

Atmospheric ν_e Search III

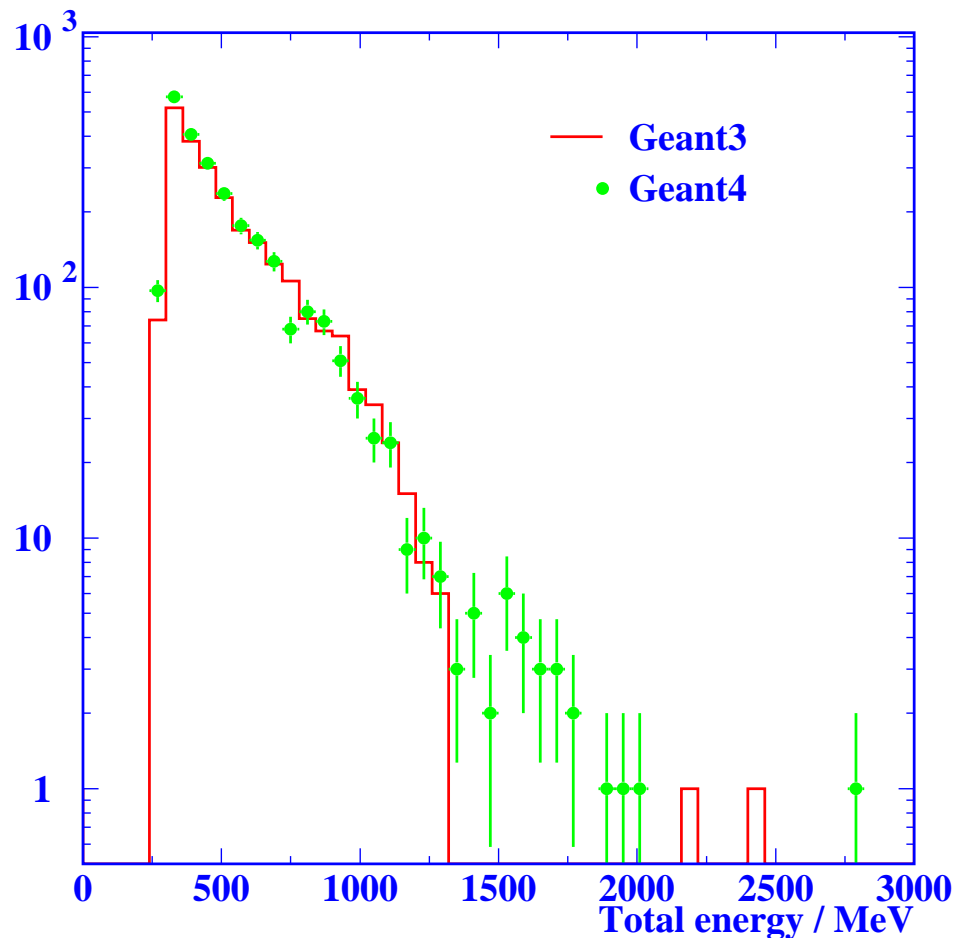
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- Compare Geant3 and Geant4 simulation of 100 GeV muons in CALDET
Attempt to understand background in atmospheric ν_e selection
- Studies with muons entering perpendicular to planes found little difference between G3 and G4, except G4 more hadronic showers
- Try muons incident parallel to planes, at approx centre of middle steel plane
- As before, only consider high energy tail of events: those with > 300 MeV deposited in scintillator

