

ALLEGRO MIGRATION TO DDSIM

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CERN

FCC Detector Full Sim Working Meeting

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DDSIM VS. K4SIMGEANT4

FCC Study Report: One simulation tool to rule them all

DDSim

- Part of DD4hep (able to compartmentalize subdetectors)
- Wrapping around Geant4 — Geant4 controls event loop
- Configured with standalone Python steering
- Used by multiple experiments (including currently running ones)
- Larger feature set

k4SimGeant4

- Set of Gaudi algorithms
- Event loop controlled by Gaudi
- Ability to be integrated into large Gaudi steerings
- Uses DD4hep to compartmentalize subdetectors

SIMULATION DETAILS

DDSim + digitization algorithms from k4SimGeant4

vs.

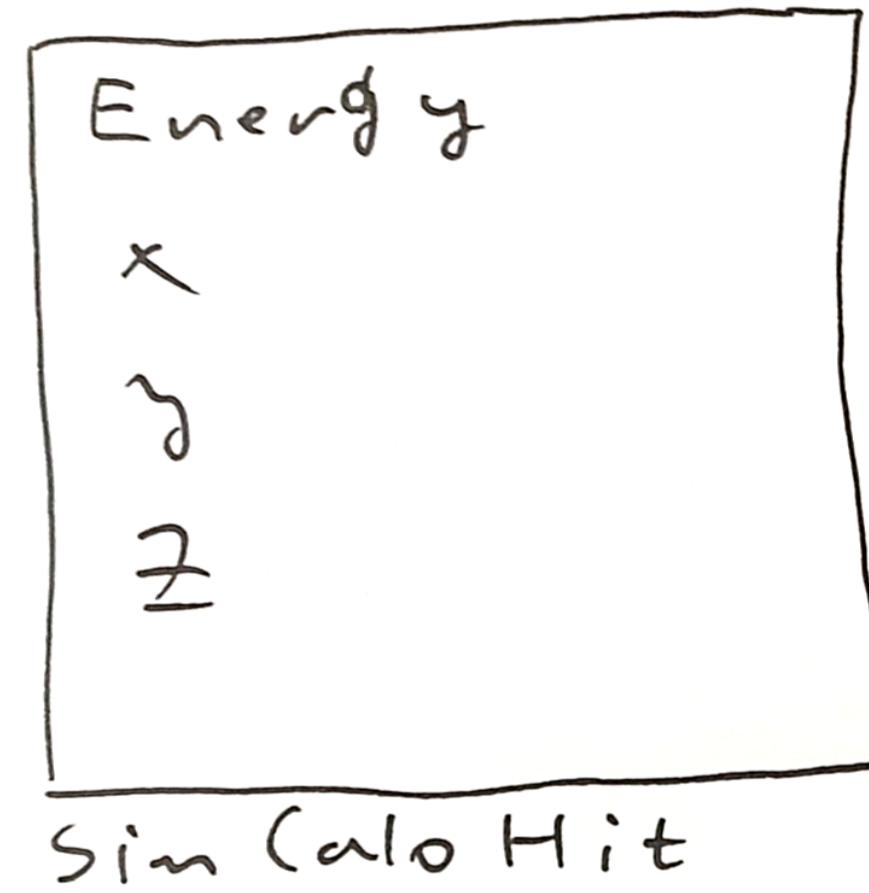
particle gun + k4SimGeant4 Geant4 Gaudi algorithm and digitization

- No changes to the [k4SimGeant4](#) algorithms
 - `geantservice.physicslist = "SimG4FtfpBert"`
 - `geantservice.g4PreInitCommands += ["/run/setCut 0.1 mm"]`
- Default **DDSim** steering
 - `SIM.physicsList = None`
 - `SIM.physics.list = "FTFP_BERT"`
 - `SIM.physics.rangecut = 0.7`
- Compact files from FCCDetectors
- Number of events:
 - electron @ 50 GeV: 10k
 - pion @ 50 GeV: 10k

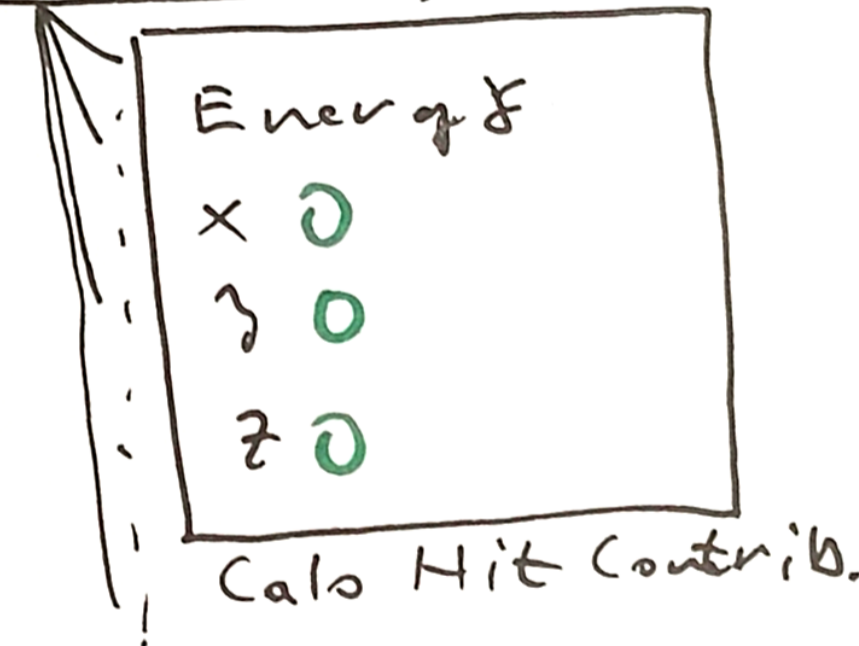
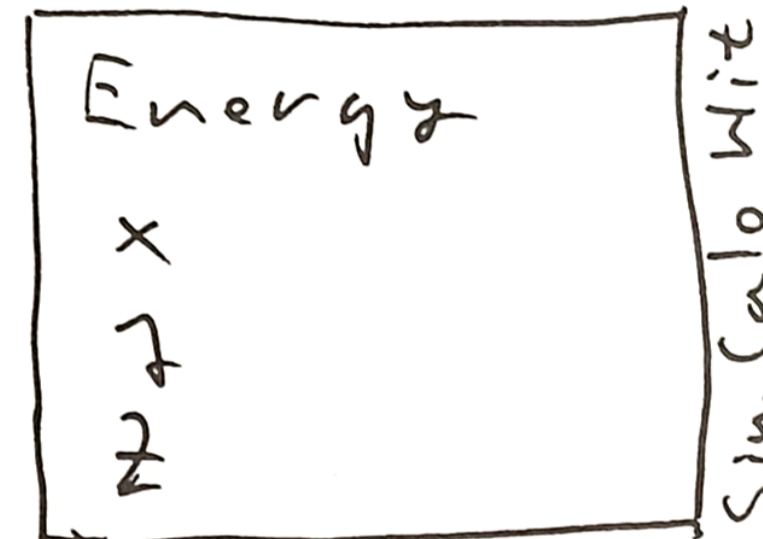
ECAL

GEANT4 OUTPUT

k4 Sim Geant 4



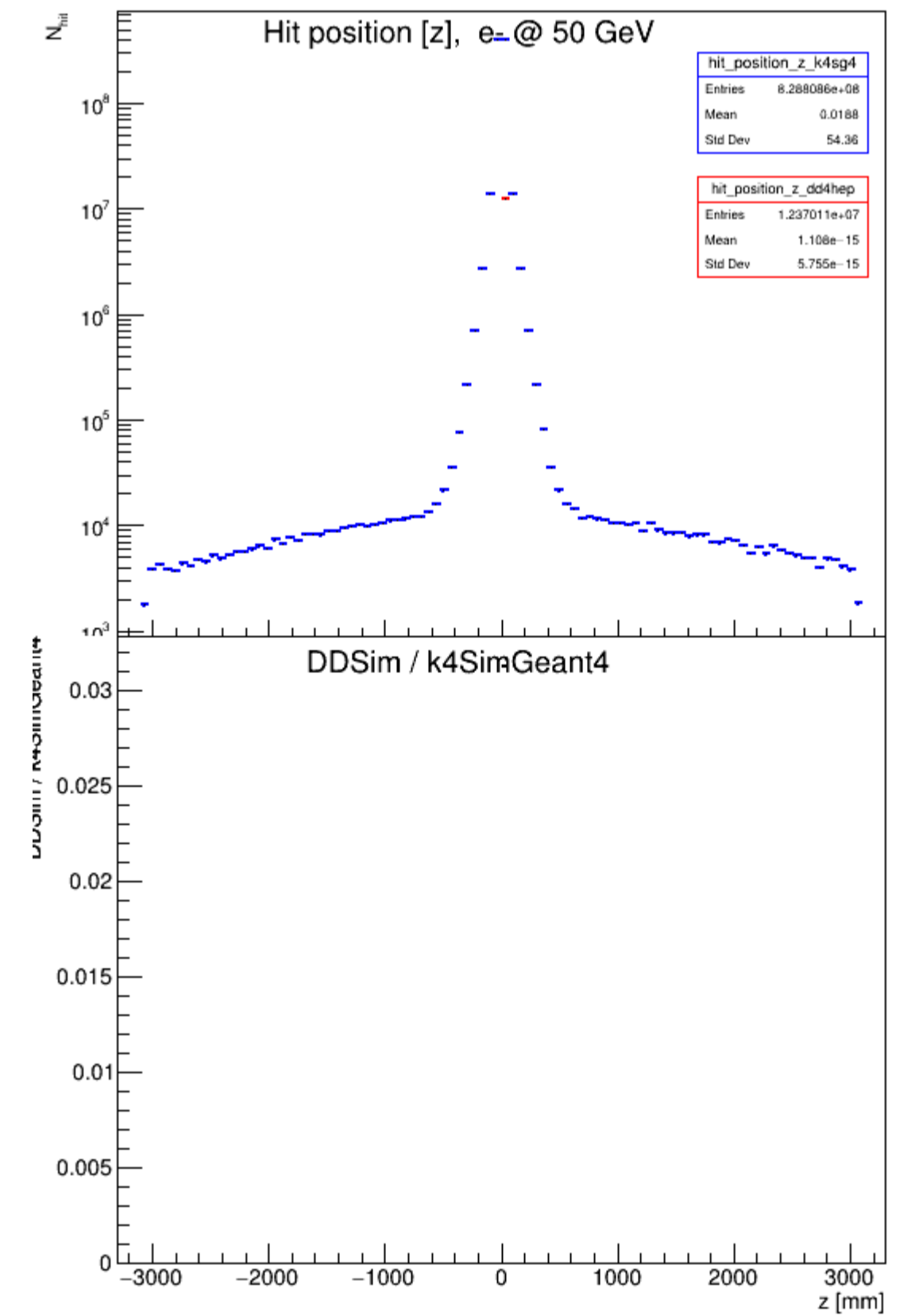
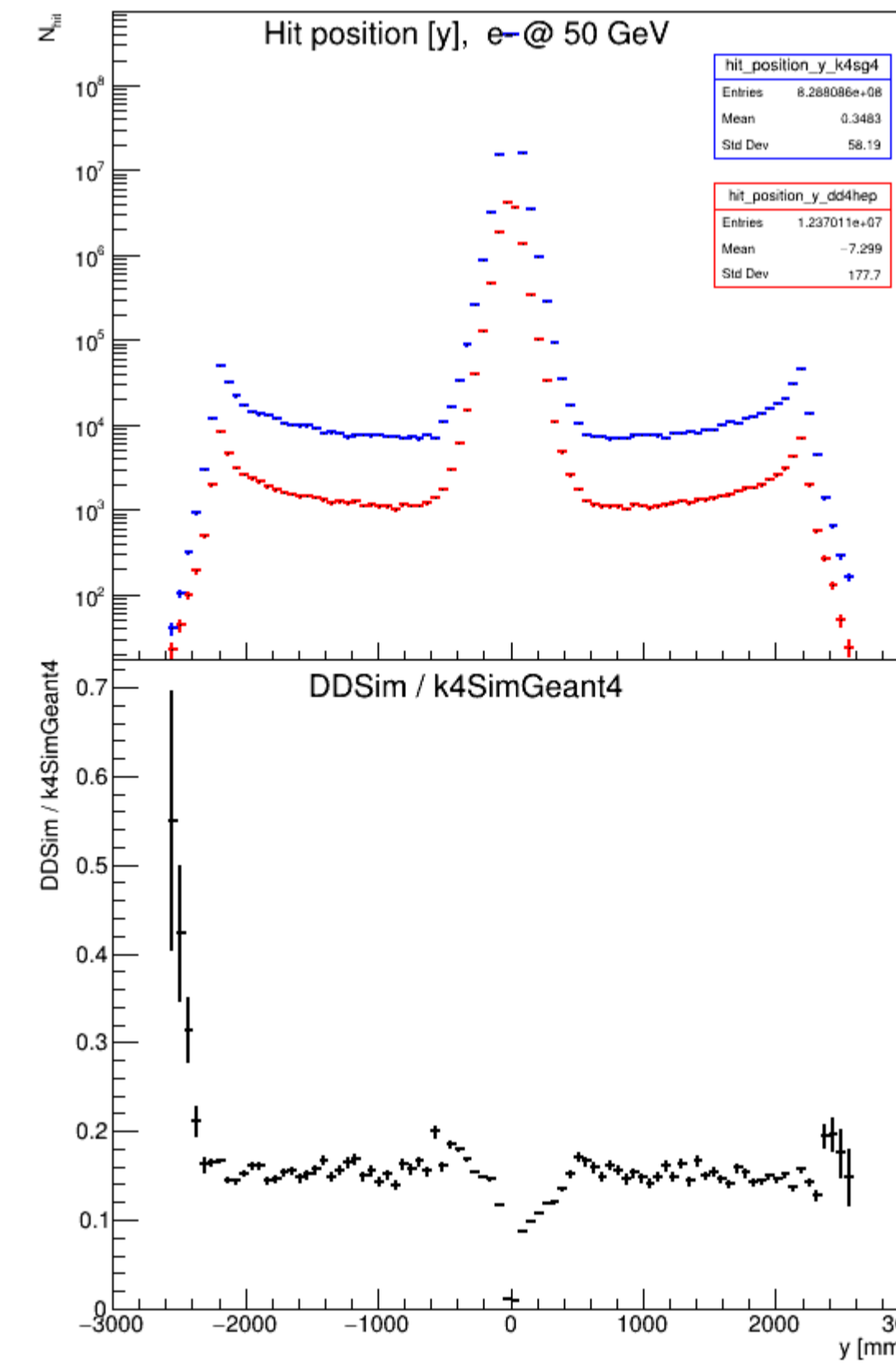
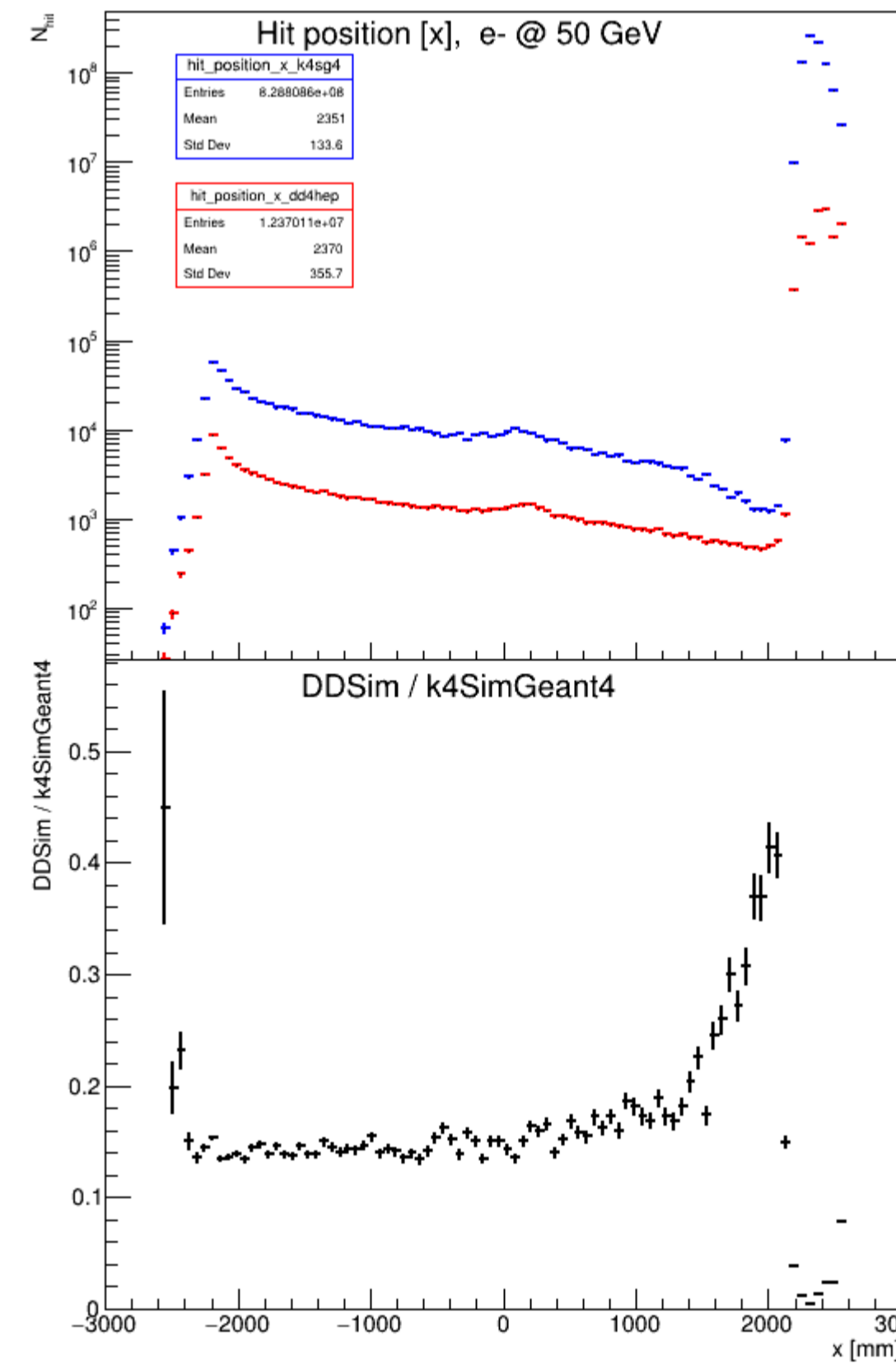
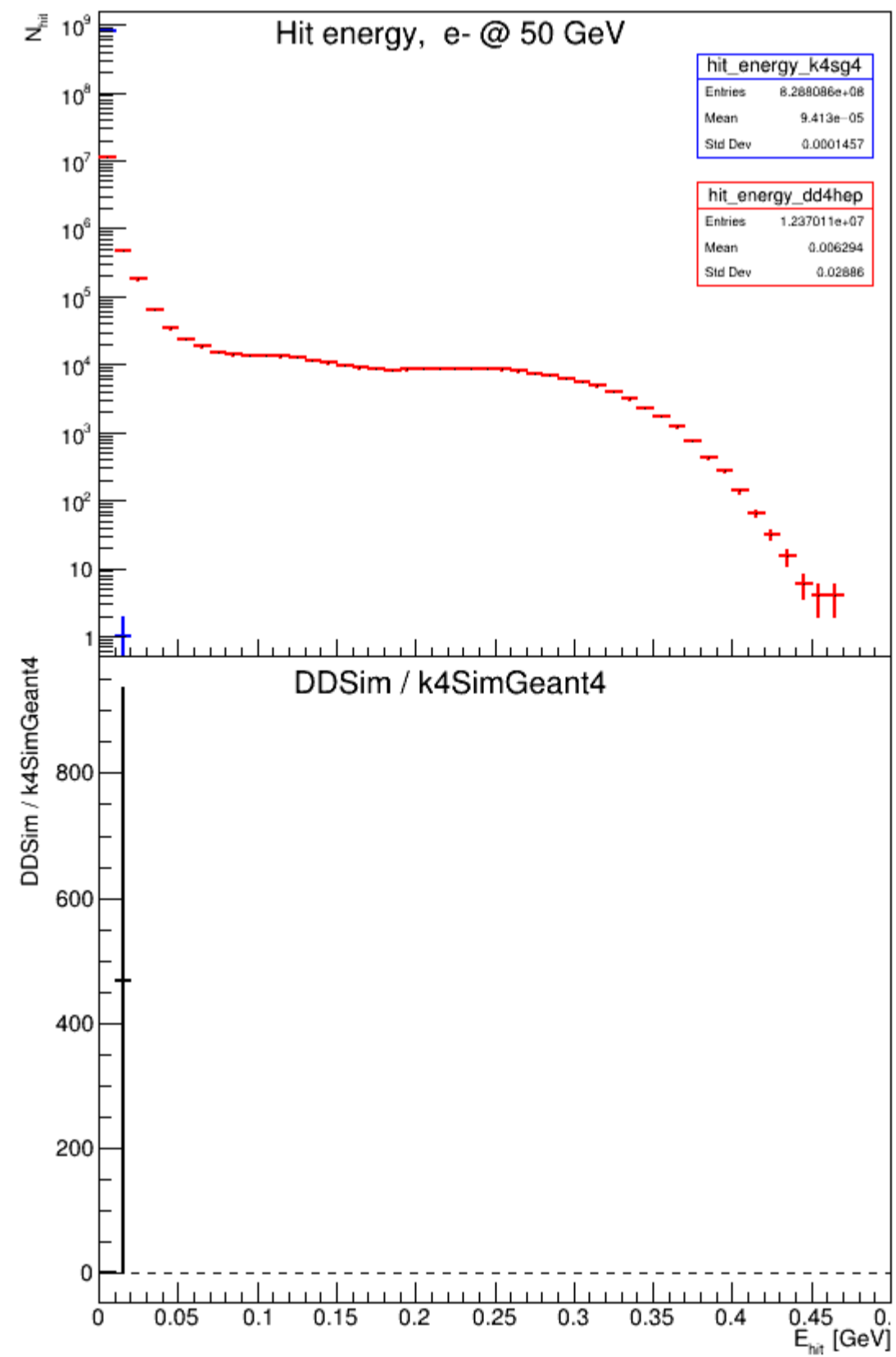
DD Sim



