

Calorimeter MC and Data

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Monte Carlo

Goal: Investigate influence of GEANT cuts on MC calorimeter energy

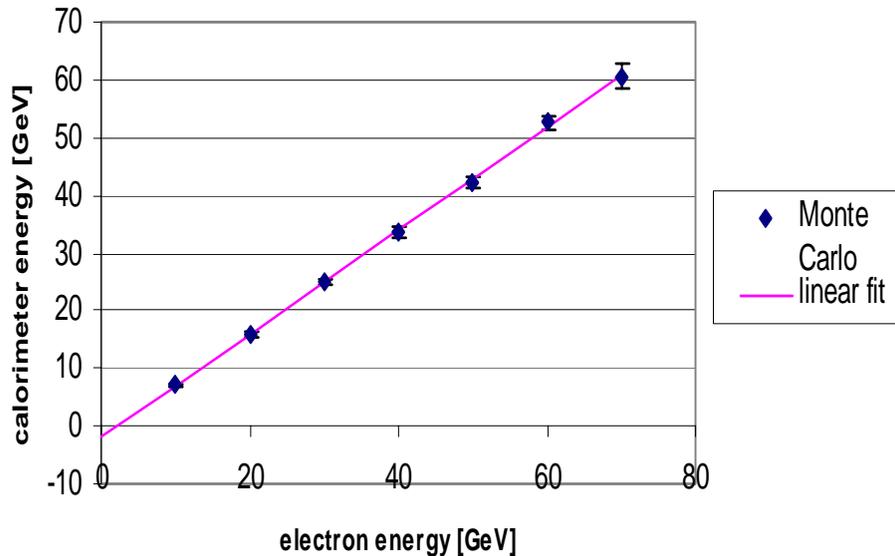
Method: Generate single electron in target area, record EMCal Energy for different parameter values

Parameters:

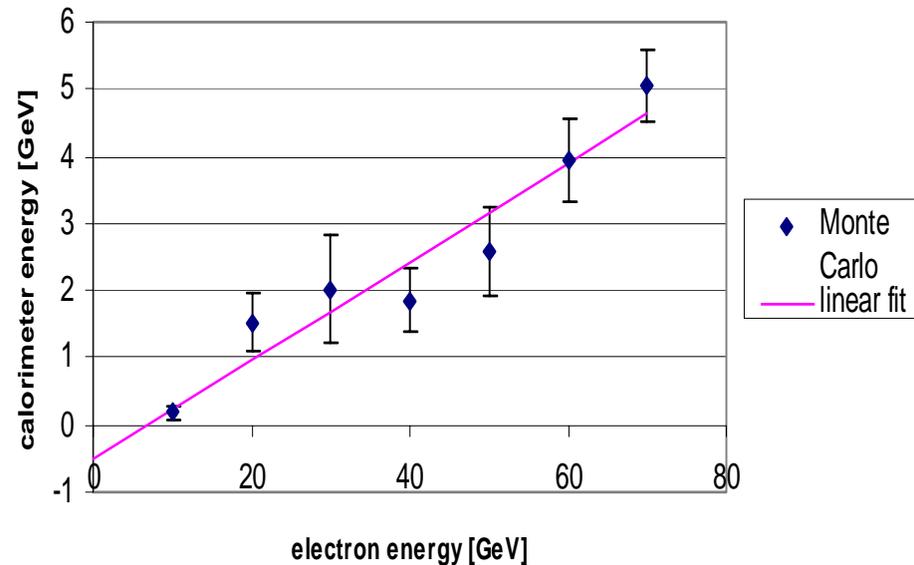
- GEANT cuts (γ , e, had, n) 5, 10, 25, 50 MeV
- Electron energy 10..70 GeV in 10 GeV steps
- Electron originating at $z = 0, 100$ cm (in E872 coordinates)
- Block cut fixed at 250 MeV

Energy dependence (examples)

Single electron at z = 100 cm (50 MeV GEANT cuts)



single electron at z = 0 cm (5 MeV cuts)



Functional dependence can be approximated by:

$$E_{EMCal,MC} = f_{reg}(E_e - E_{thr})$$

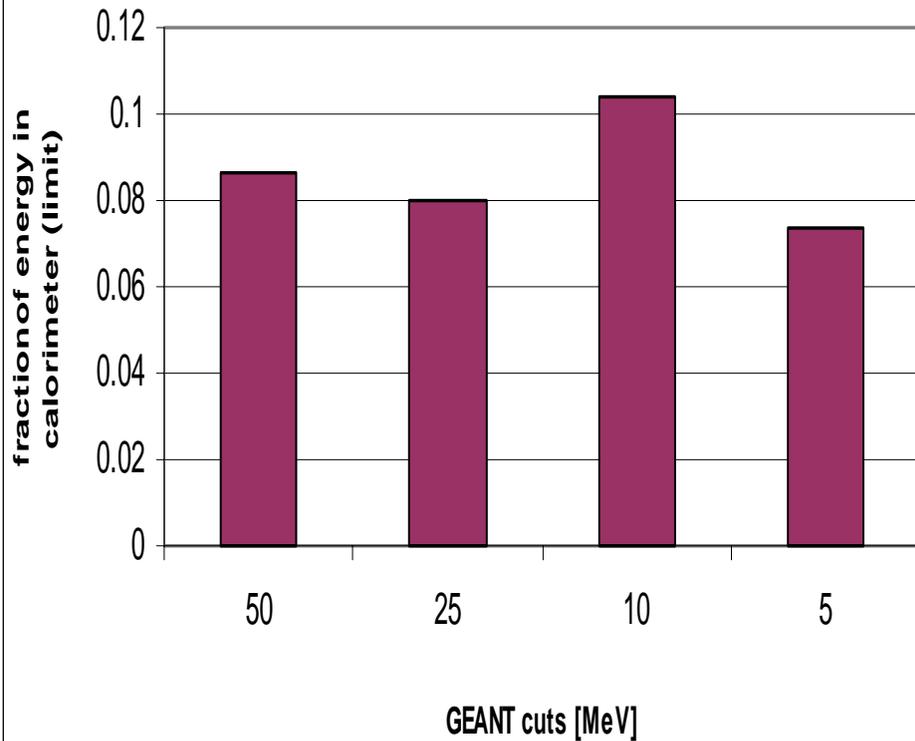
f_{reg} : fraction of energy registered in EMCal