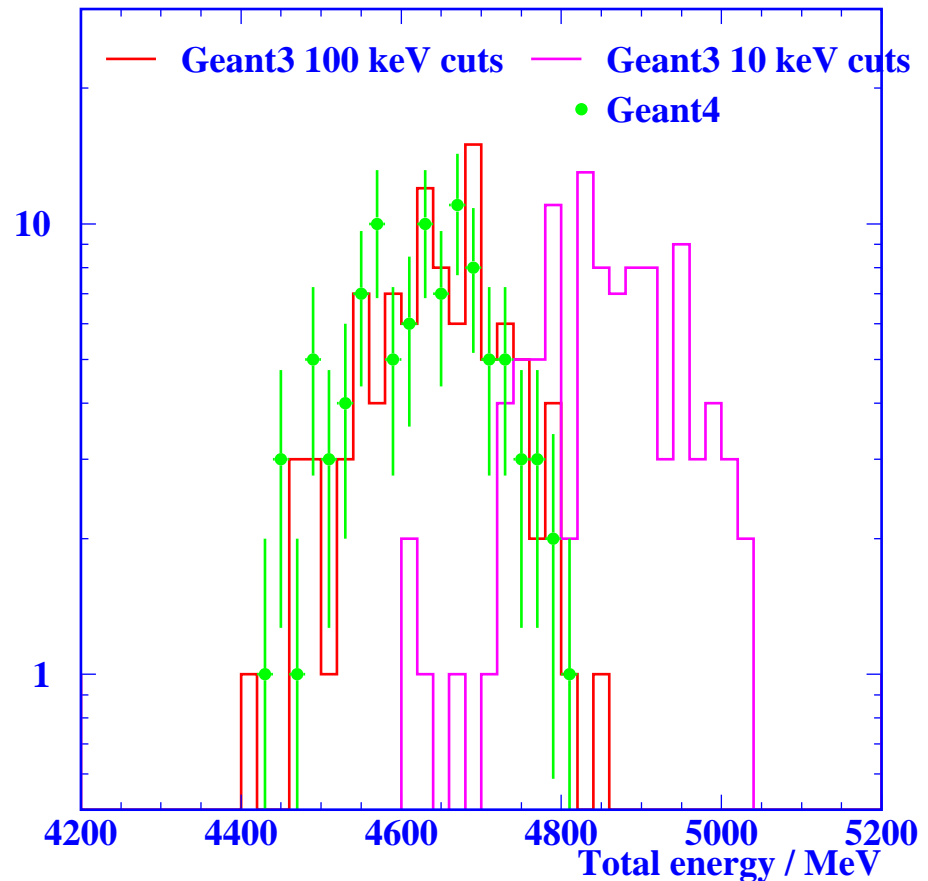
Total Energy Deposited

- Events passing 300 MeV cut in 1M generated:
G3: 2388
G4: 2503
- Total energy deposited similar
G3: $\langle E \rangle = 538 \pm 4$ MeV
G4: $\langle E \rangle = 536 \pm 5$ MeV
- Geant4 more high energy tail?
- BUT how does energy normalization really compare?