ECAL

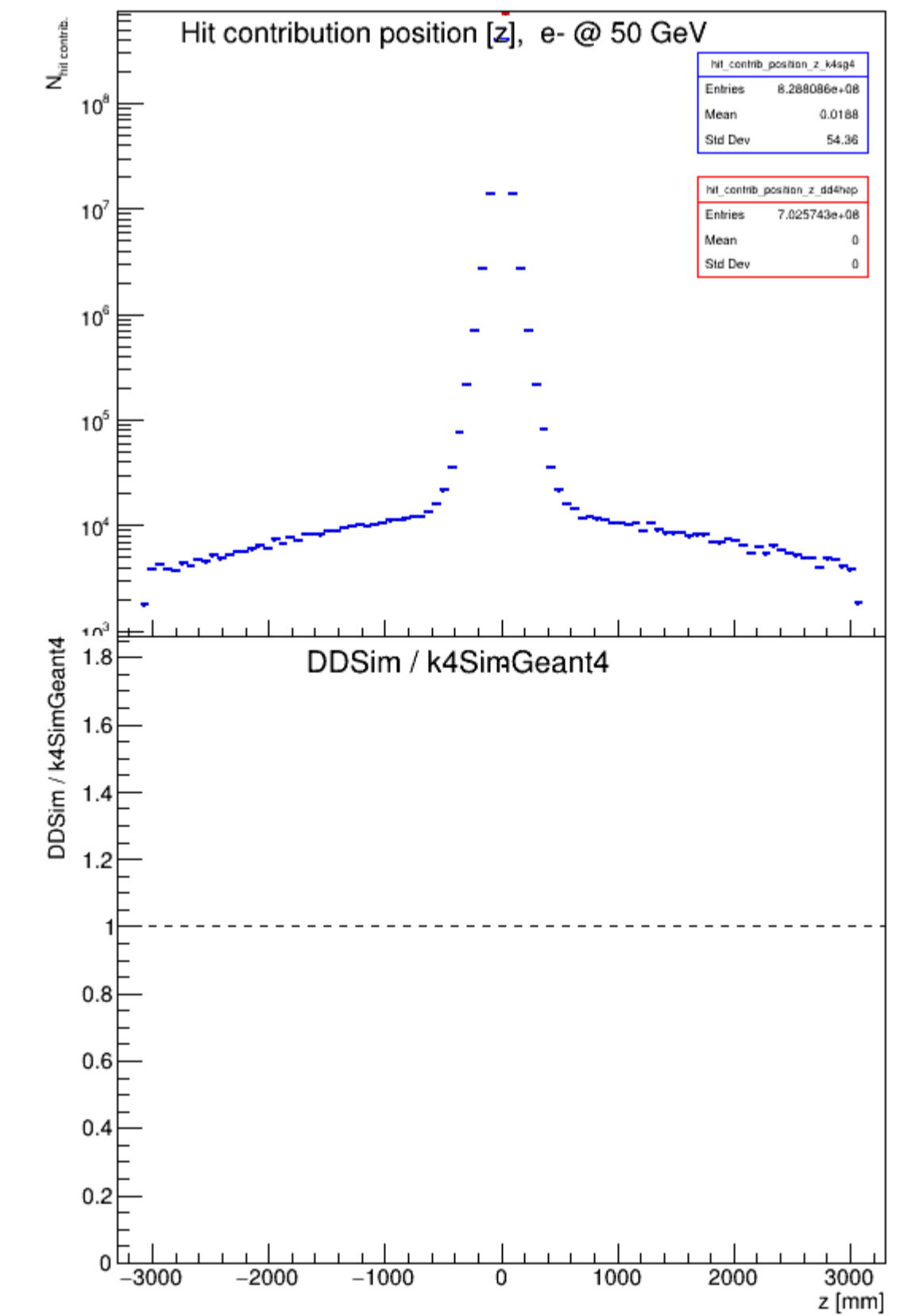
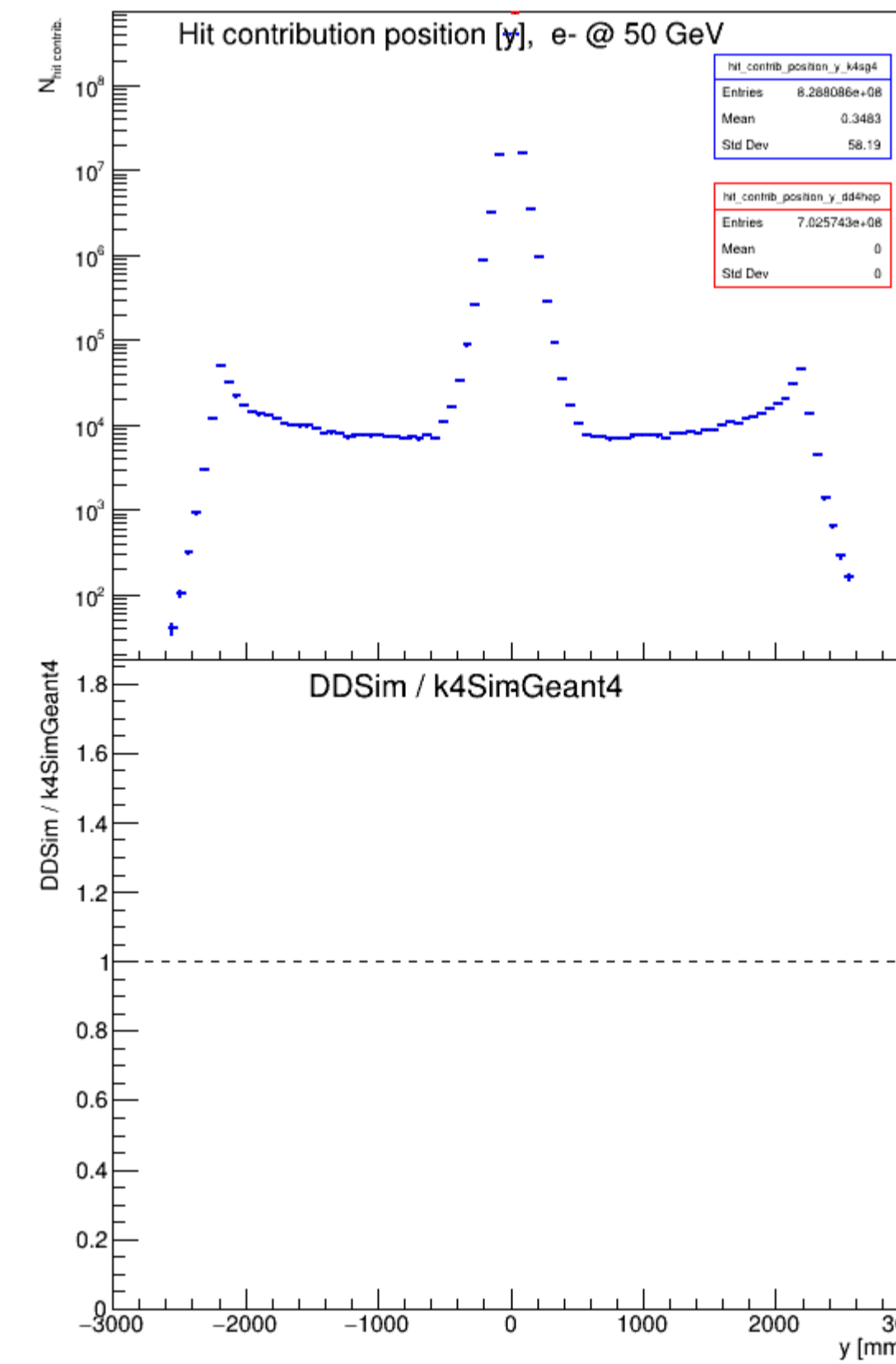
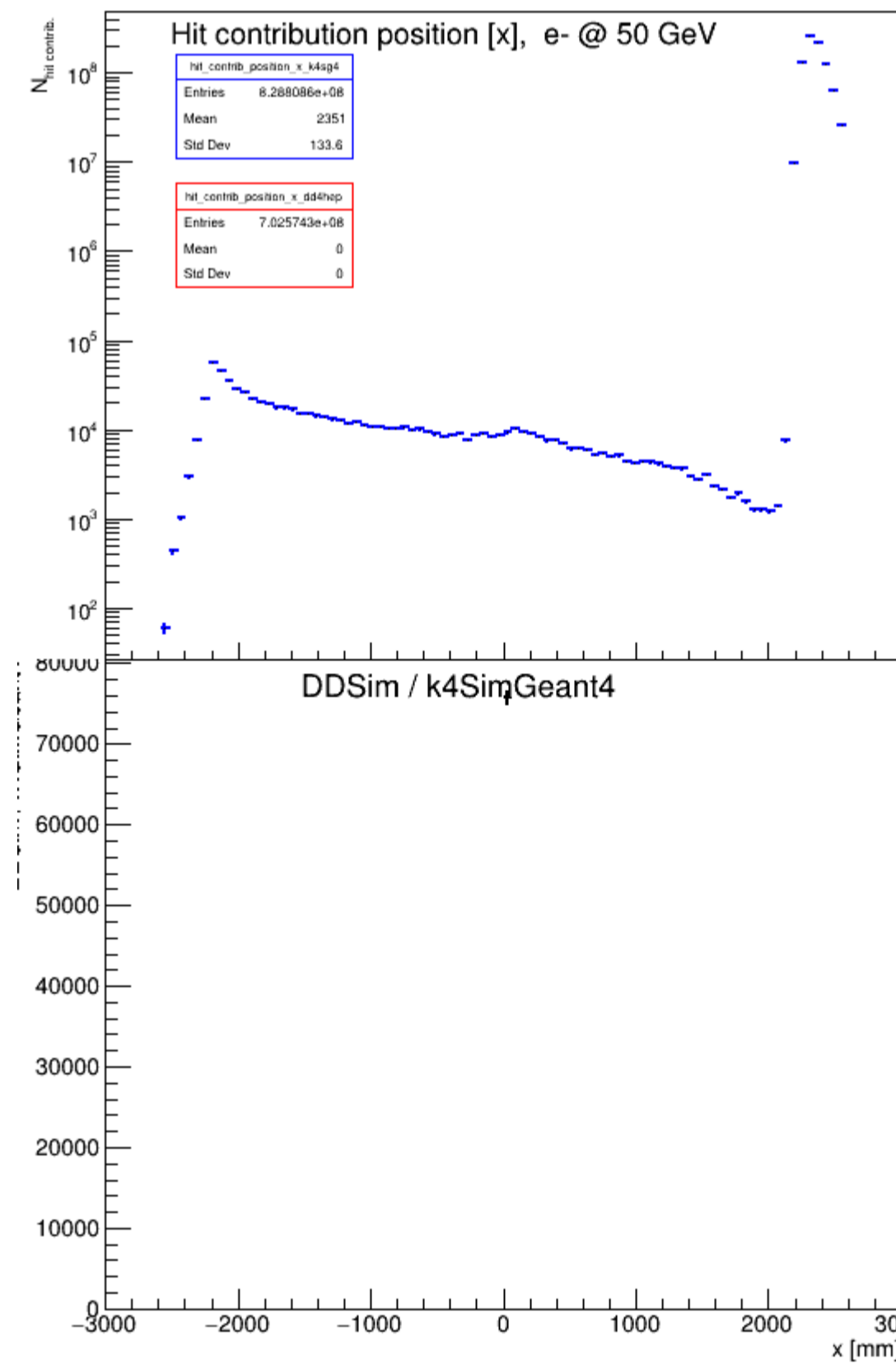
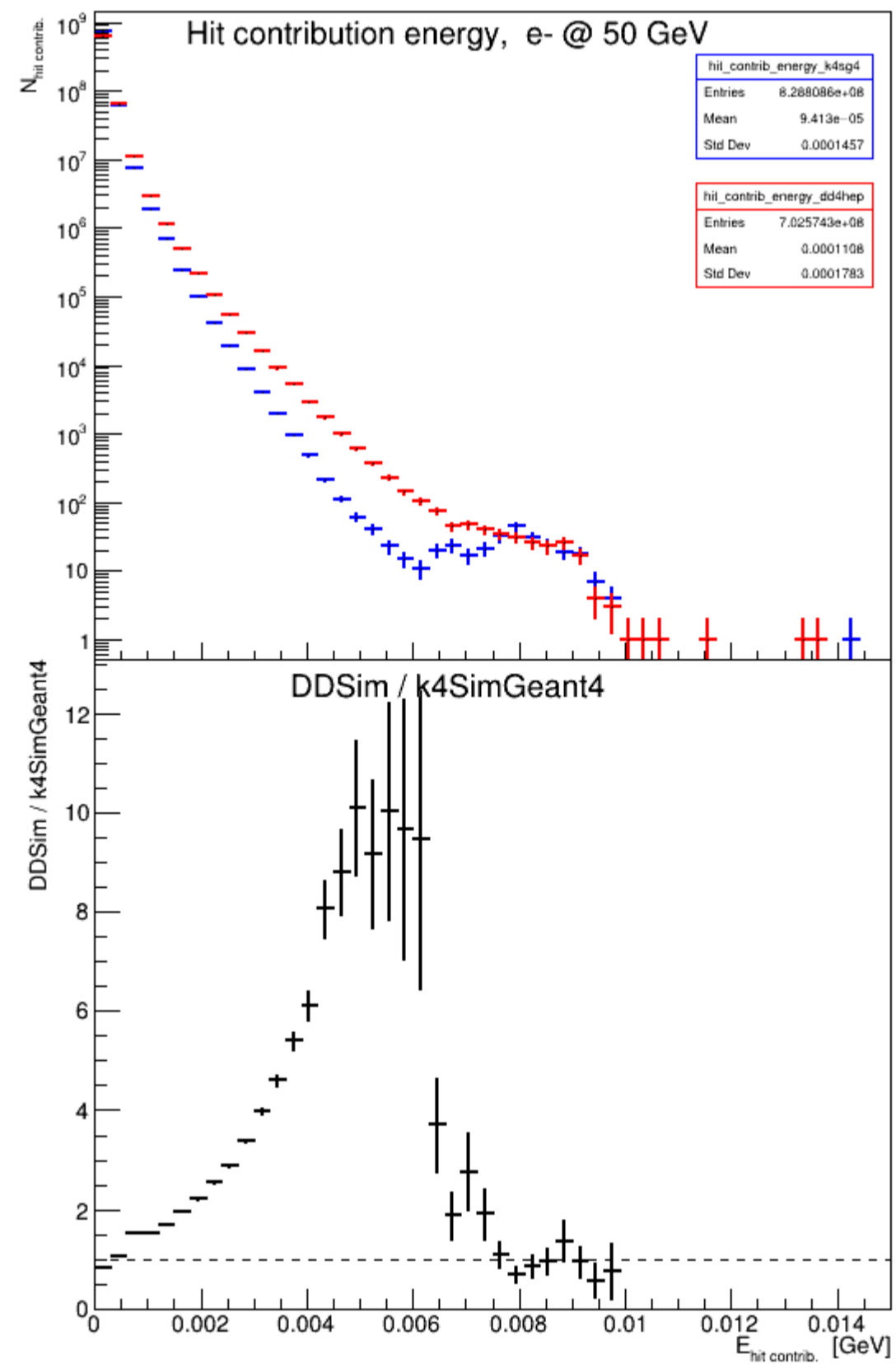
ELECTRON @ 50 GEV

