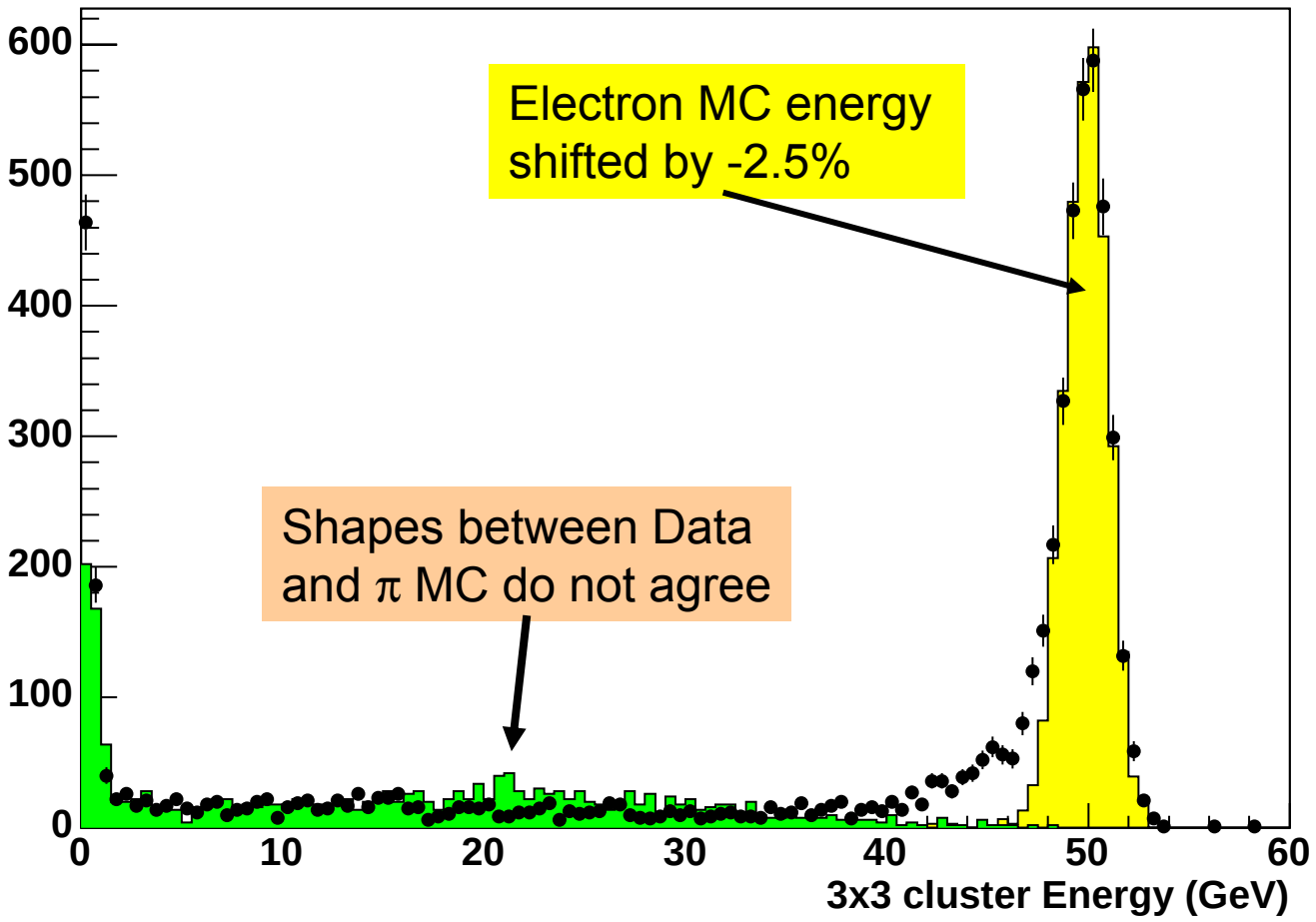
$\text{MeVper}\,\mu\text{A} = 420\,ns \cdot 23.6\,eV\,/1.6 \cdot 10^{-19}\,C$

Accordion :