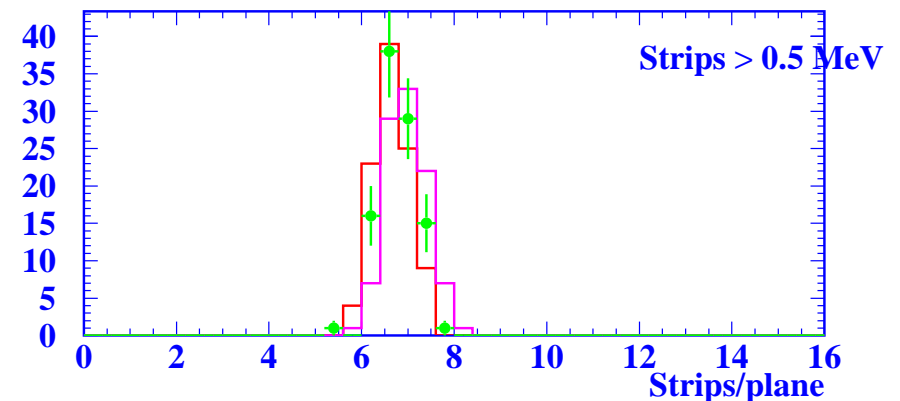
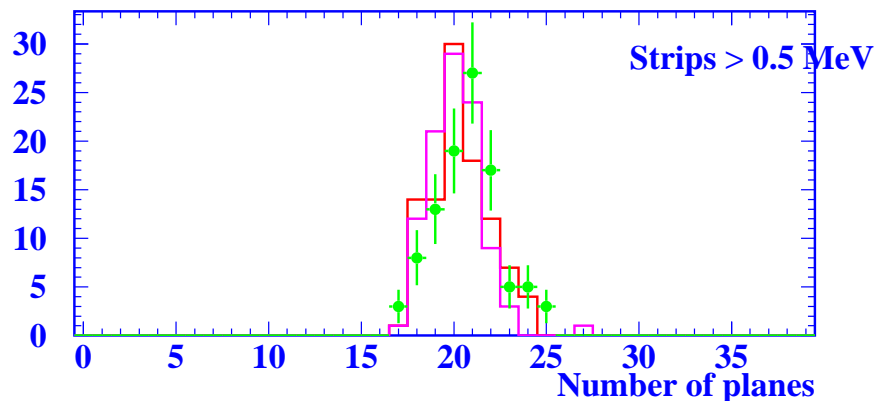
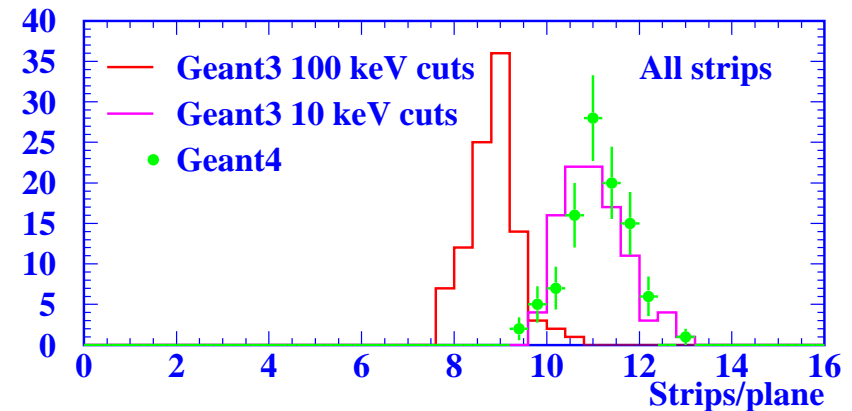
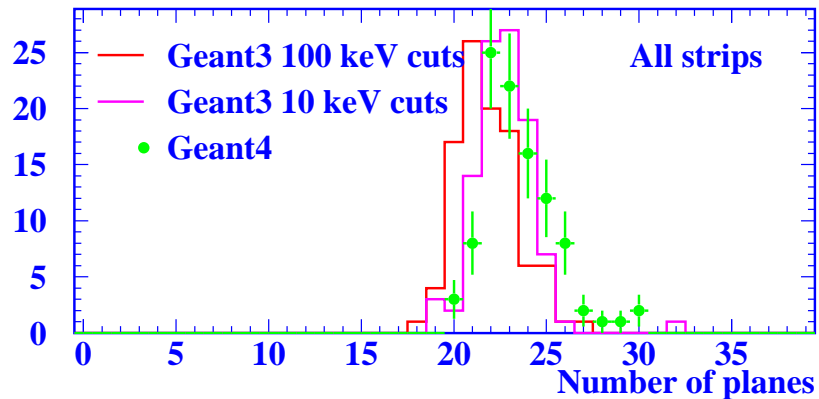


Energy Normalization

- Check with 100 GeV electrons (perpendicular to planes)
- G3 and G4 normalizations agree within 0.5% using 100 keV / 0.3 mm cuts
- But G3 energy increases by 4.5% if use 10 keV cuts
- Does not explain why G4 distribution cuts off at lower energies than G3 for muons perpendicular to planes