E_e : electron energy

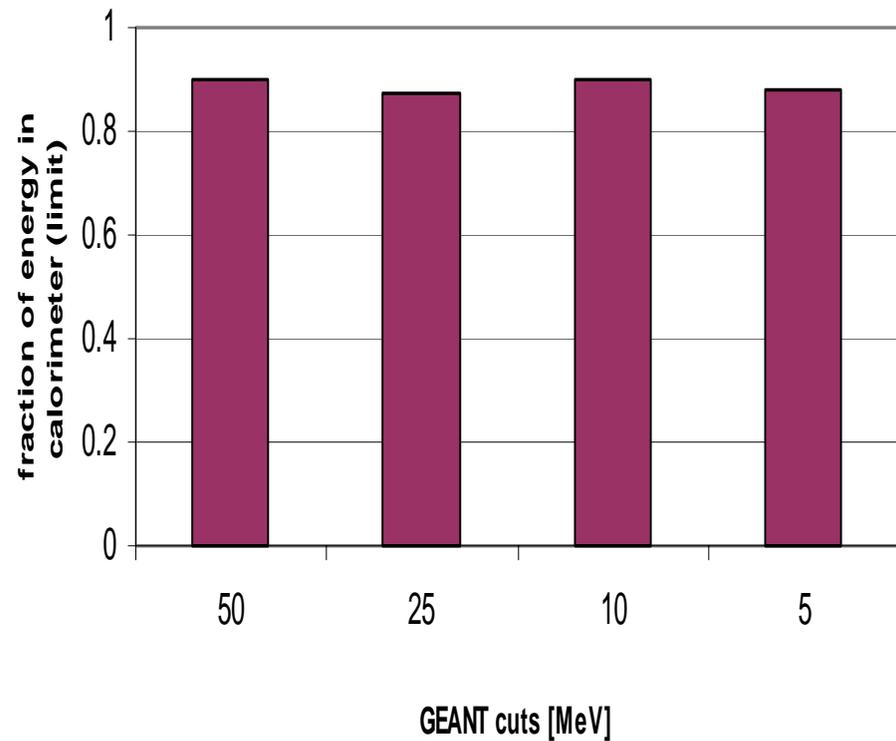
E_{thr} : “threshold” energy

Registered fraction

electron at z = 0 cm

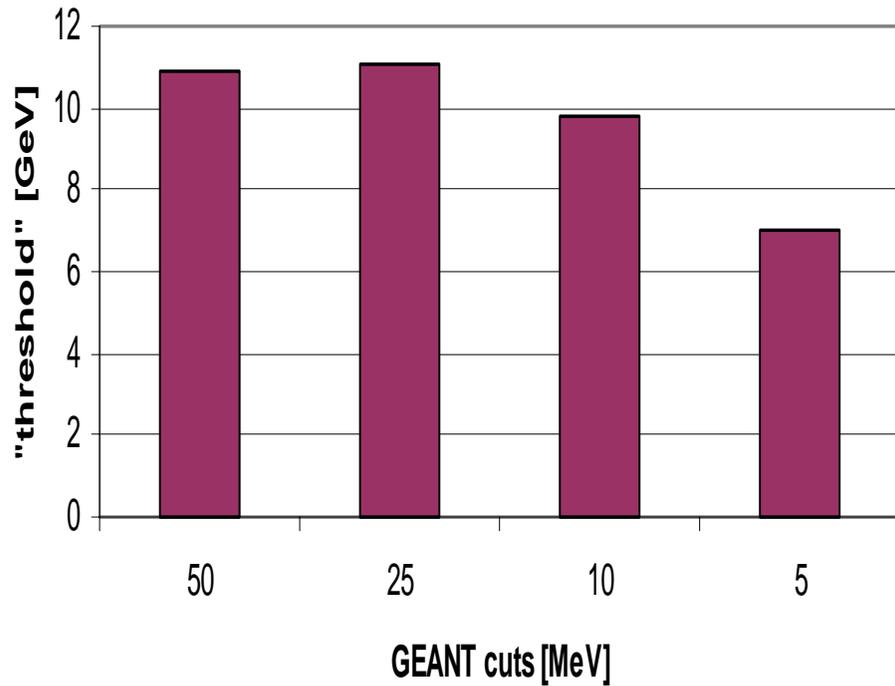


Electron at z = 100 cm

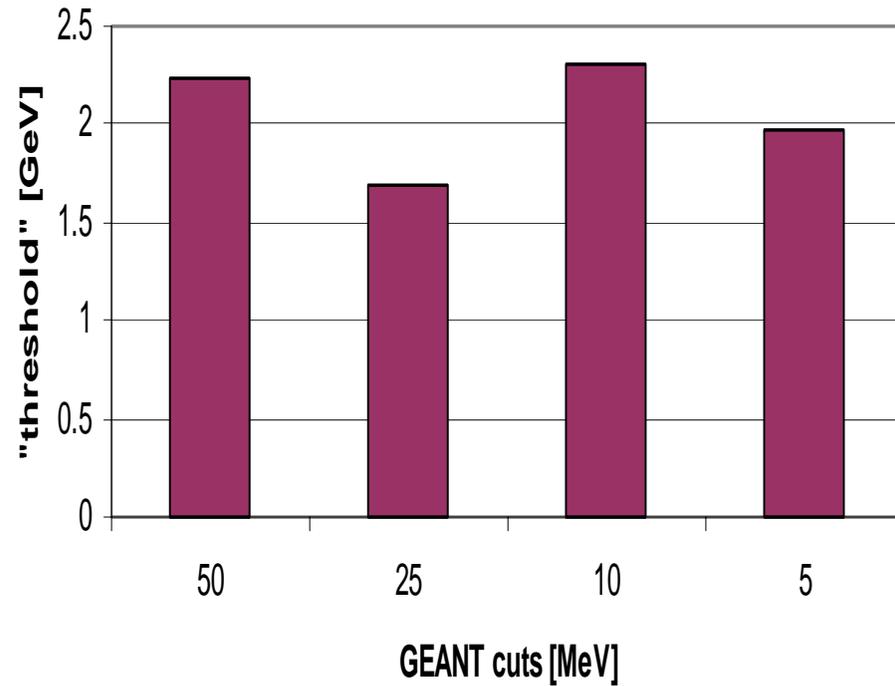


“Threshold” energy

electron at z = 0 cm

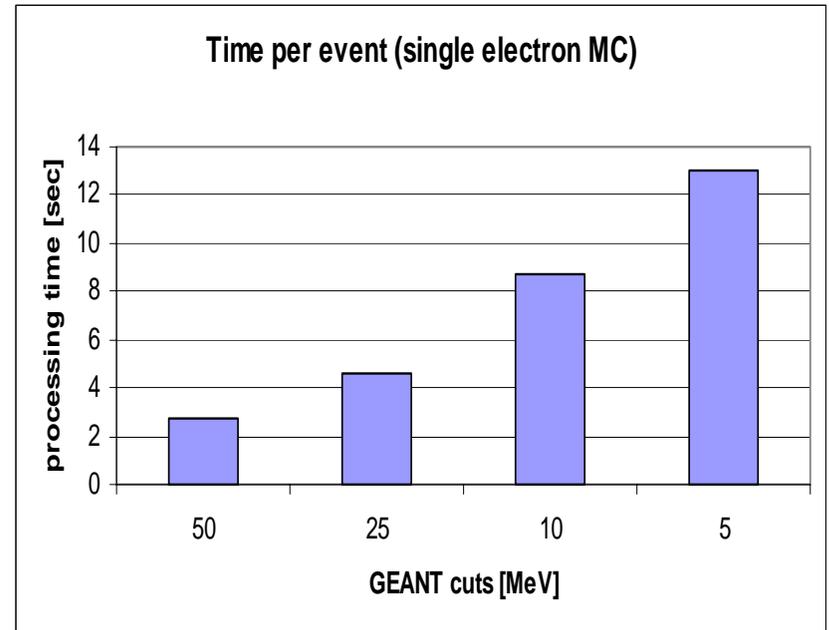


electron at z = 100cm



Conclusion (MC)

Lowering the GEANT cuts below 50 MeV makes little difference for the quality of the Monte Carlo, but takes a lot longer.