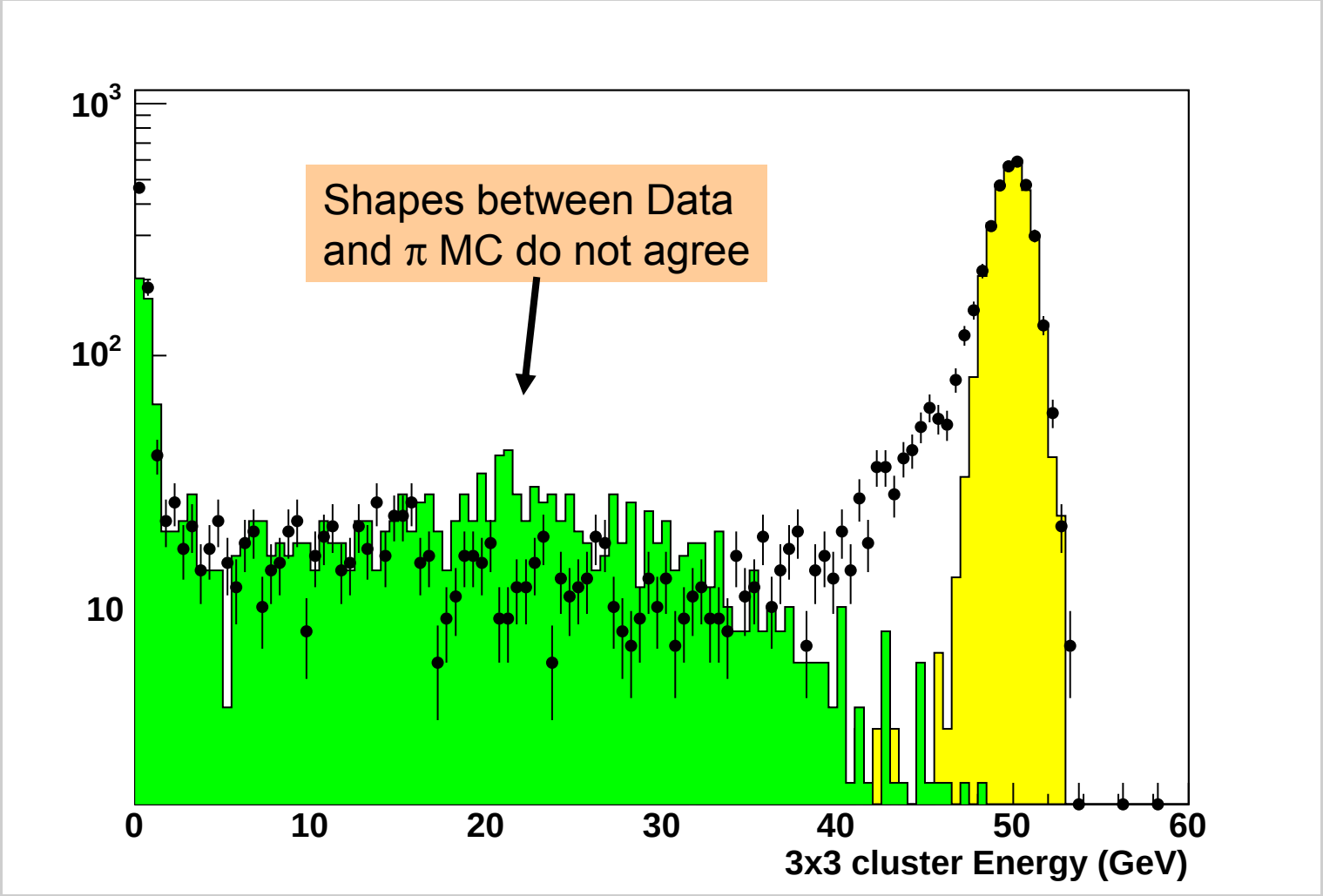
$\text{MeVper}\,\mu\text{A} = 470\,ns \cdot 23.6\,eV\,/1.6 \cdot 10^{-19}\,C$

SF(Presampler η<0.8)=t*W/e/1250 = 0.0496
SF(Accordion η<0.8)=t*W/e/370.37 = 0.18718