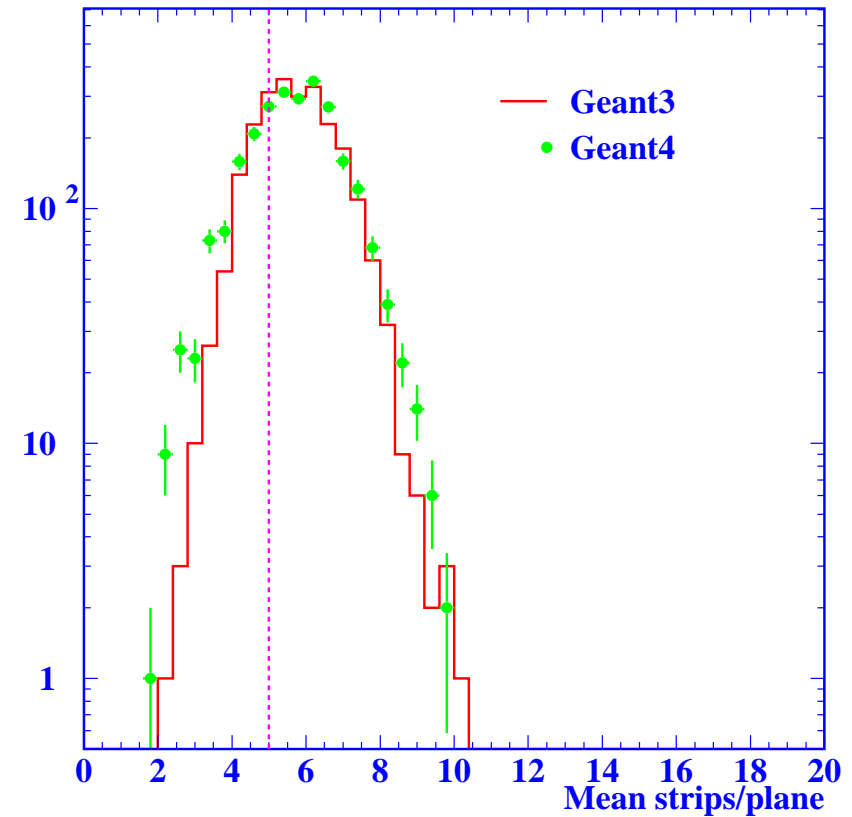
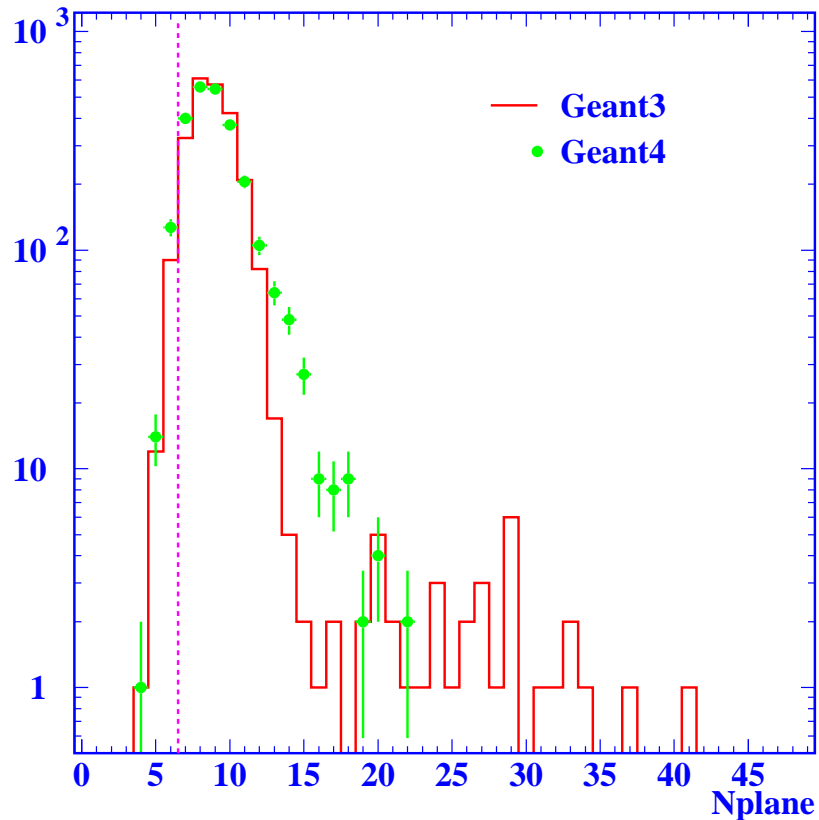


Electron Showers



- Shower shapes depend on which strips are included
- For muon studies, only include strips with >0.5 MeV (~ 0.3 mip)
- Look at variables used in ν_e selection cuts