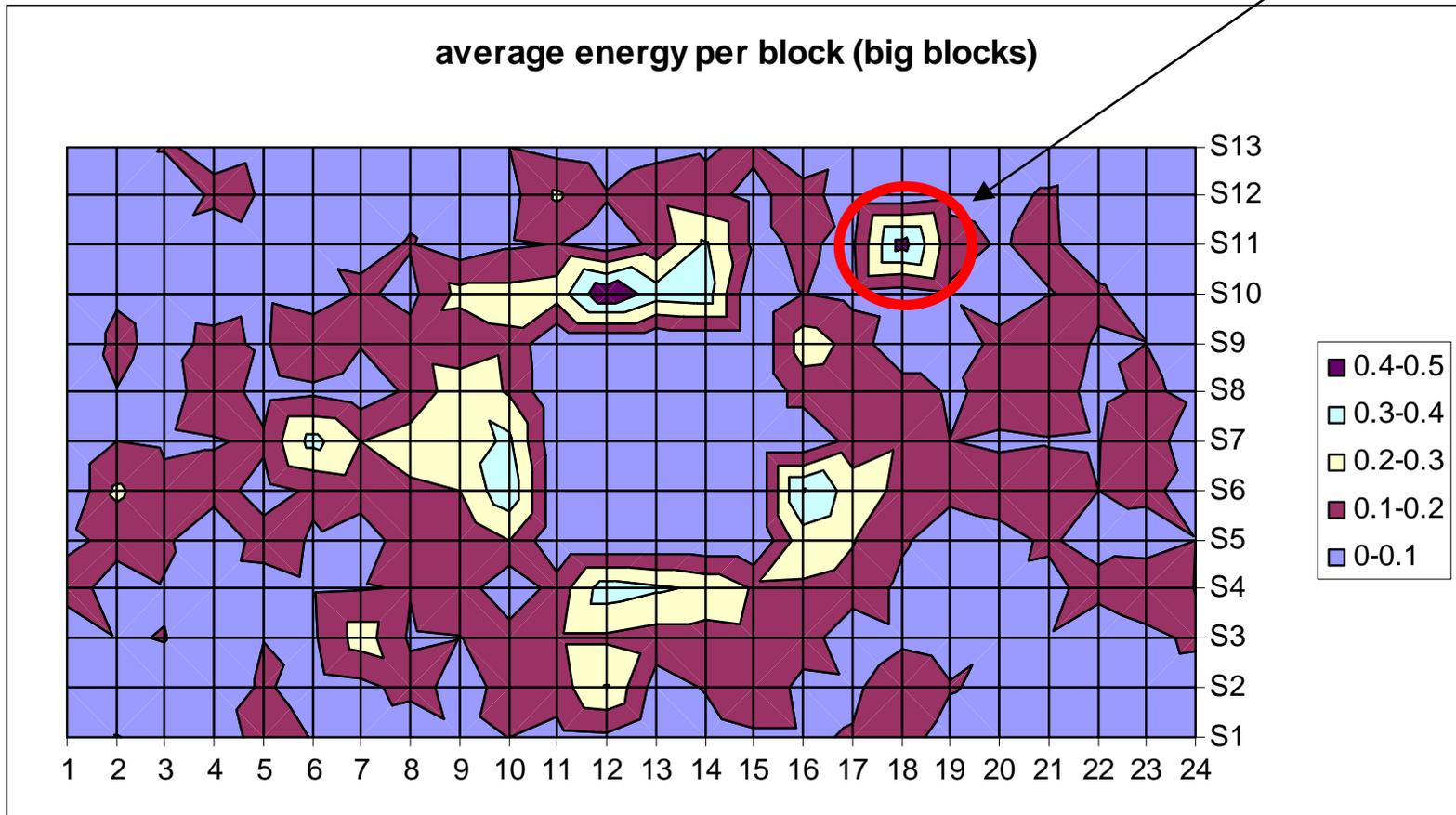
Calorimeter data spectrum

Goal: Determine fraction of electron events in event sample

Method: Fit calorimeter energy data to Monte Carlo spectrum leaving $eCC/total$ as only free parameter