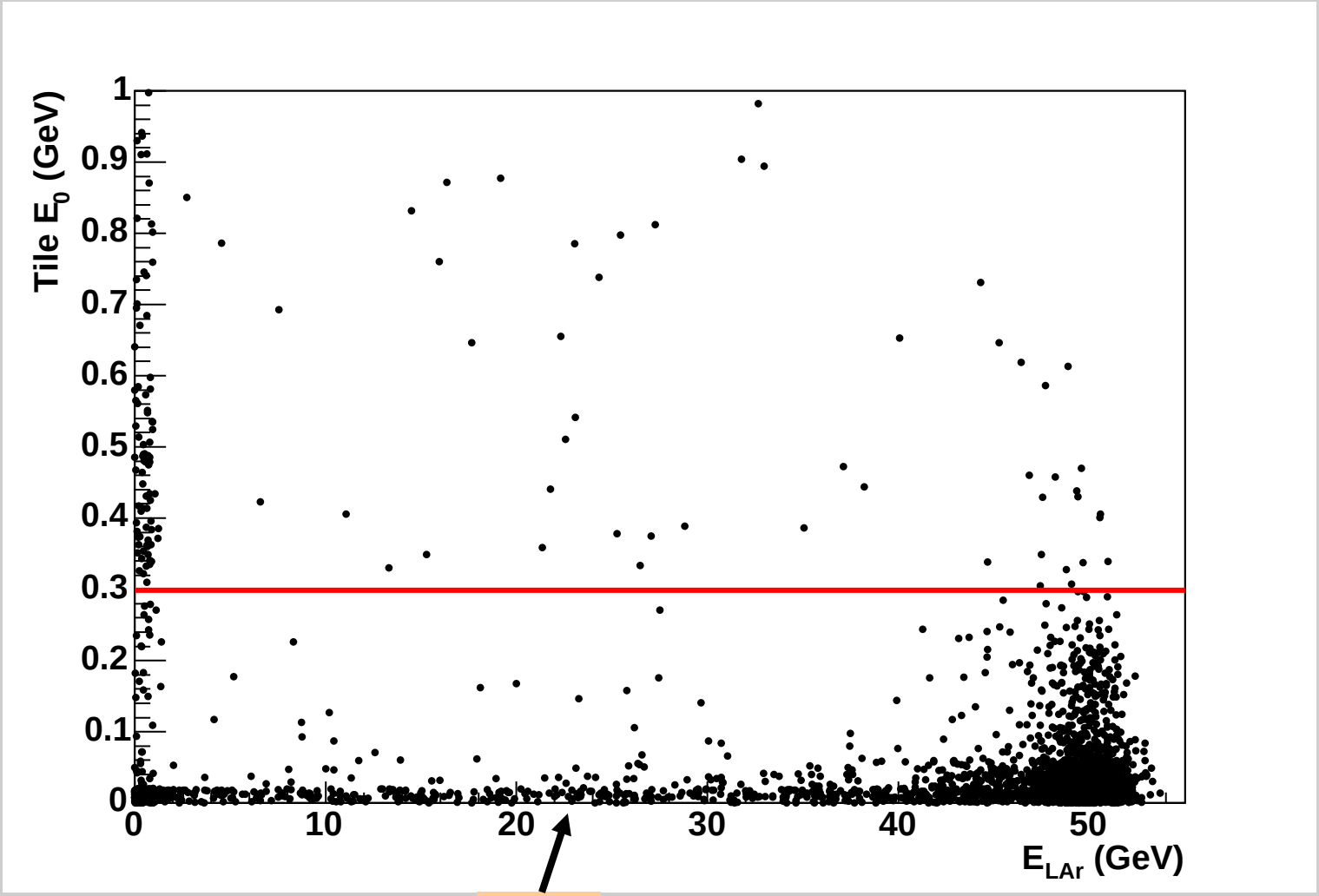
50 GeV data vs e and π MC



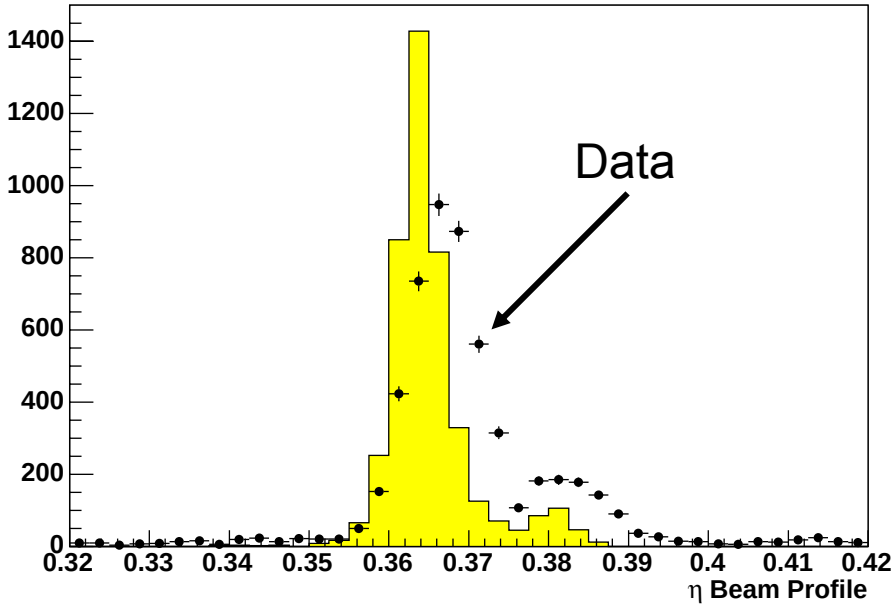