ECAL HITS



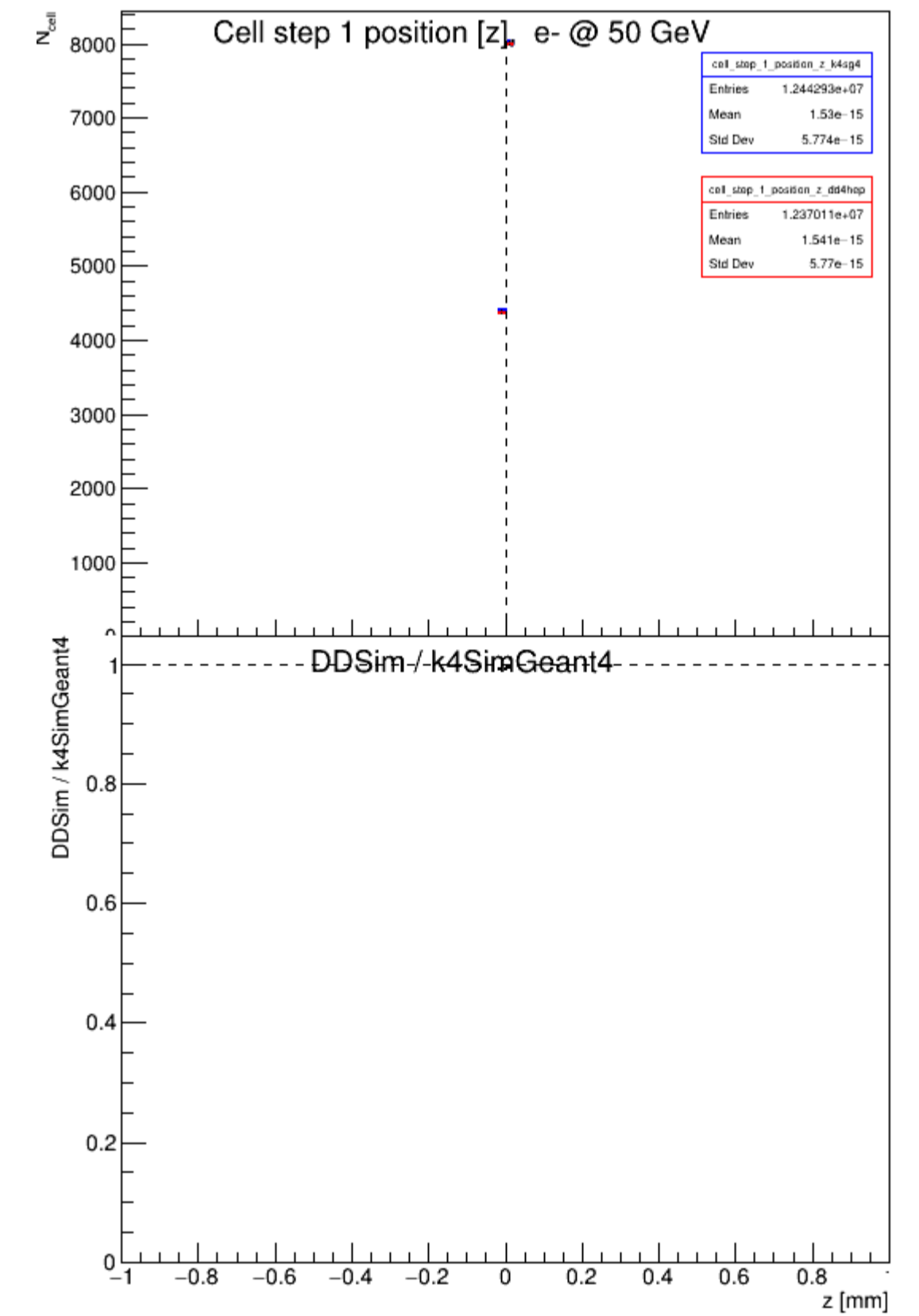
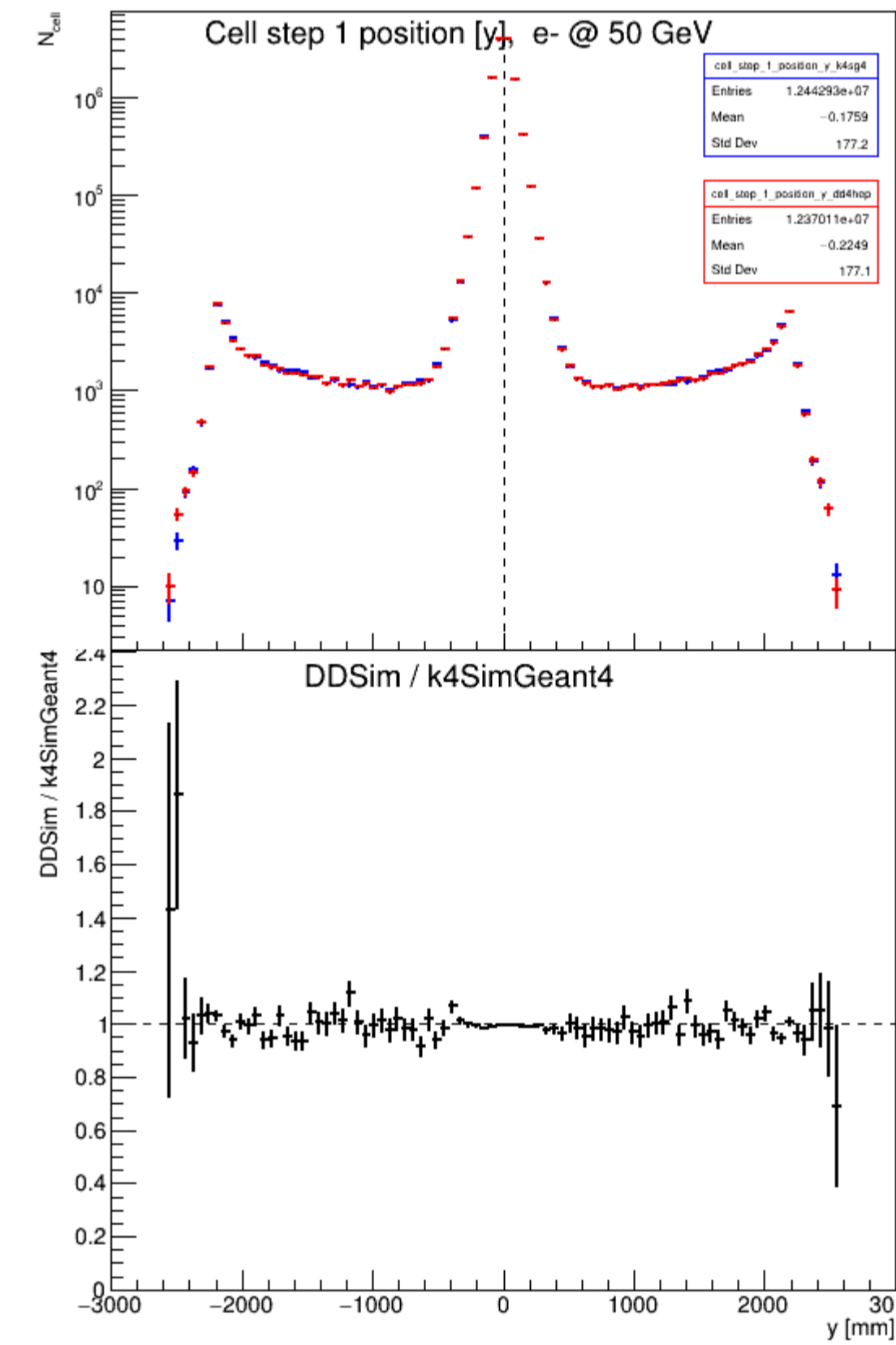
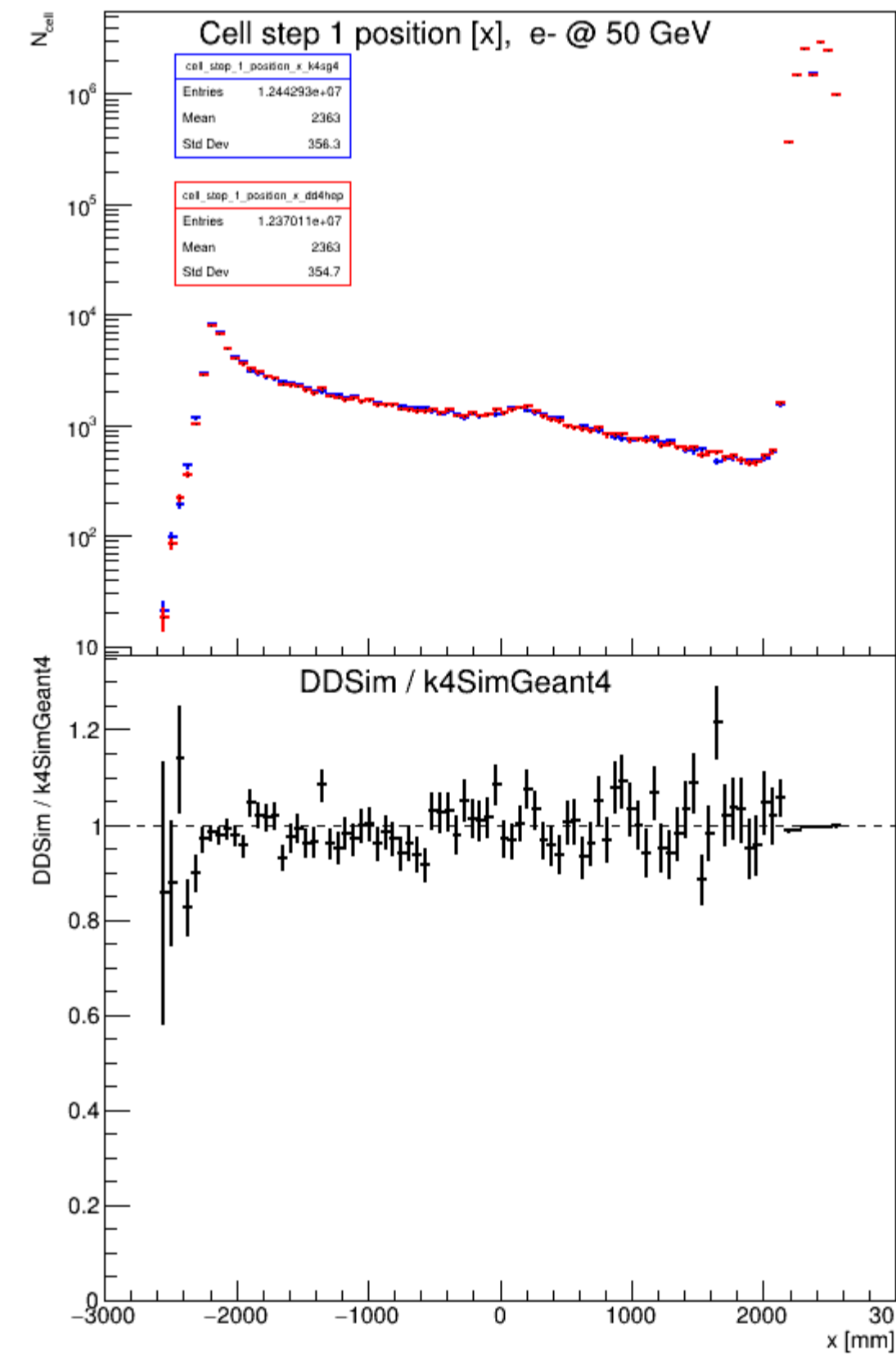
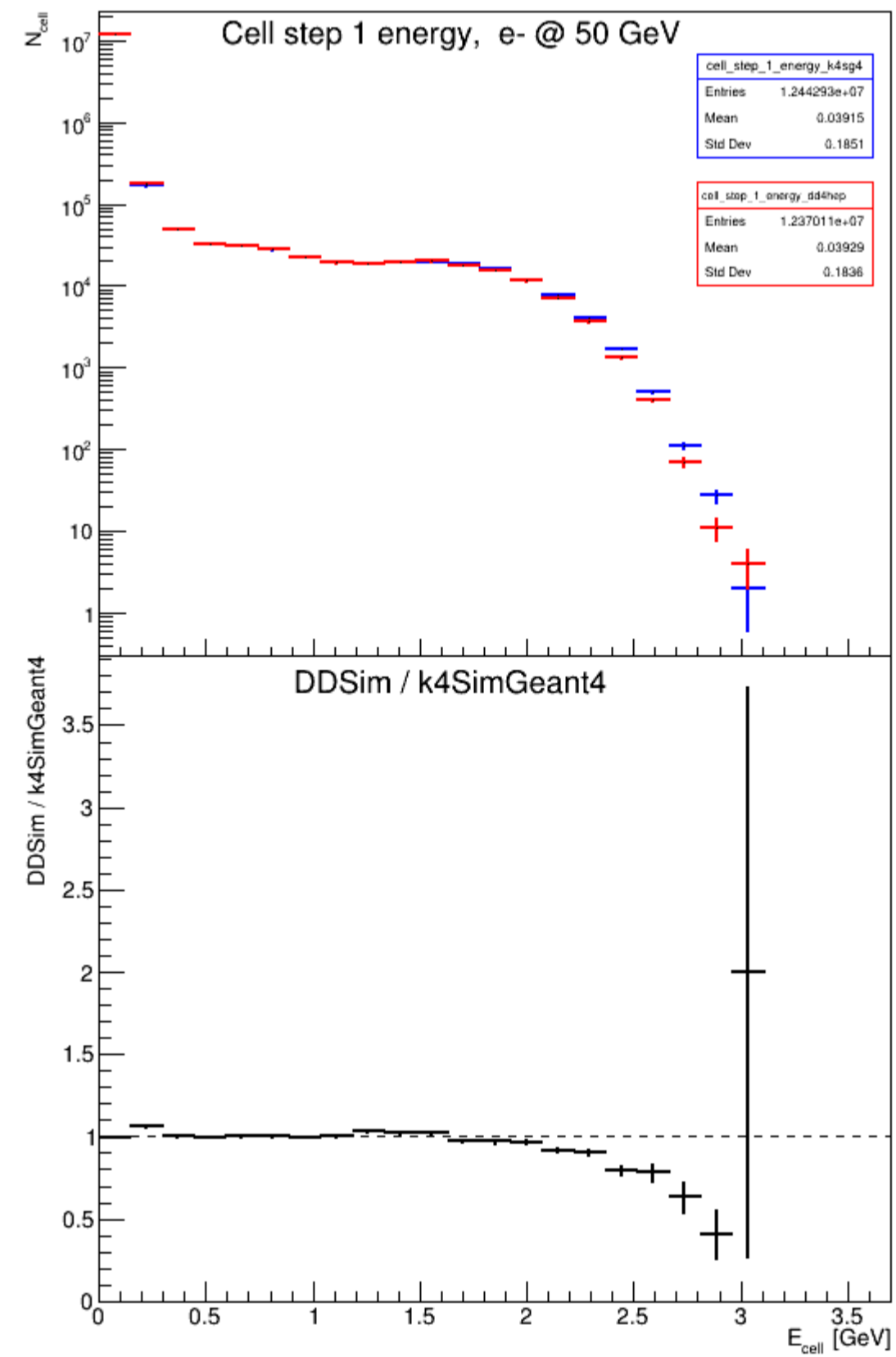
ELECTRON @ 50 GEV