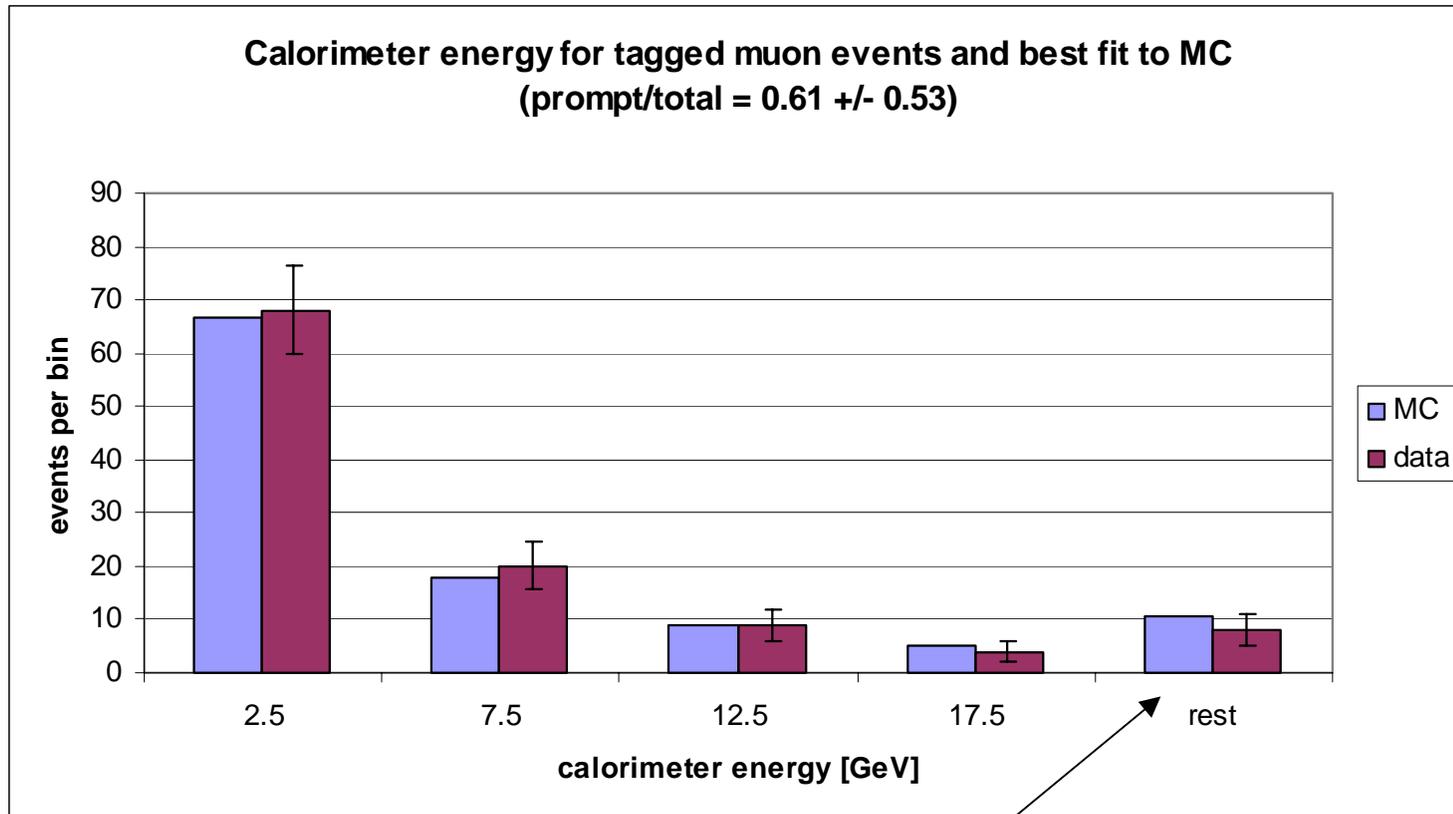
Energy per block

Hot block, see:
3253_08684
3353_25590



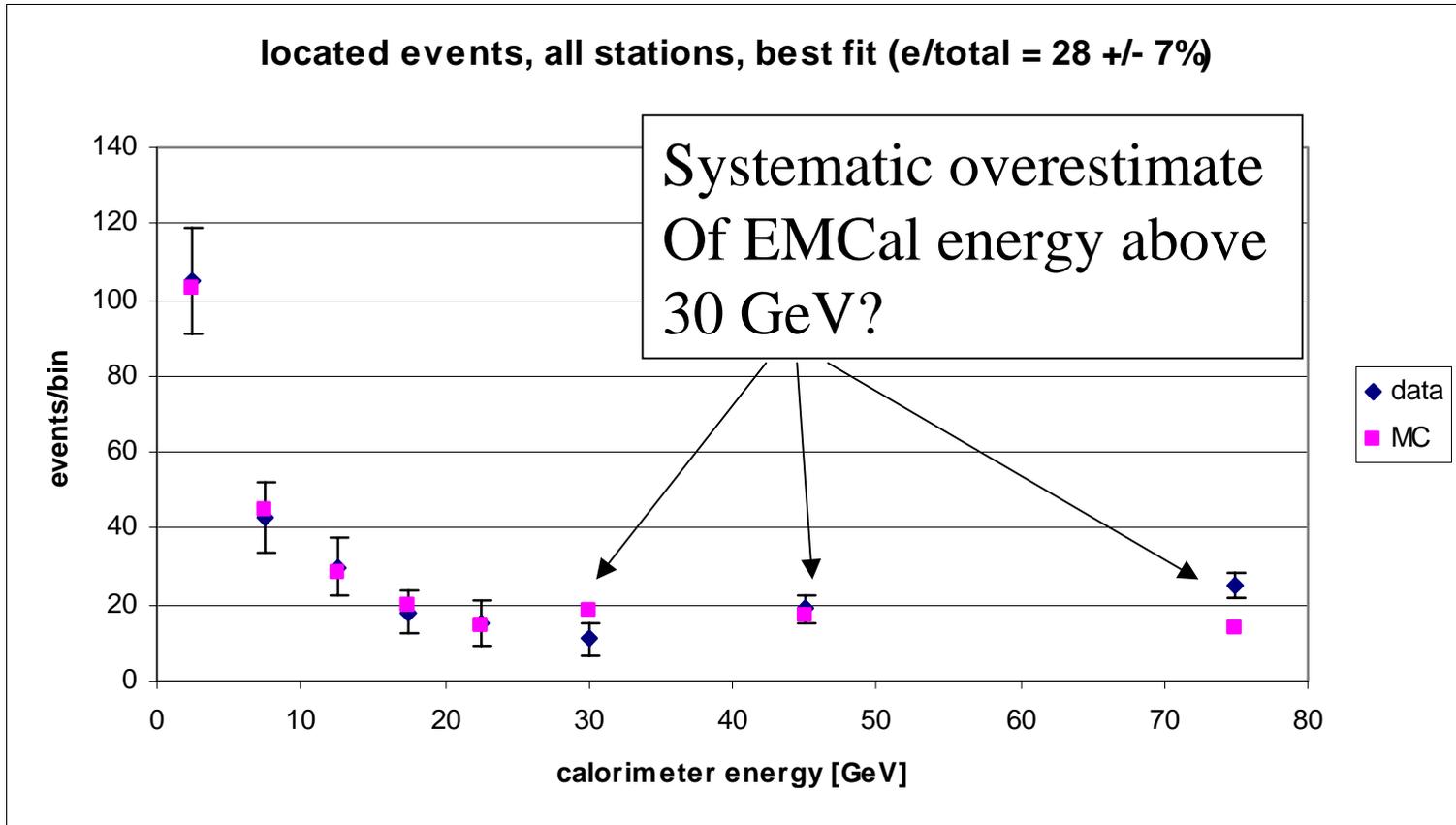
Plot for small blocks looks ok (not shown)