50 GeV data vs e and π MC

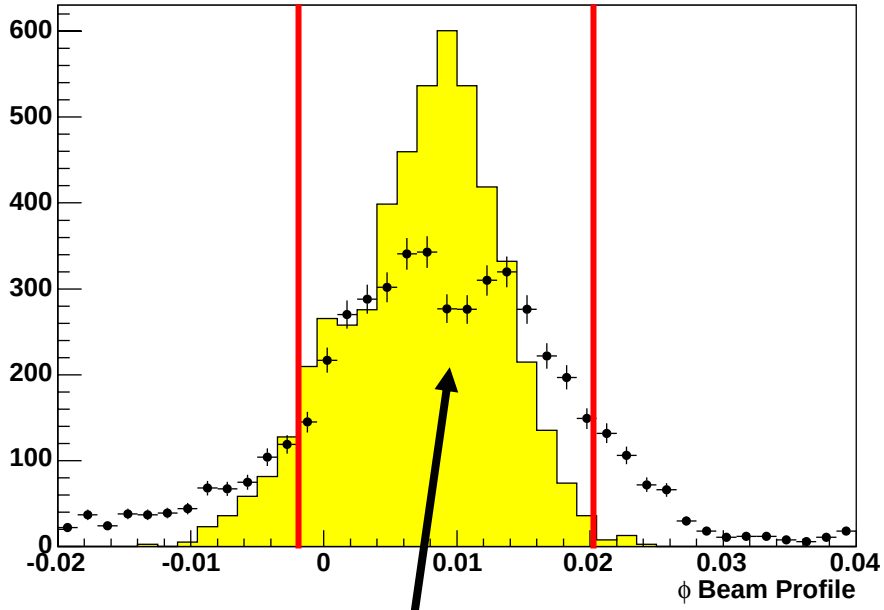


Energy in Tile0 vs Erec in LAr (Data)