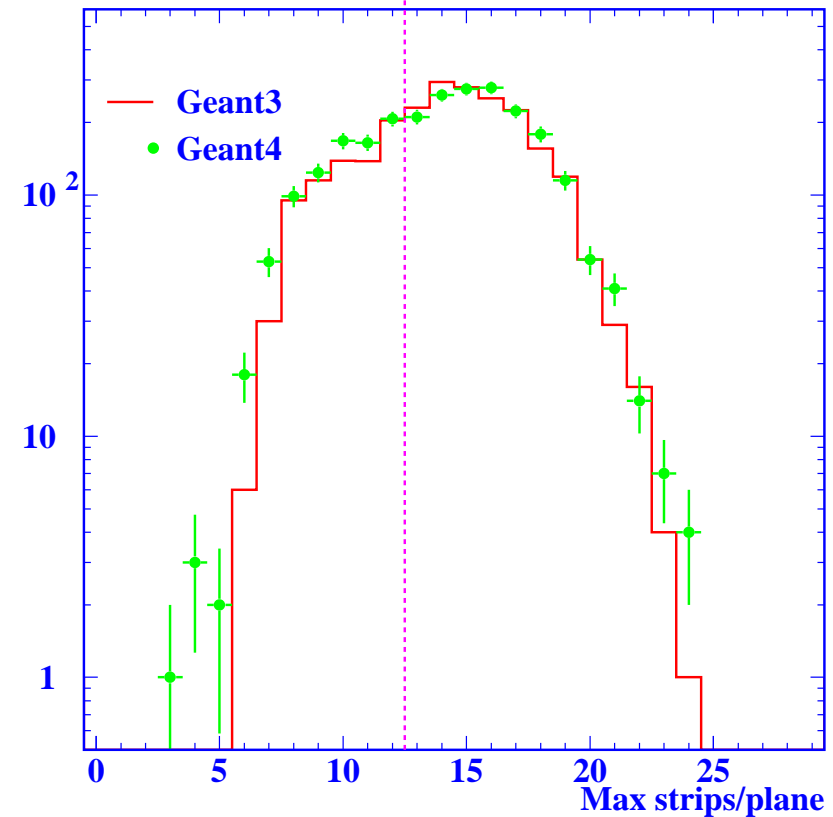
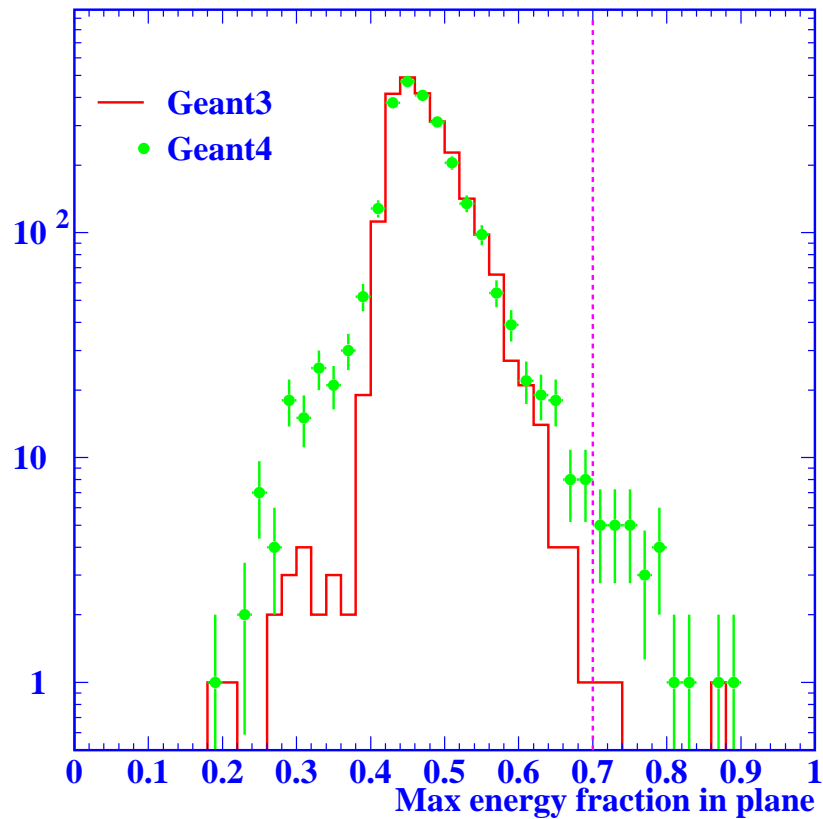
Vertical muons