Muon events



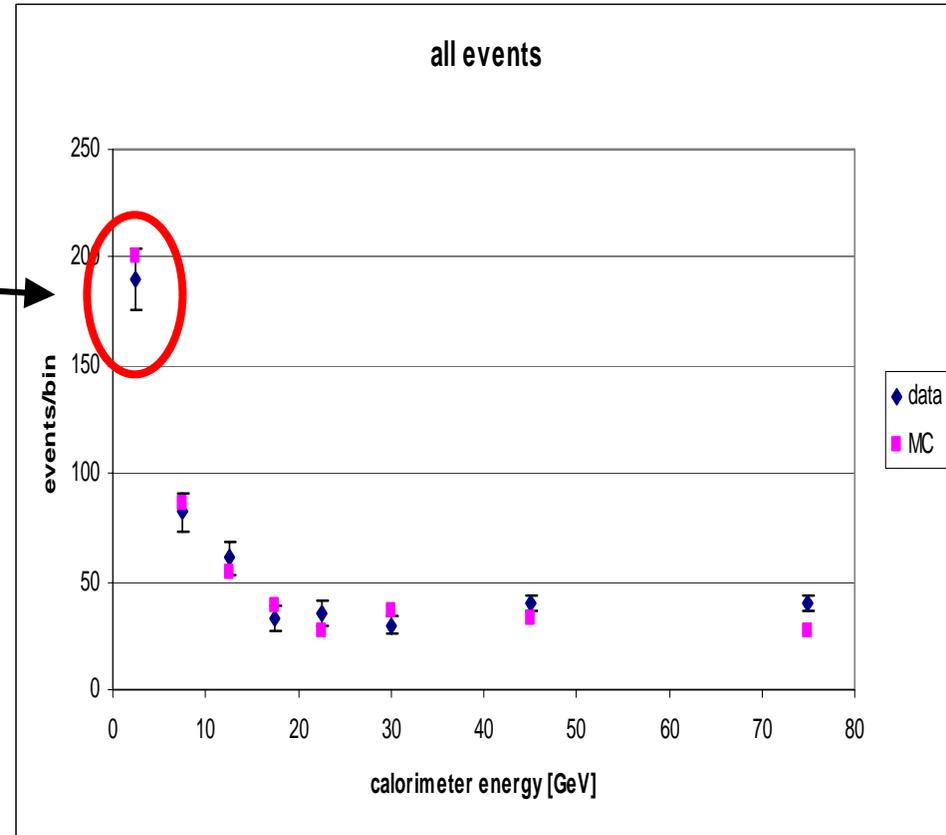
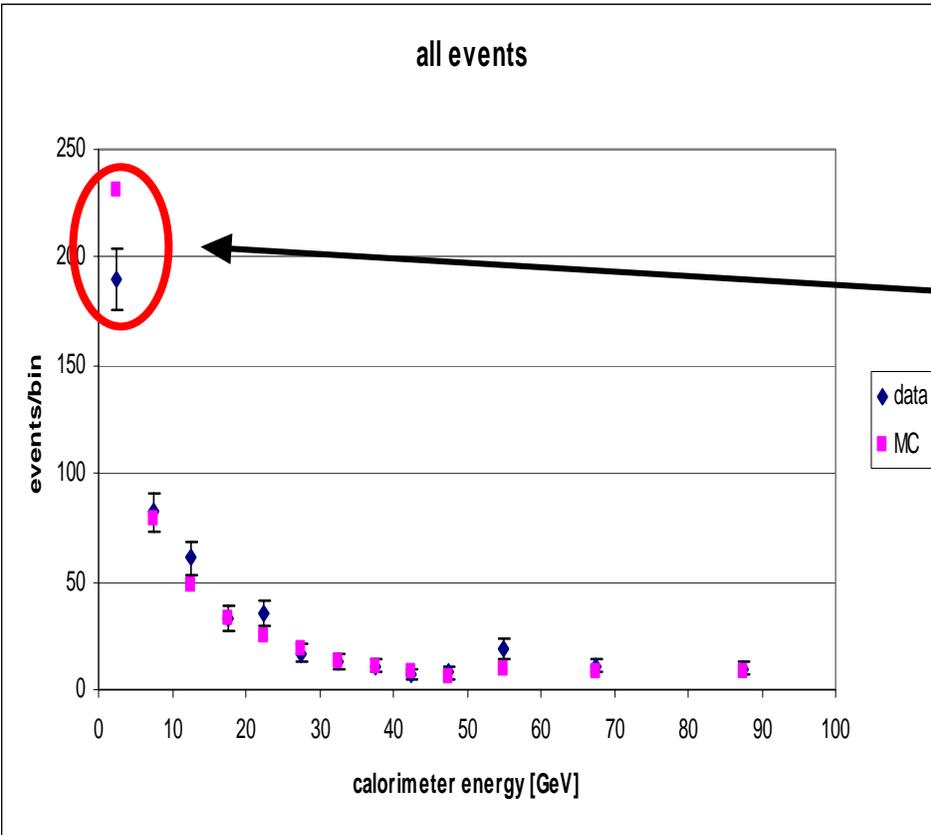
No excess!