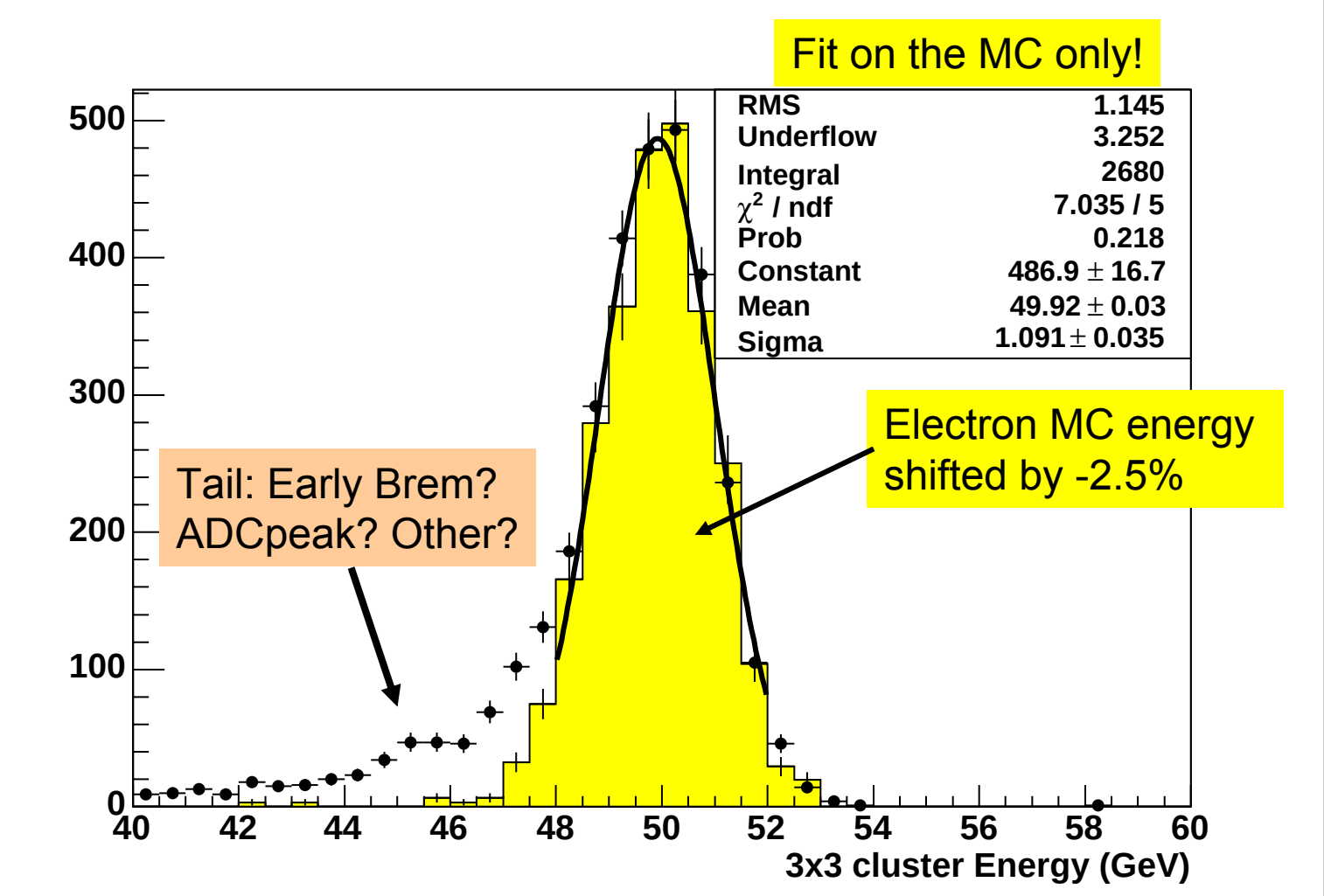
Beam profile: we need a match with MC



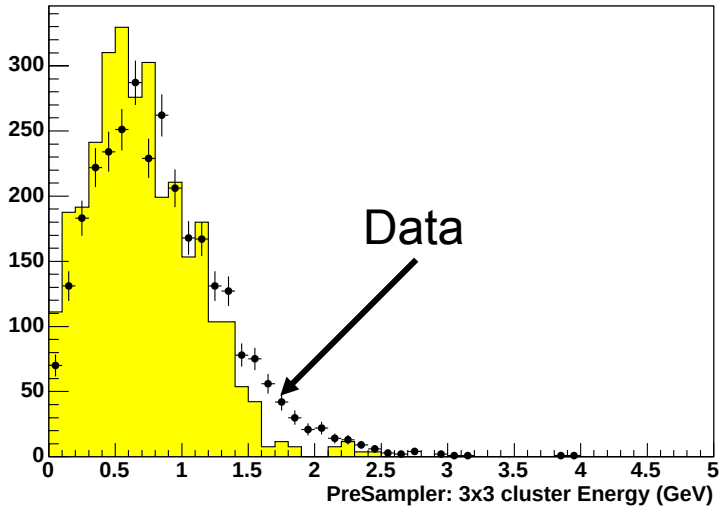


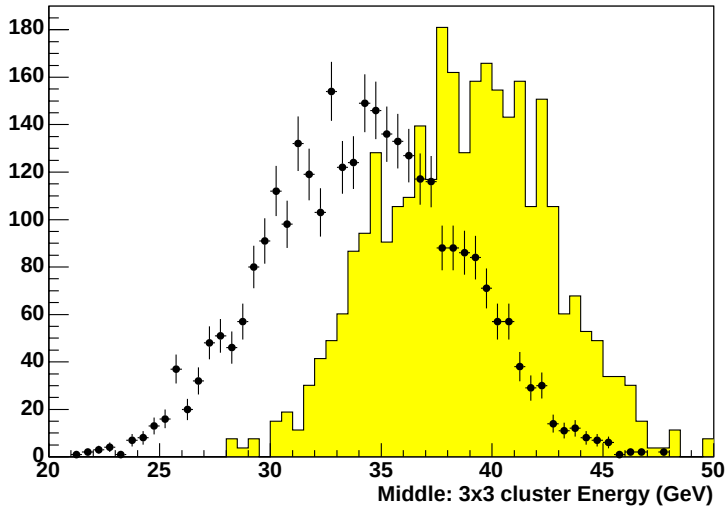
Dip is not appearing in MC