ECAL HIT CONTRIBUTIONS



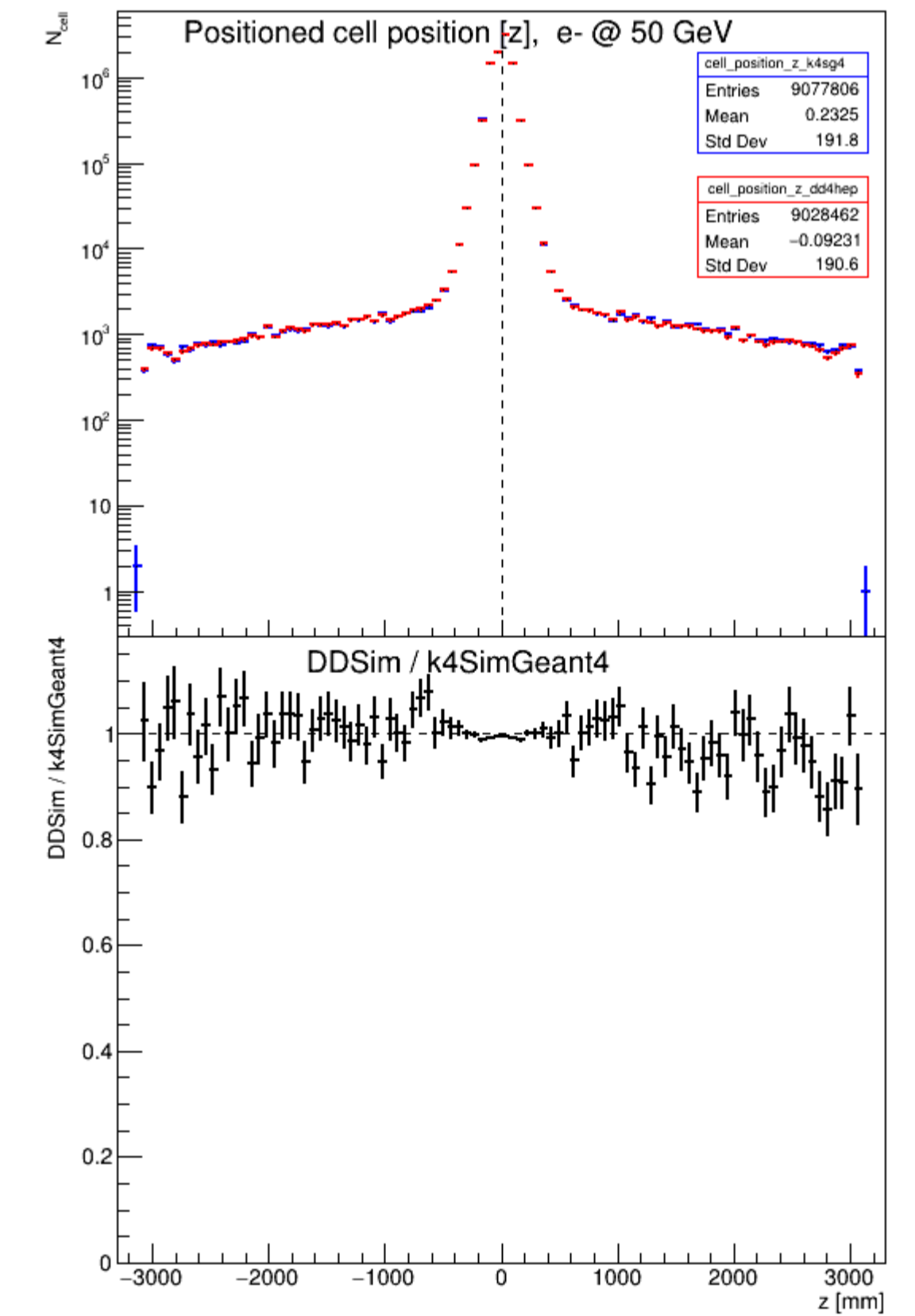
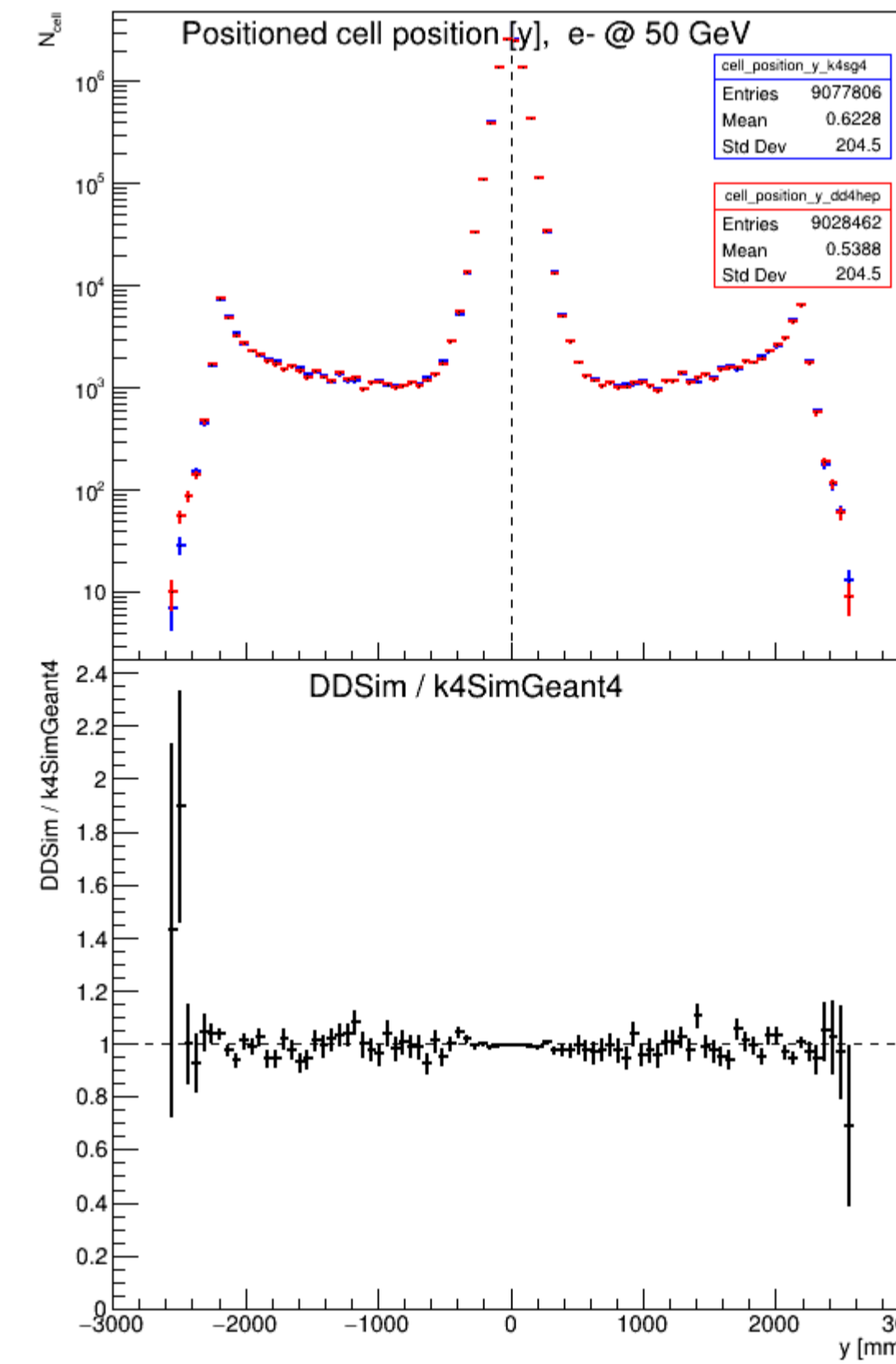
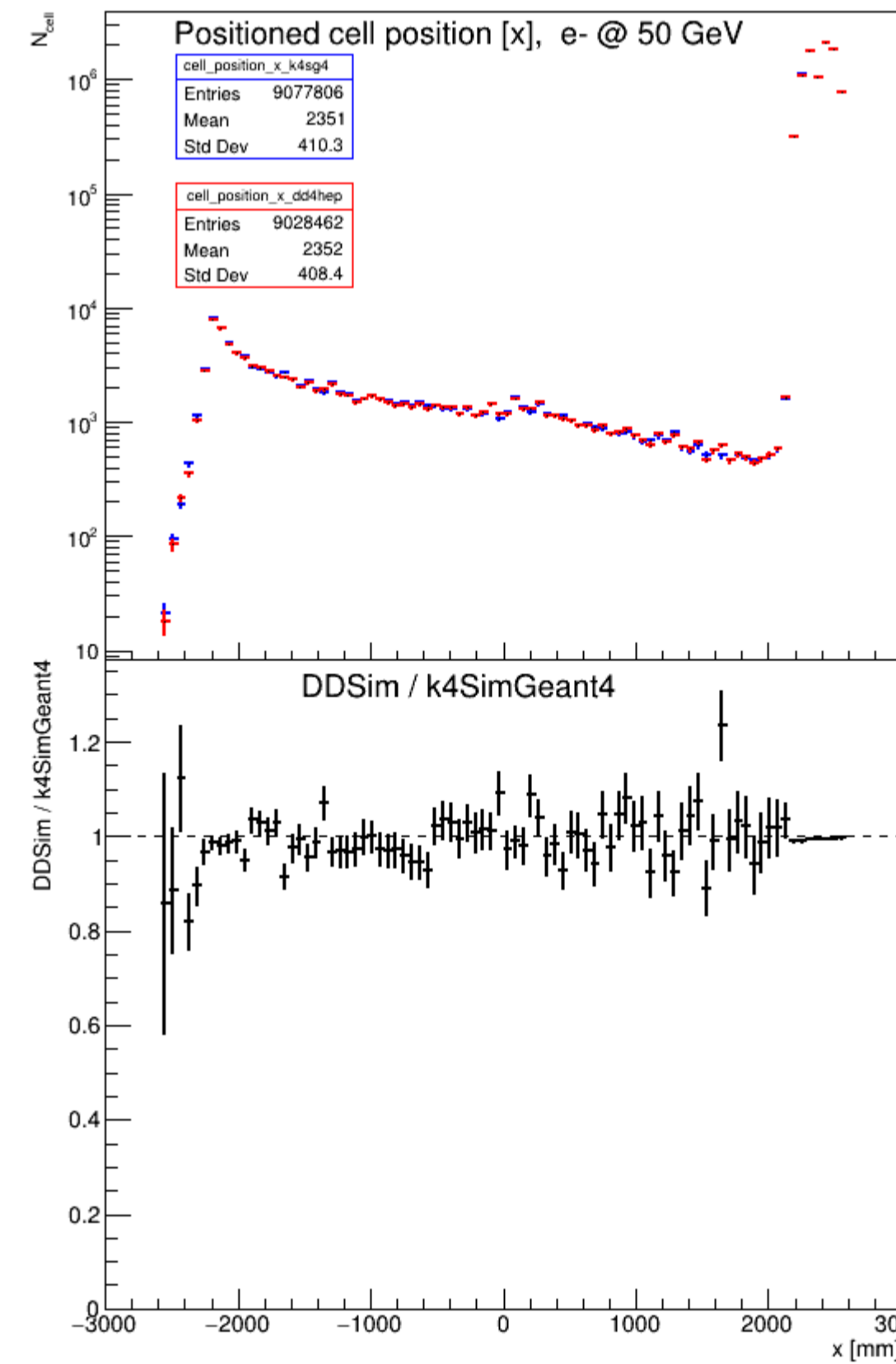
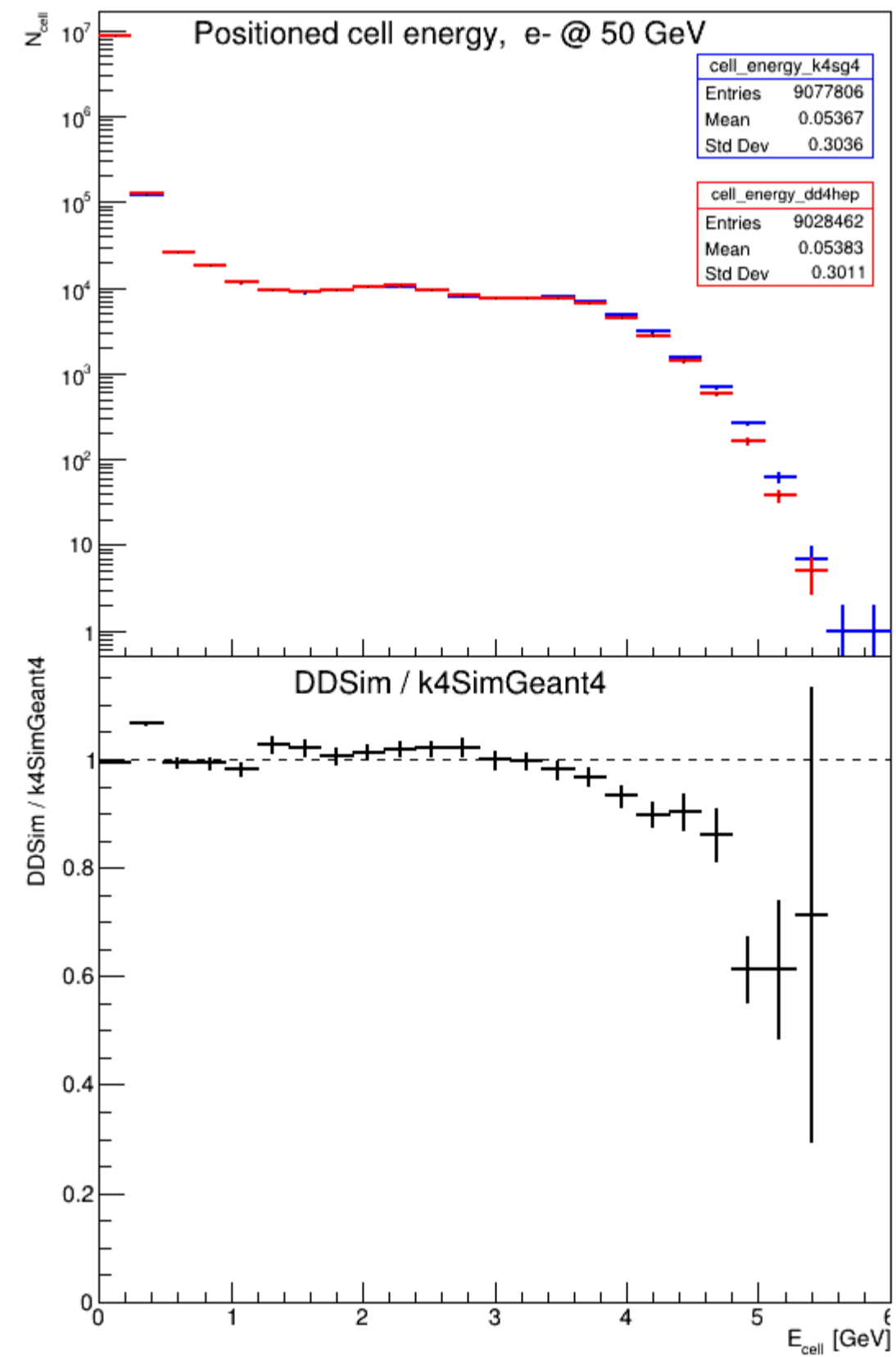
ELECTRON @ 50 GEV