- Filter requires ≥ 7 planes
- High tail from hadronic interactions

- ν_e selection requires < 5 strips/plane

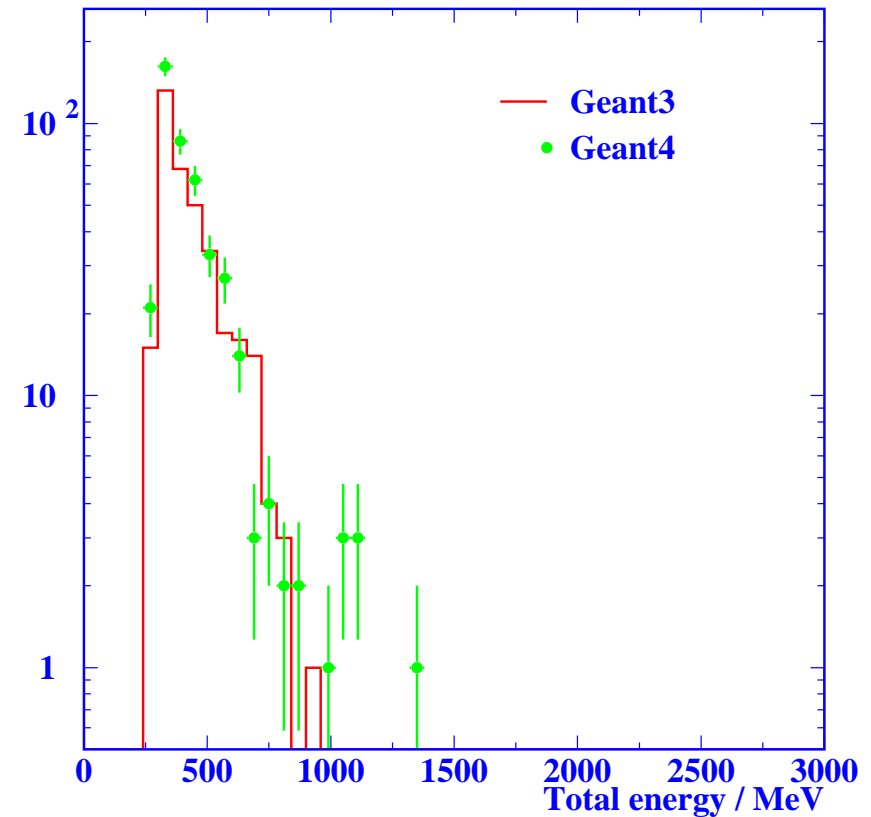
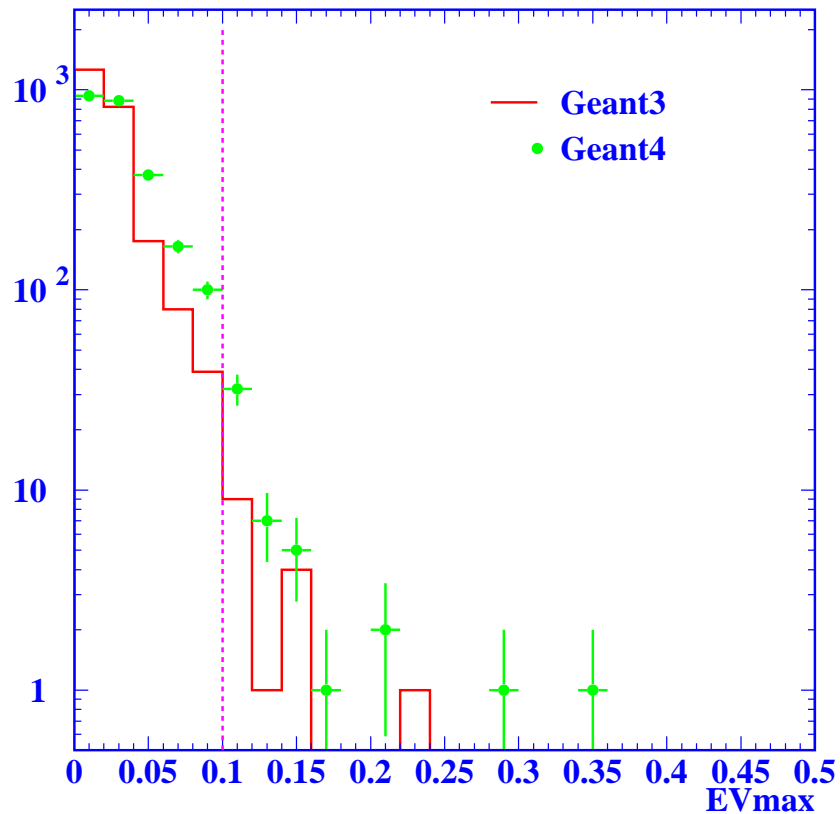
Vertical muons



- ν_e selection requires maximum fraction of energy in one plane < 0.7

- ν_e selection requires maximum strips in any plane ≤ 12

Vertical muons



- ν_e selection requires maximum eigenvalue of 'MOI' tensor < 0.1

- Selected events

Summary

- G3 and G4 distributions generally similar (with similar cuts); differences arise from hadronic interactions
 - G4 slightly more events passing ' ν_e selection'
- G3: 354
- G4: 424
- BUT: absolute numbers depend strongly on threshold applied to strip energies