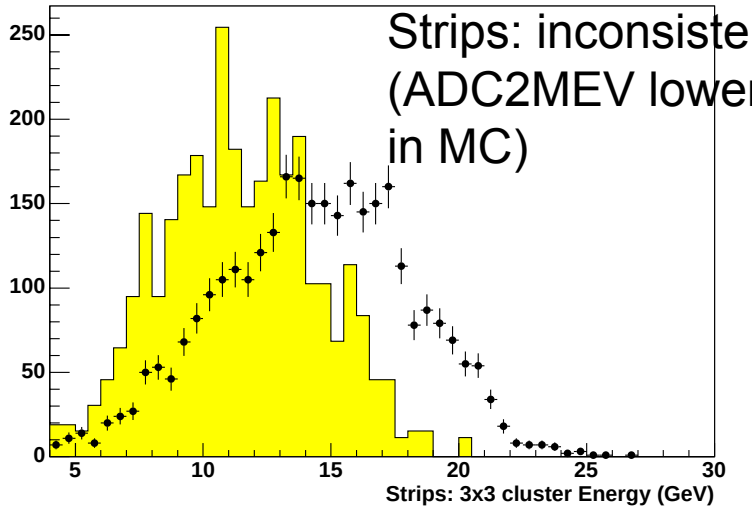
Erec after only Tile cut (E_0<300MeV)

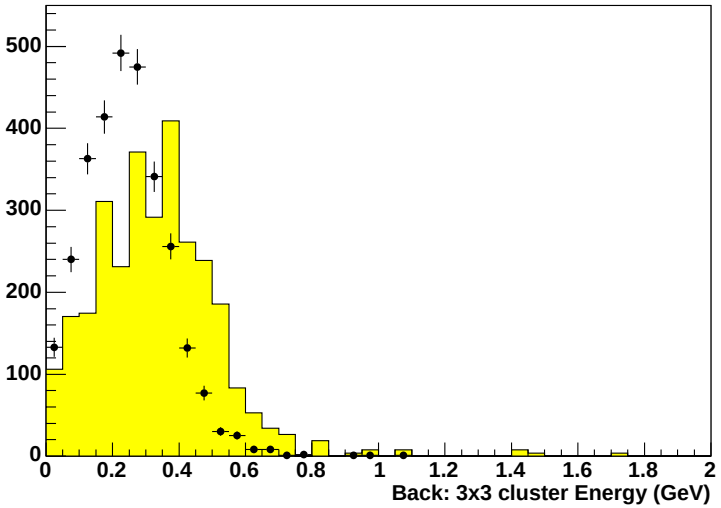


Erec per LAr Layer for 50GeV e (we need the visible Energy)