ECAL CELLS



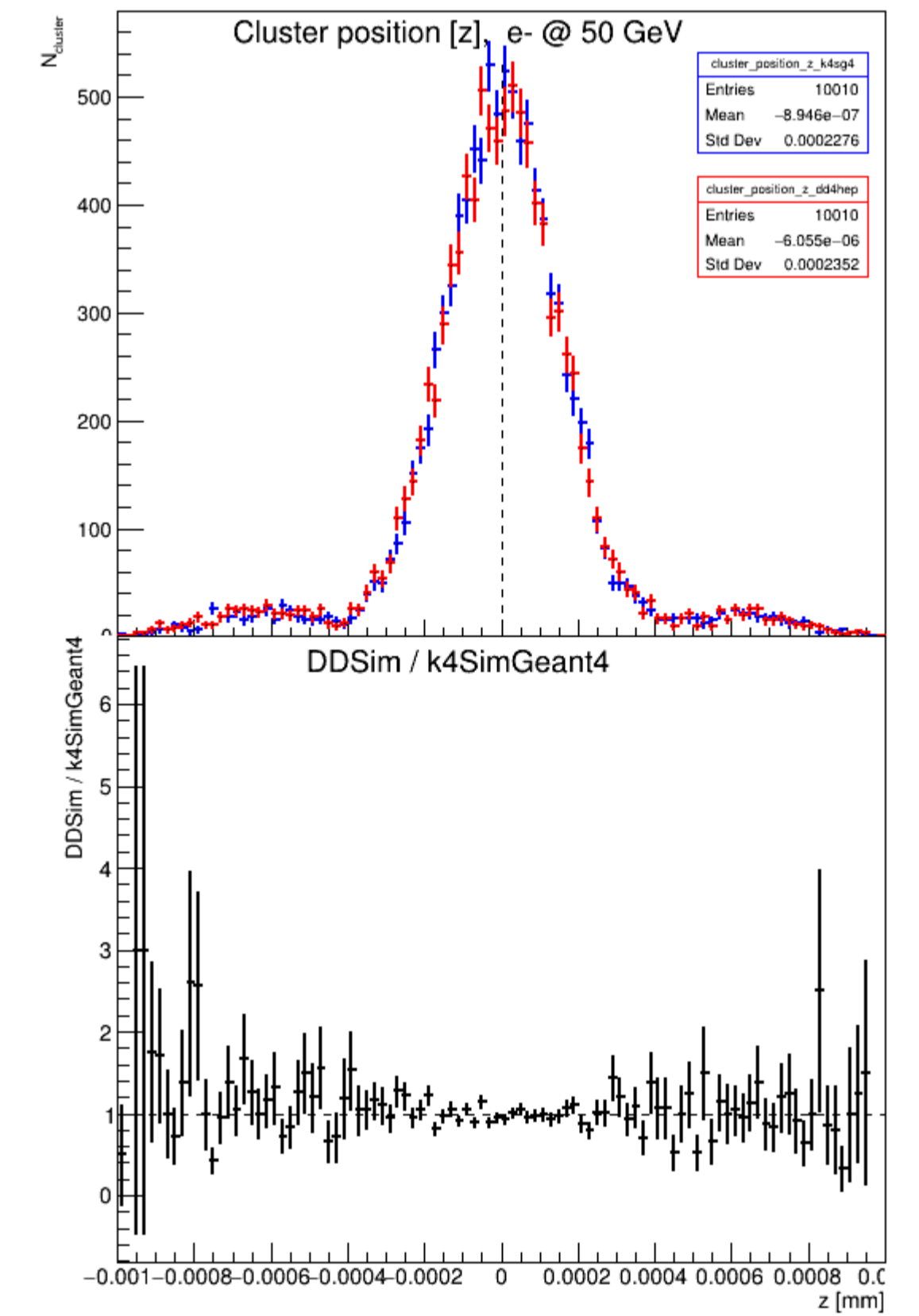
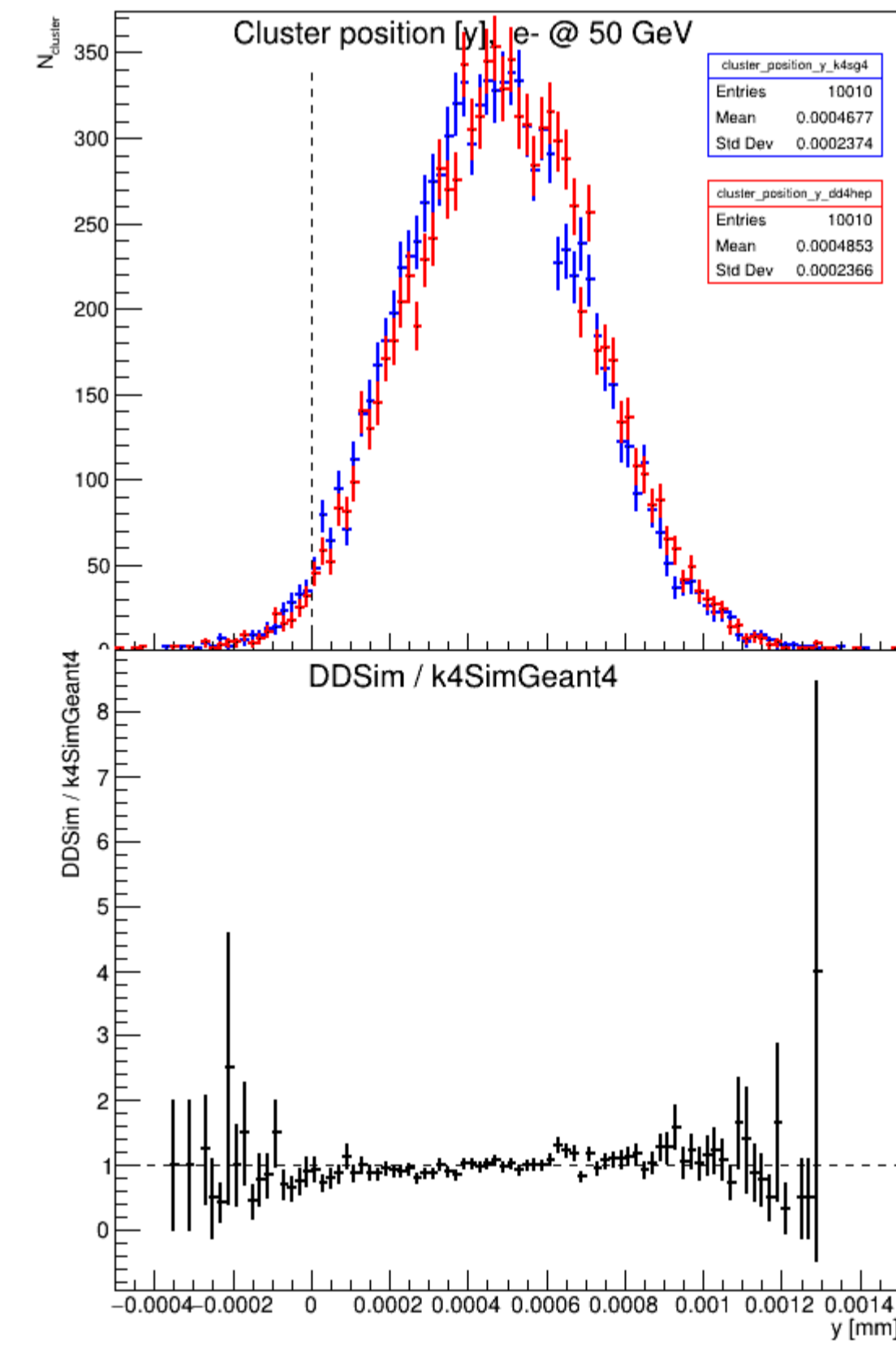
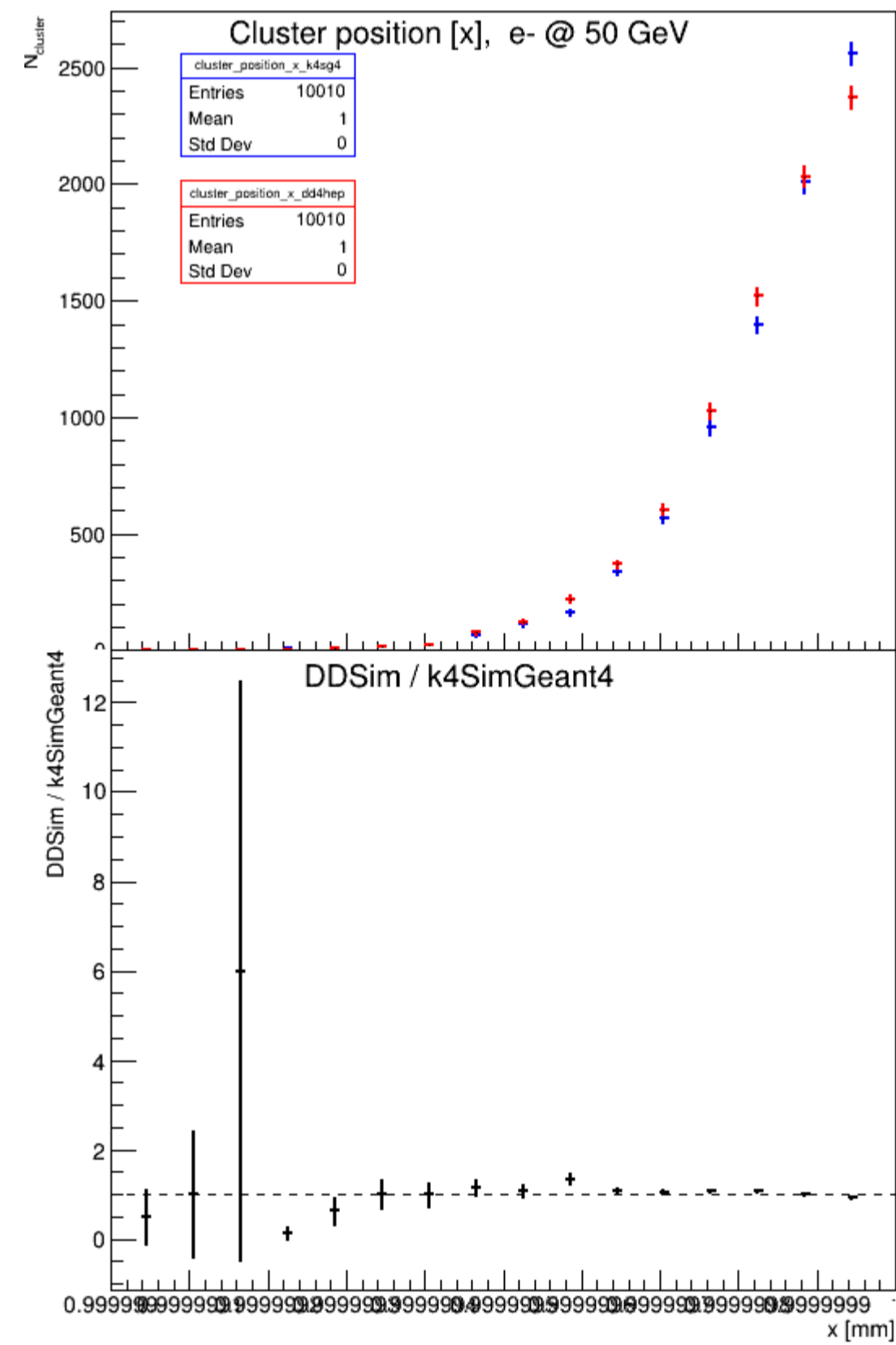
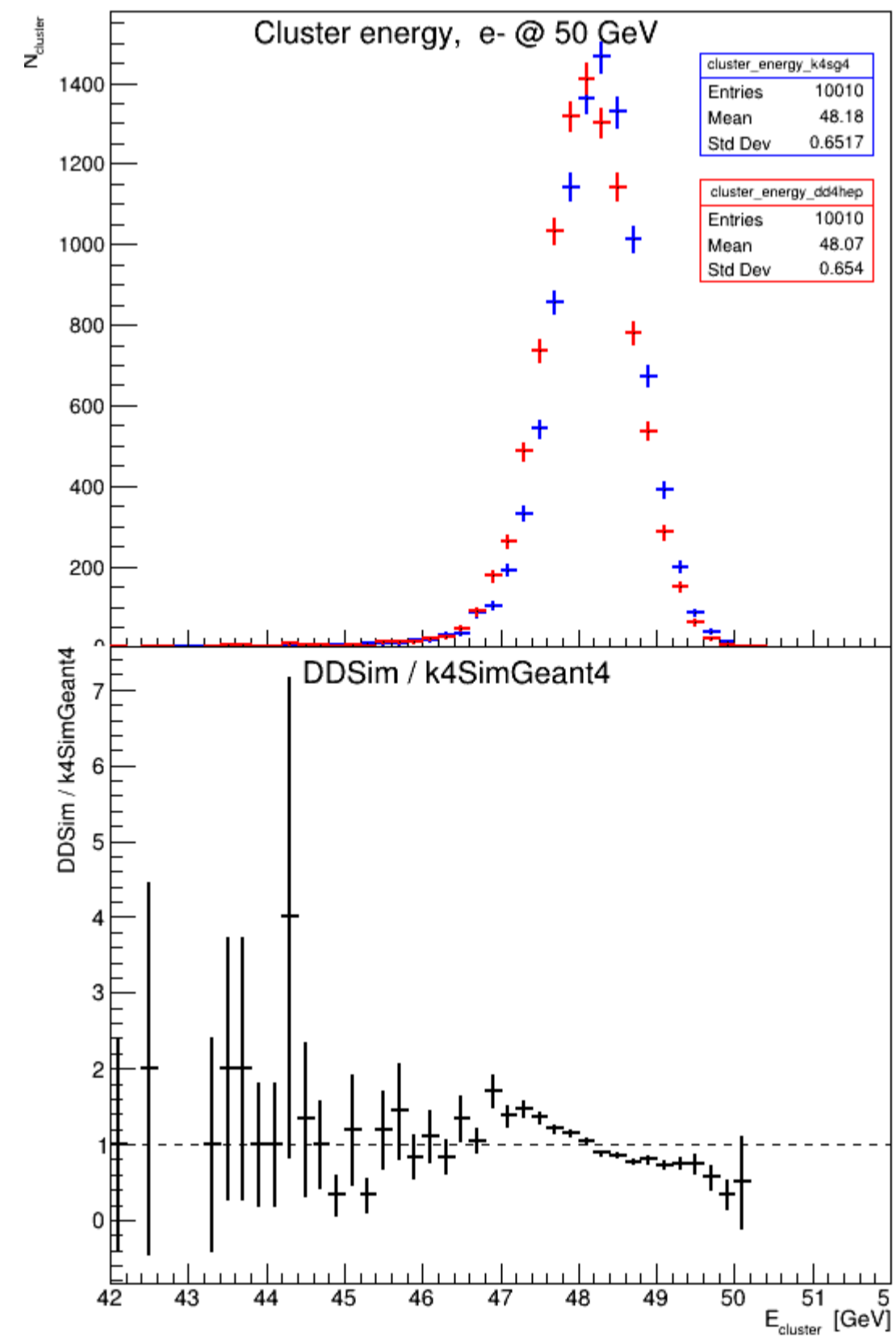
ELECTRON @ 50 GEV