All (located) events



Result is the same for χ^2 and $\log(L)$ fit

Attempted events

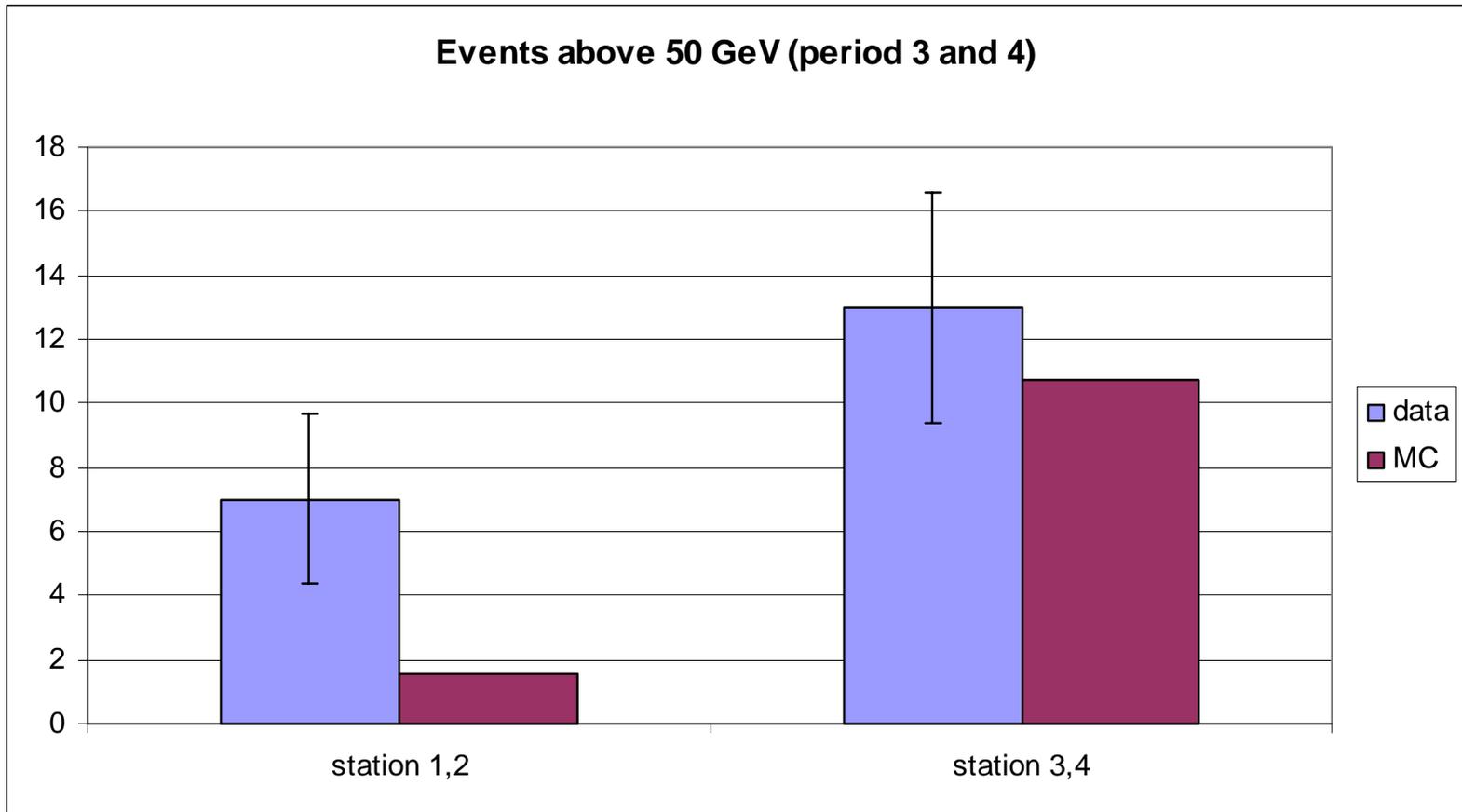


Not track weighted

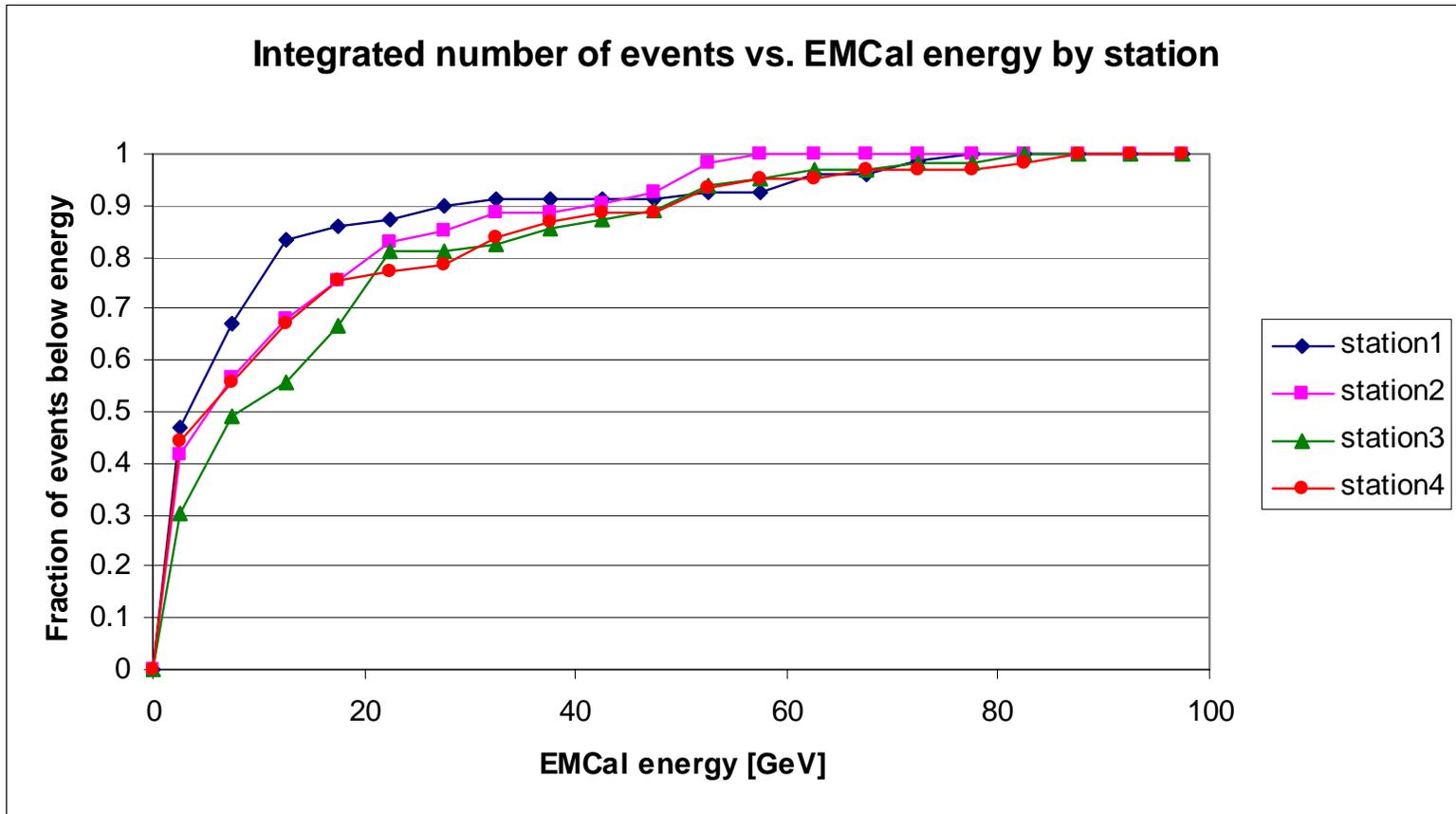
Track weighted

Value for e/CC from fit to located events

High EMCAL energy events



Energy spectrum by station



Conclusion

- EMCal Monte Carlo good only for located events (because of unknown emulsion track dependent efficiency for 499 sample)
- Data supports expectation ($N_{\mu,prompt} \approx N_{\mu,nonprompt} \approx N_e$) from muon fit, theory
- Strange behavior at high energies, but probably no “junk” in EmCal, hot blocks