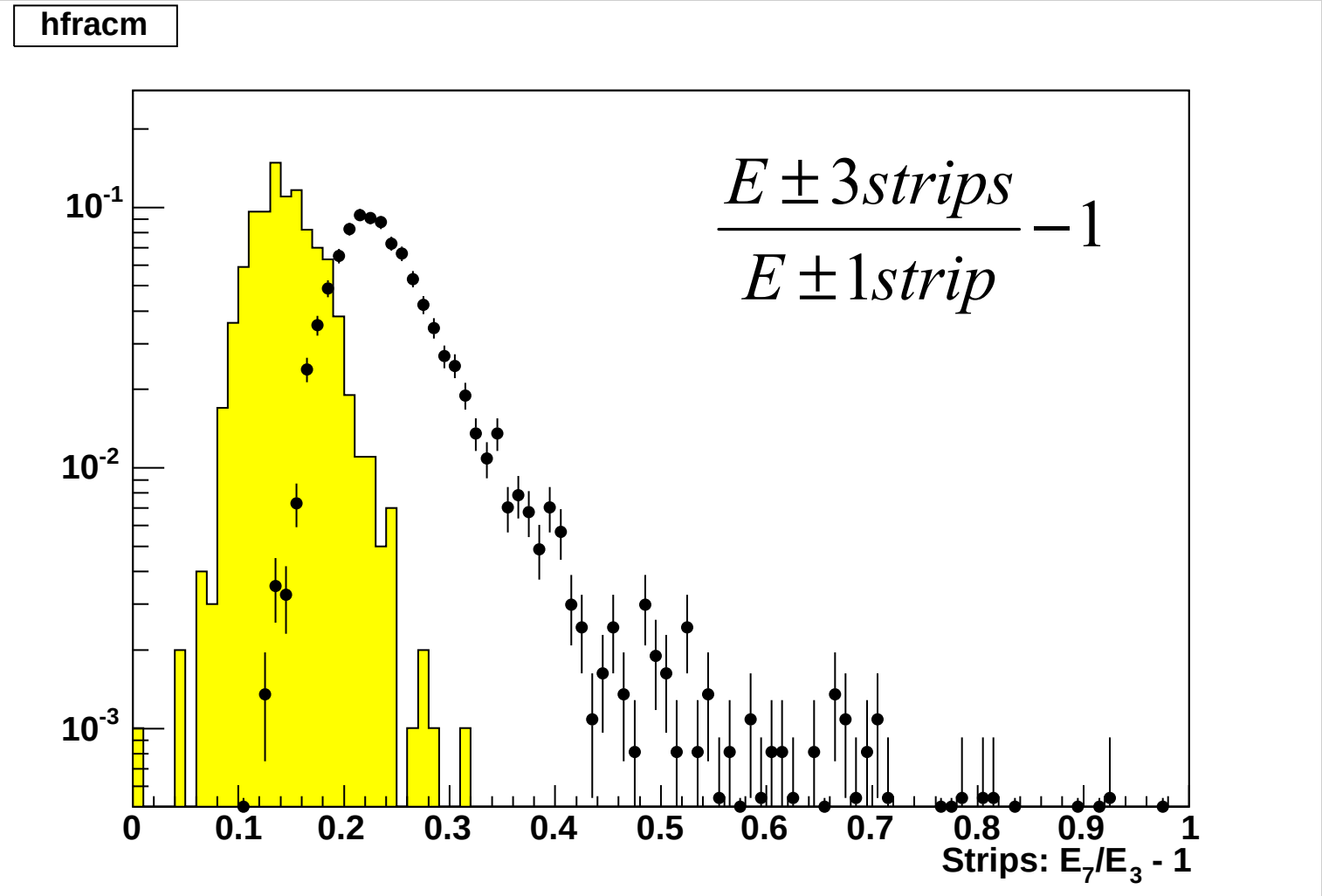




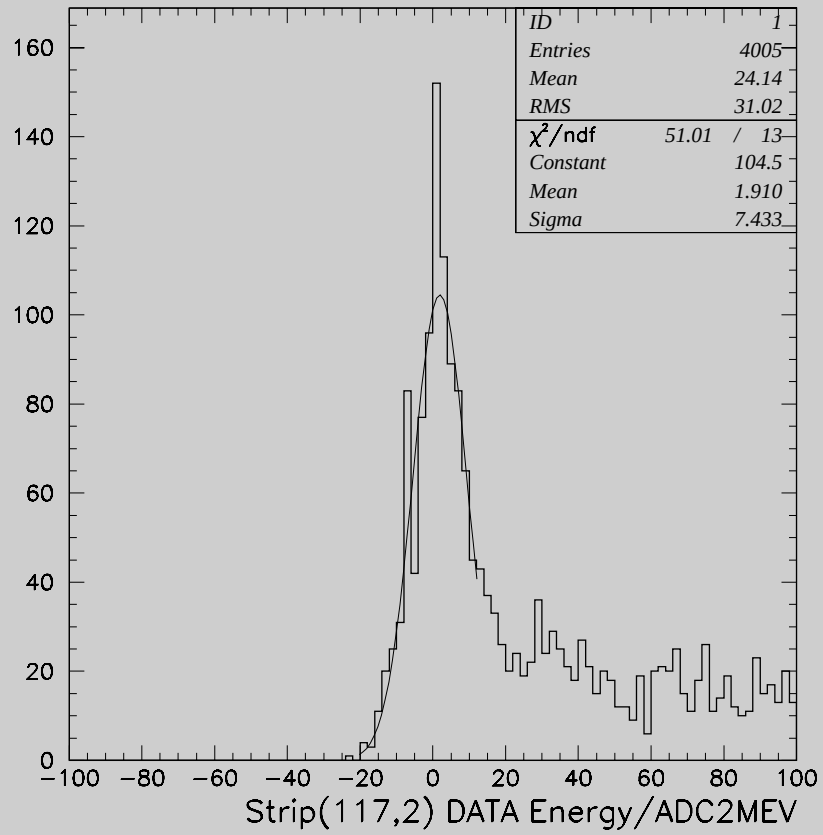


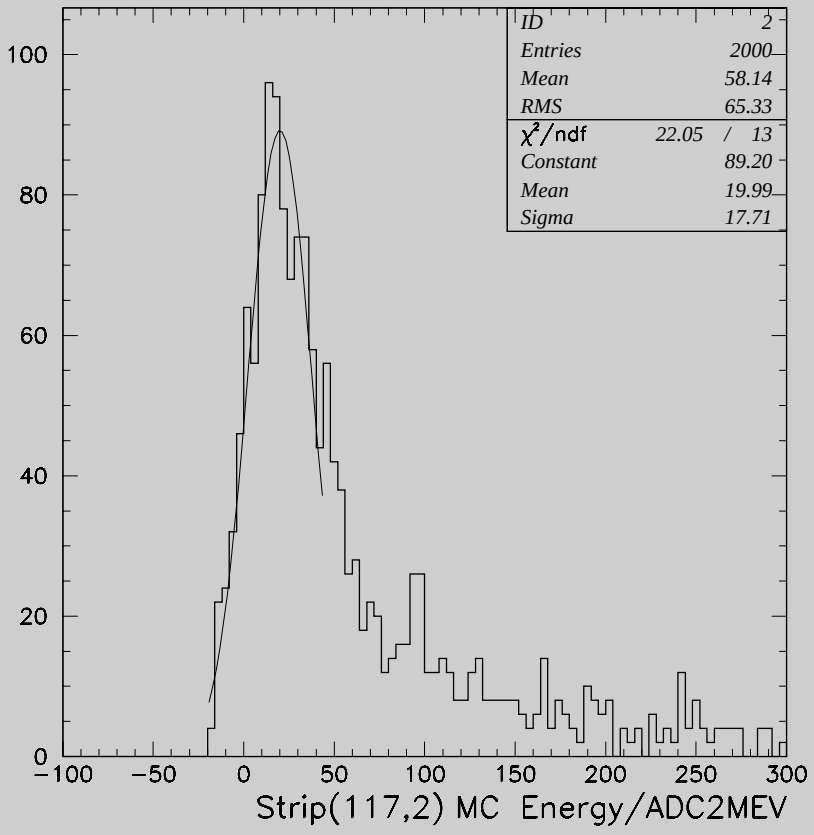


Strips: for Erec>45GeV, Data show large fraction of Energy outside core



Check a strip (η,ϕ)=(117,2): usually part of the electron cluster





This one looks narrower in the Data: to be checked

Summary/To check (before cluster calibrations/corrections)

- Need to check the agreement of the MC geometry with the runs I am analyzing (true for everybody)
- Need to run MC with correct beam profile
- Need to compare layer response visible energy
- Strip response needs to be understood
  - Probably MC is not reflecting correctly the noise (including cross-talk)
- Electron tail needs to be understood
- Study different beam energies
- **On the positive side**: the non-tail region of the electron energy is in agreement with MC giving a ~1.1GeV Gaussian σ for 50GeV