ECAL POSITIONED CELLS



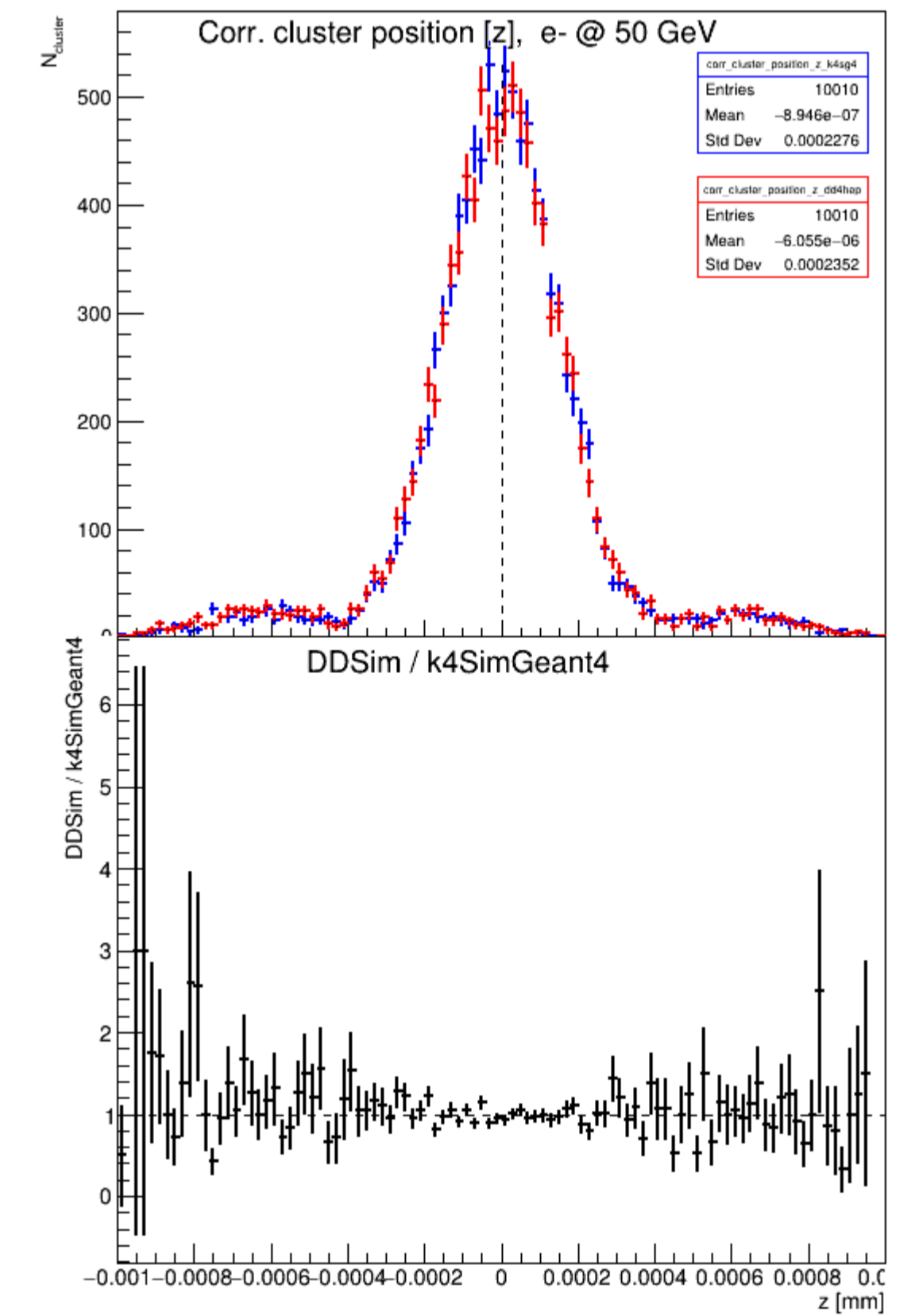
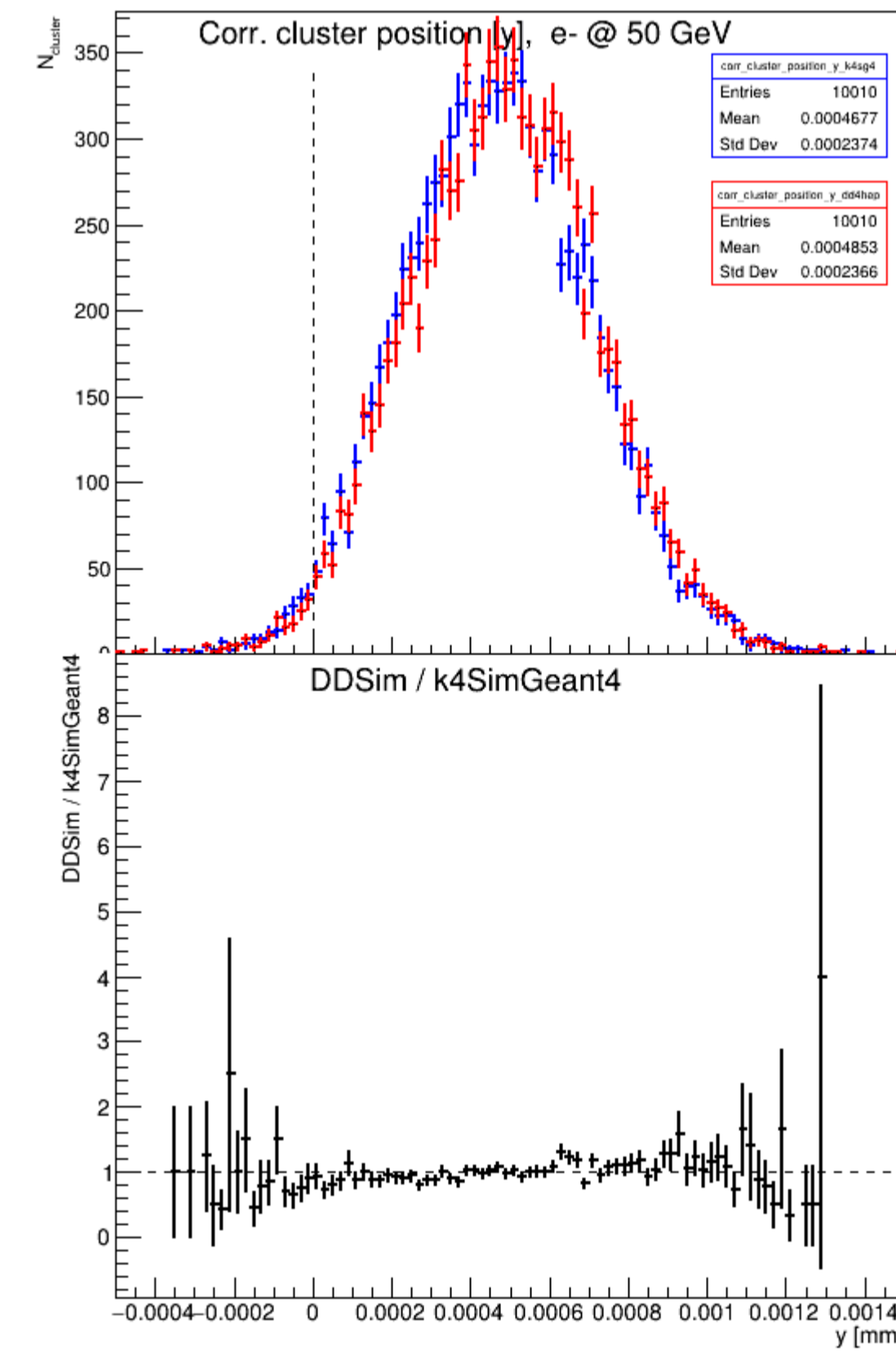
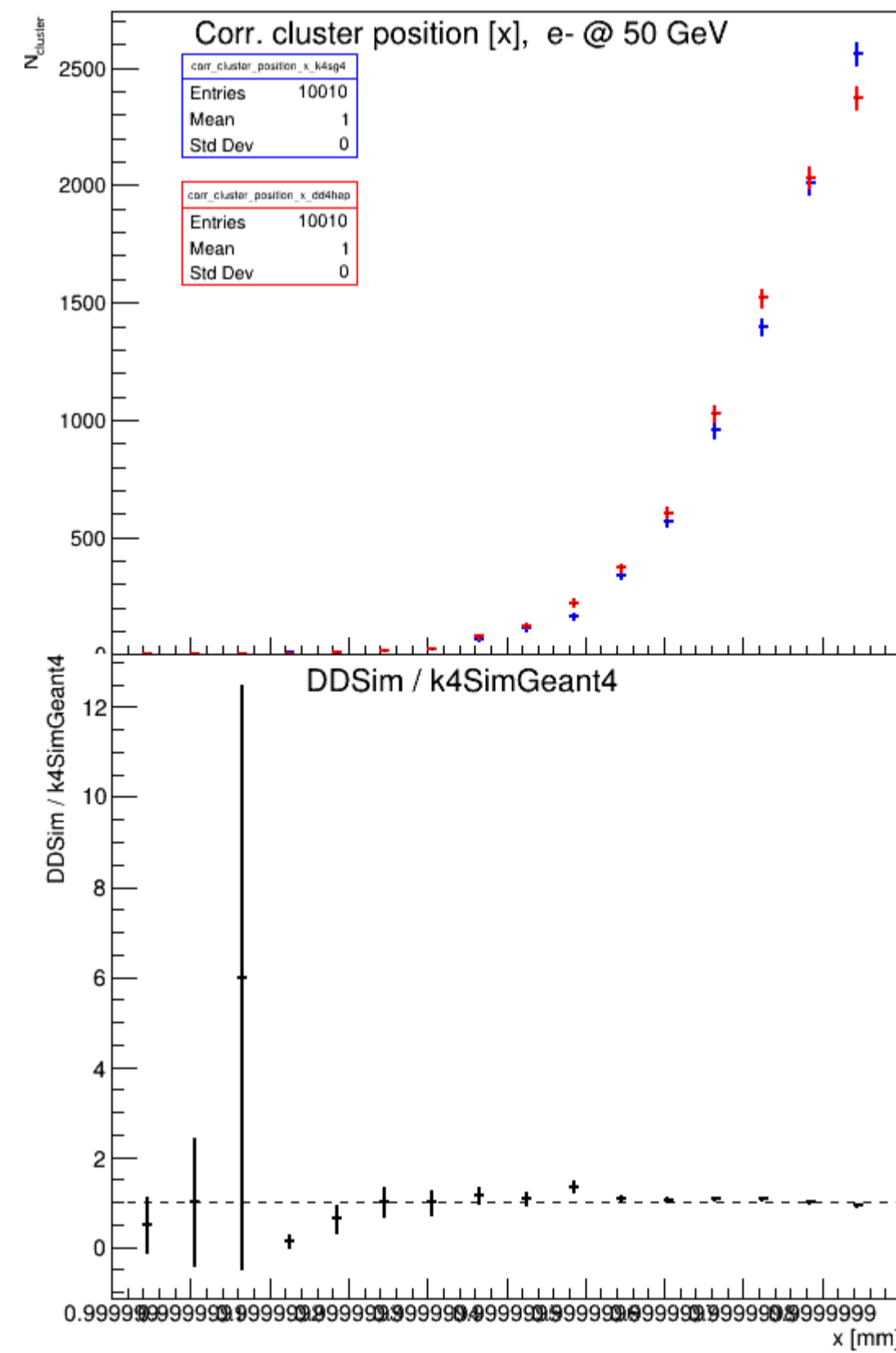
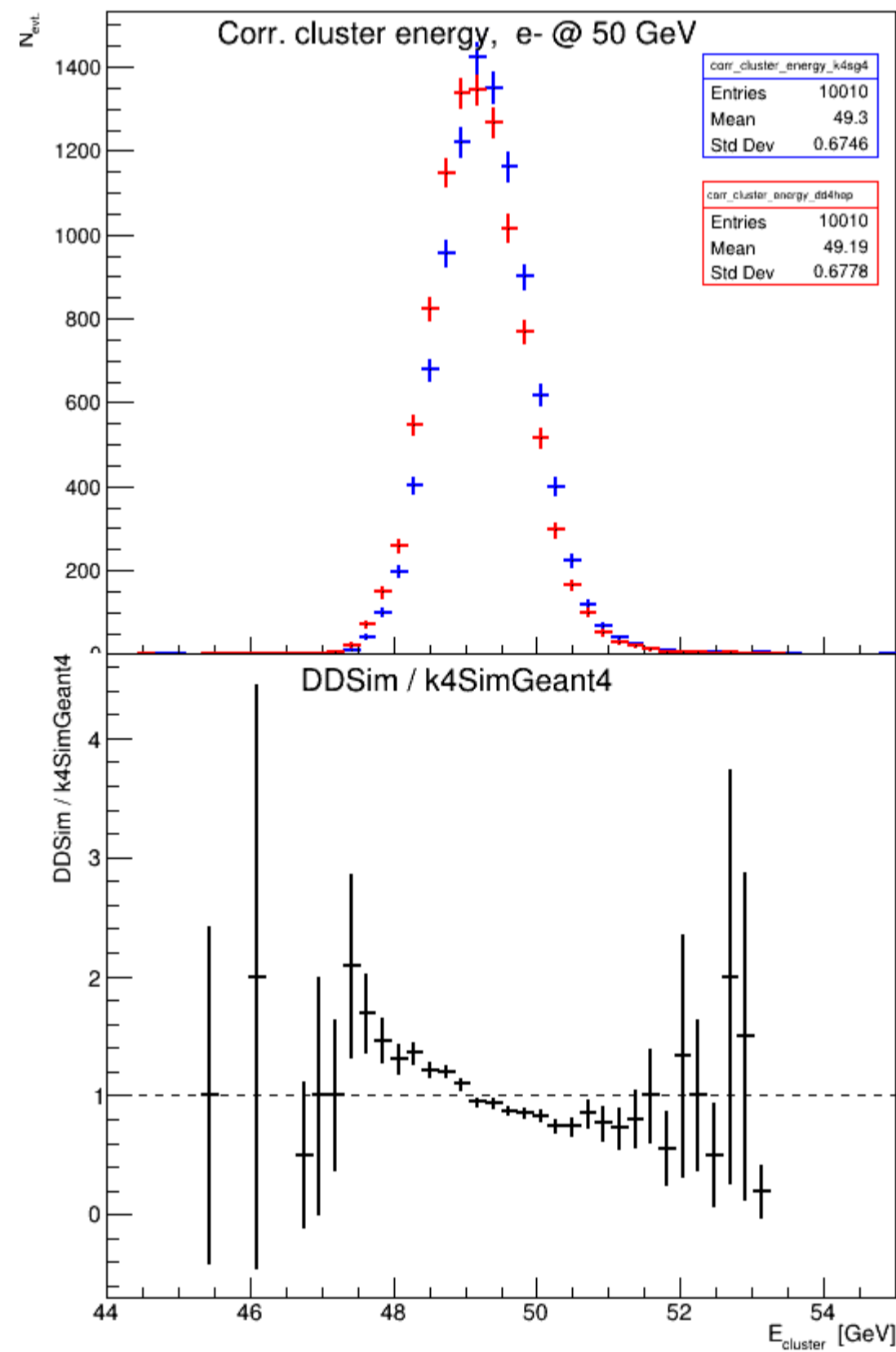
ELECTRON @ 50 GEV

ECAL CLUSTER



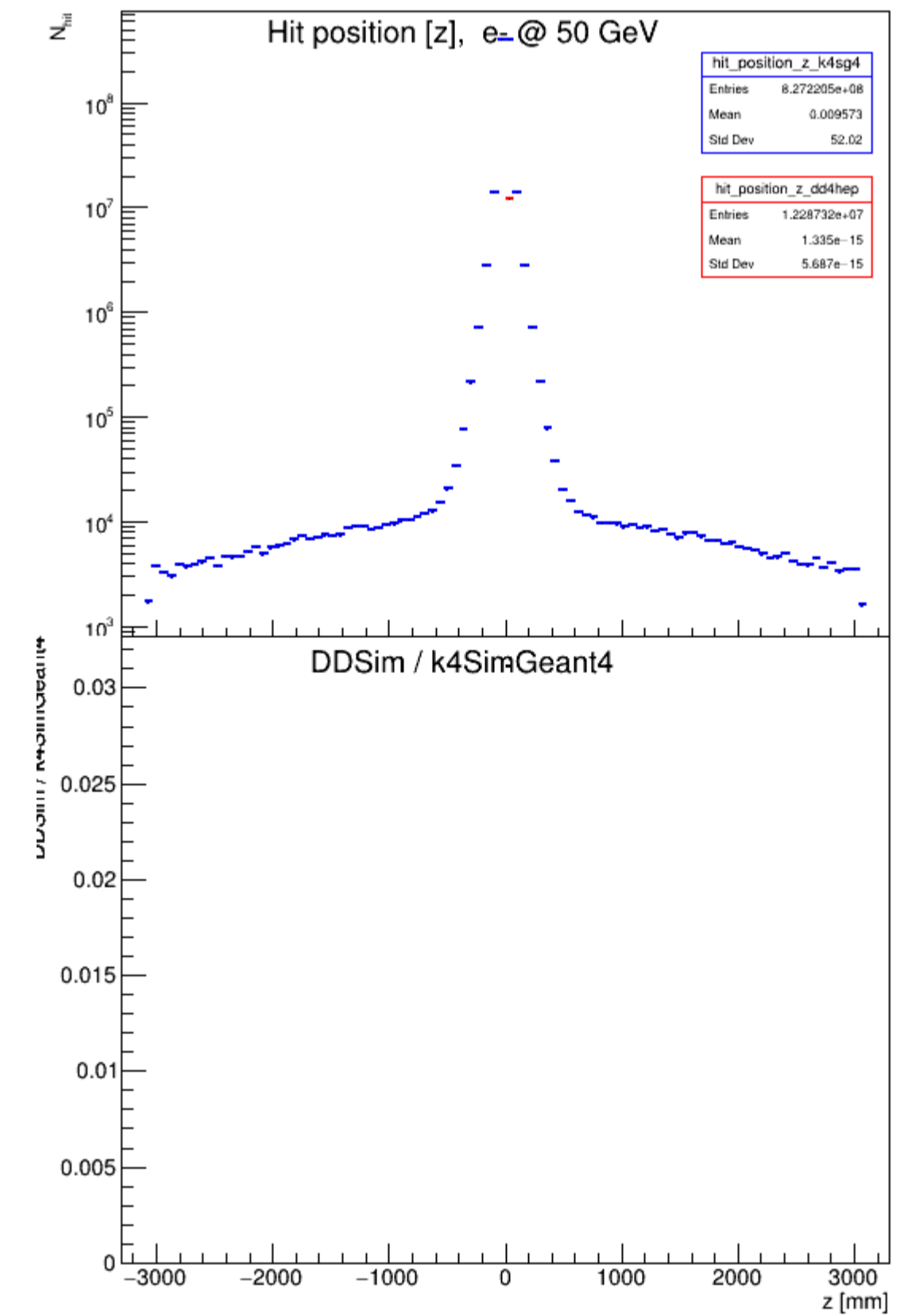
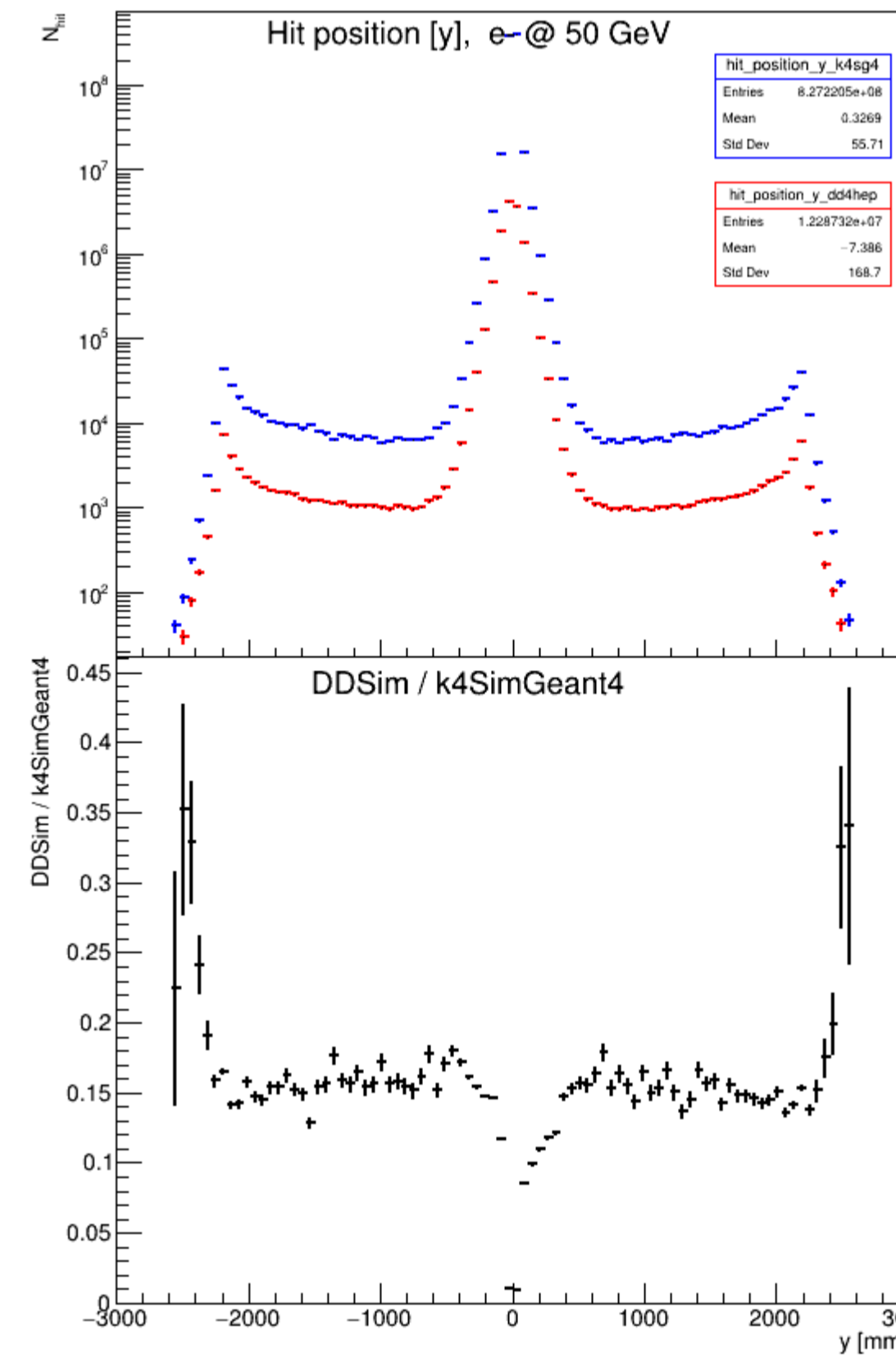
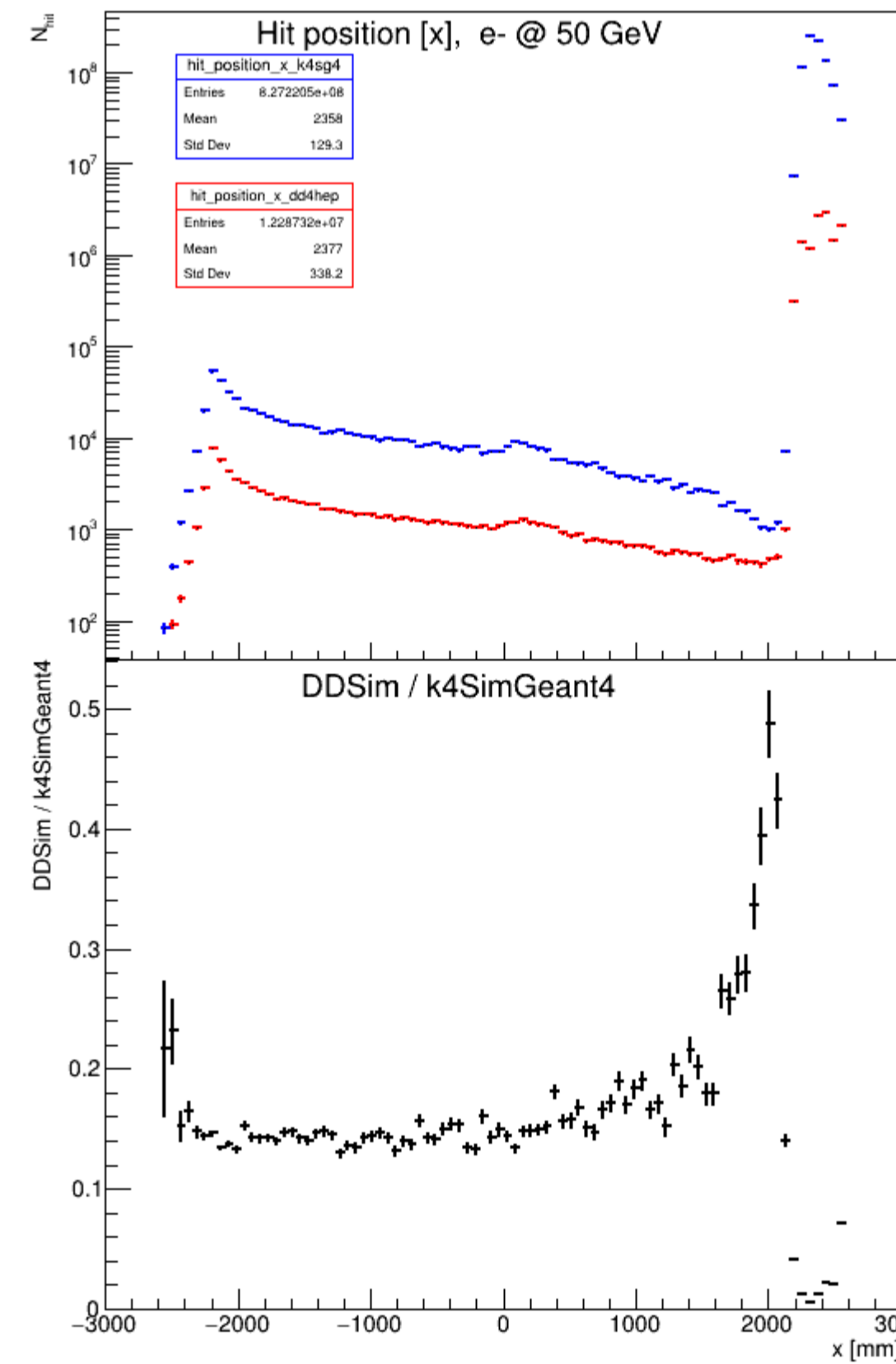
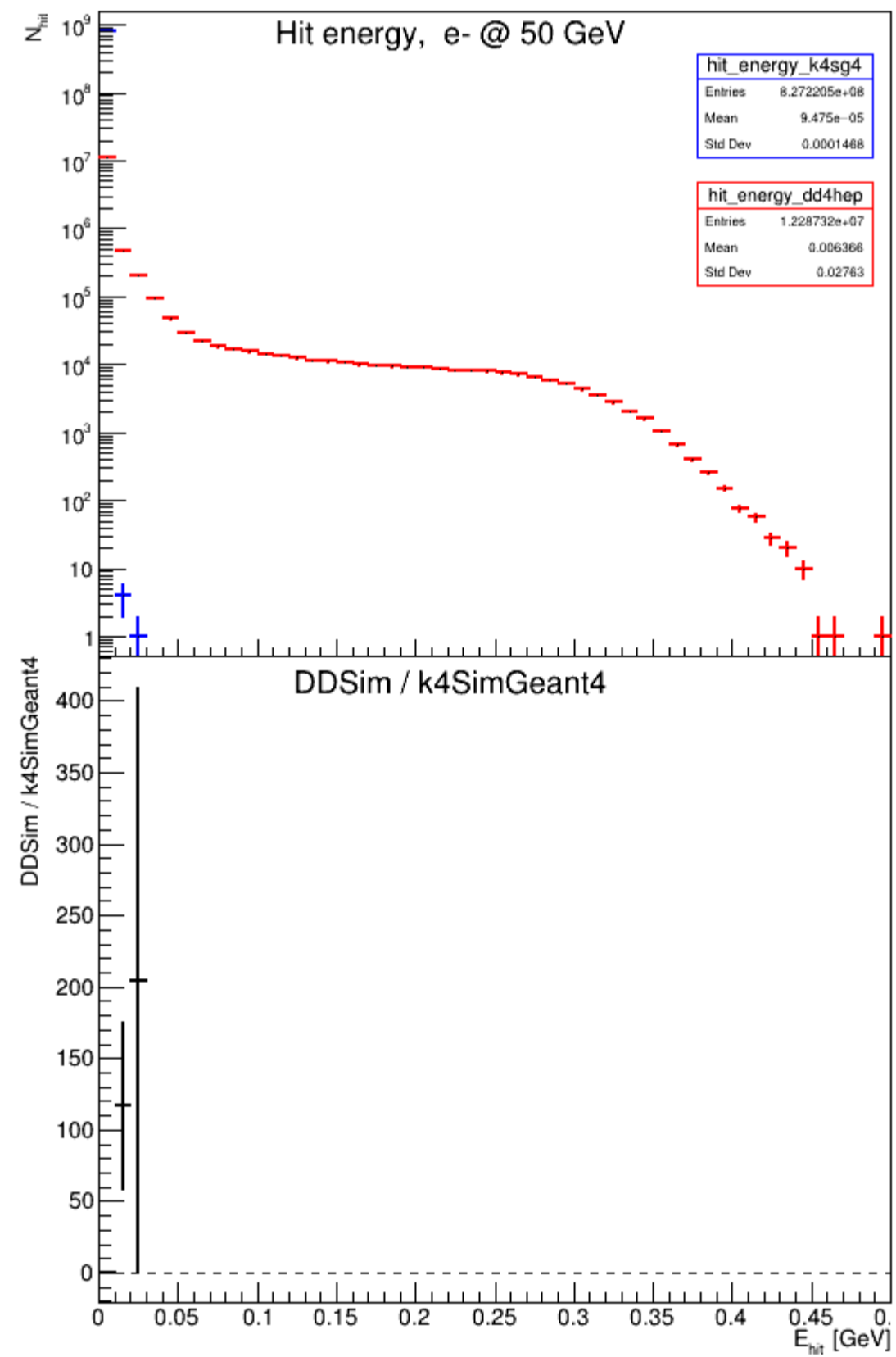
ELECTRON @ 50 GEV

ECAL CORR. CLUSTER



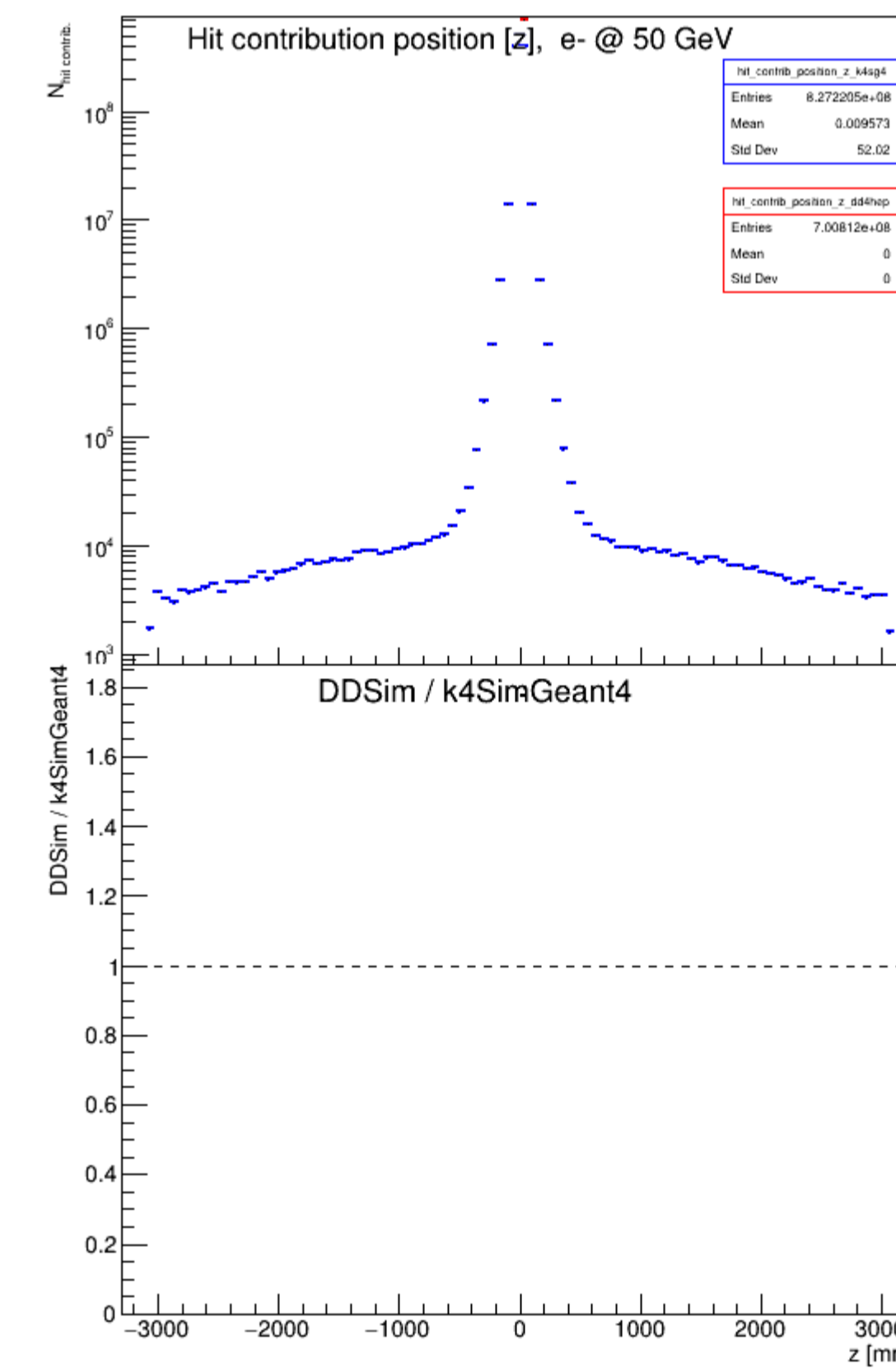
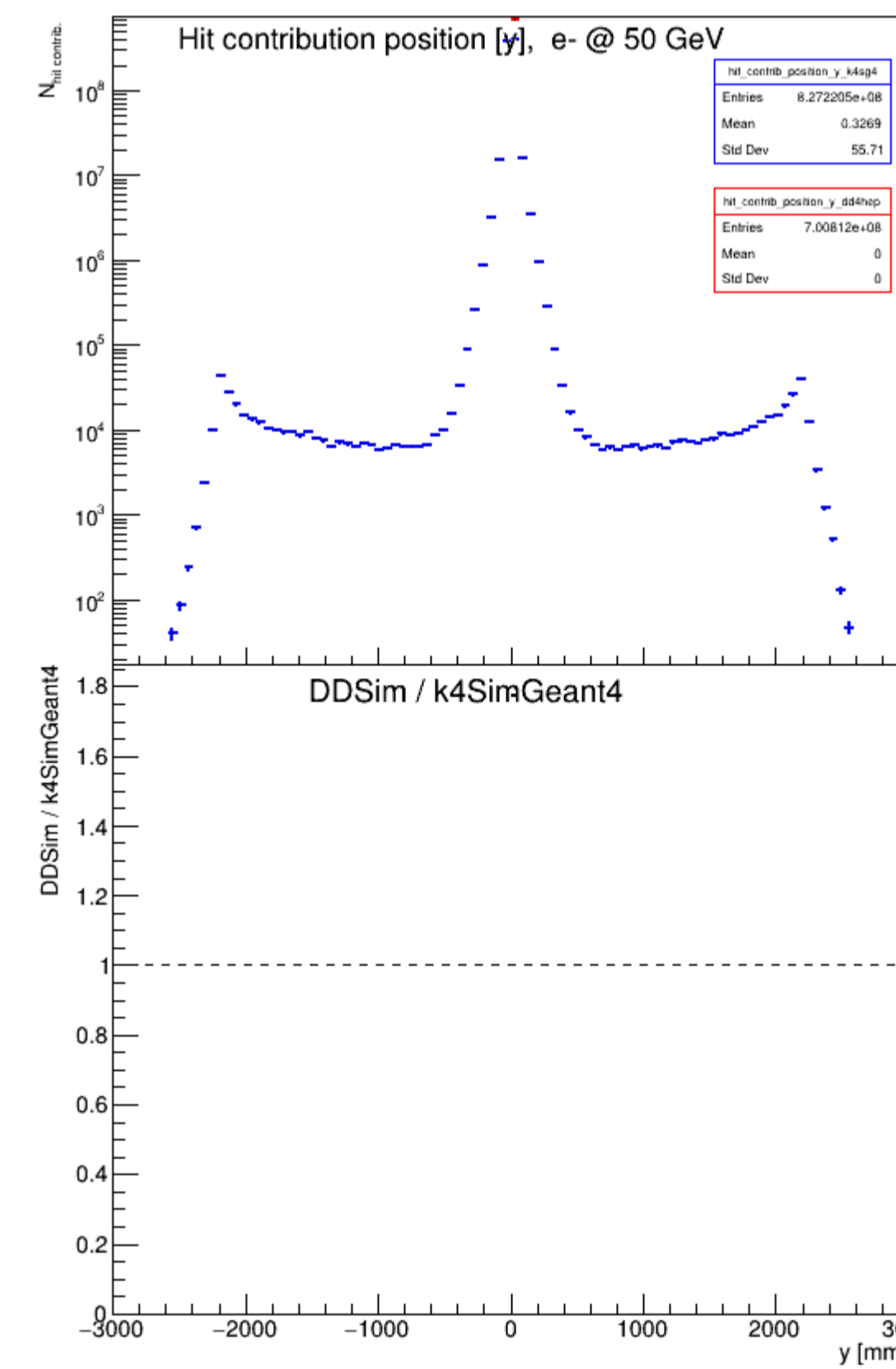
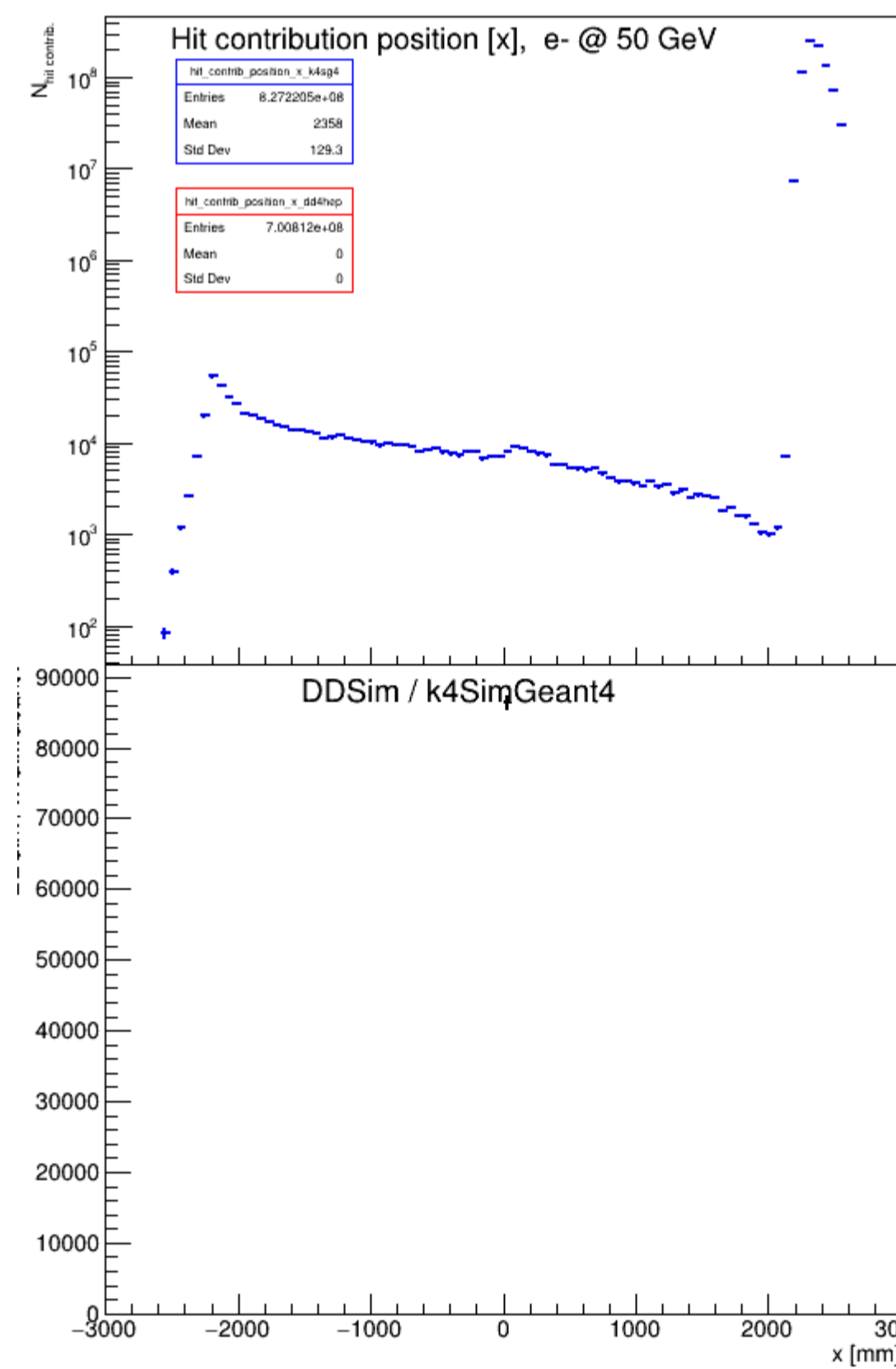
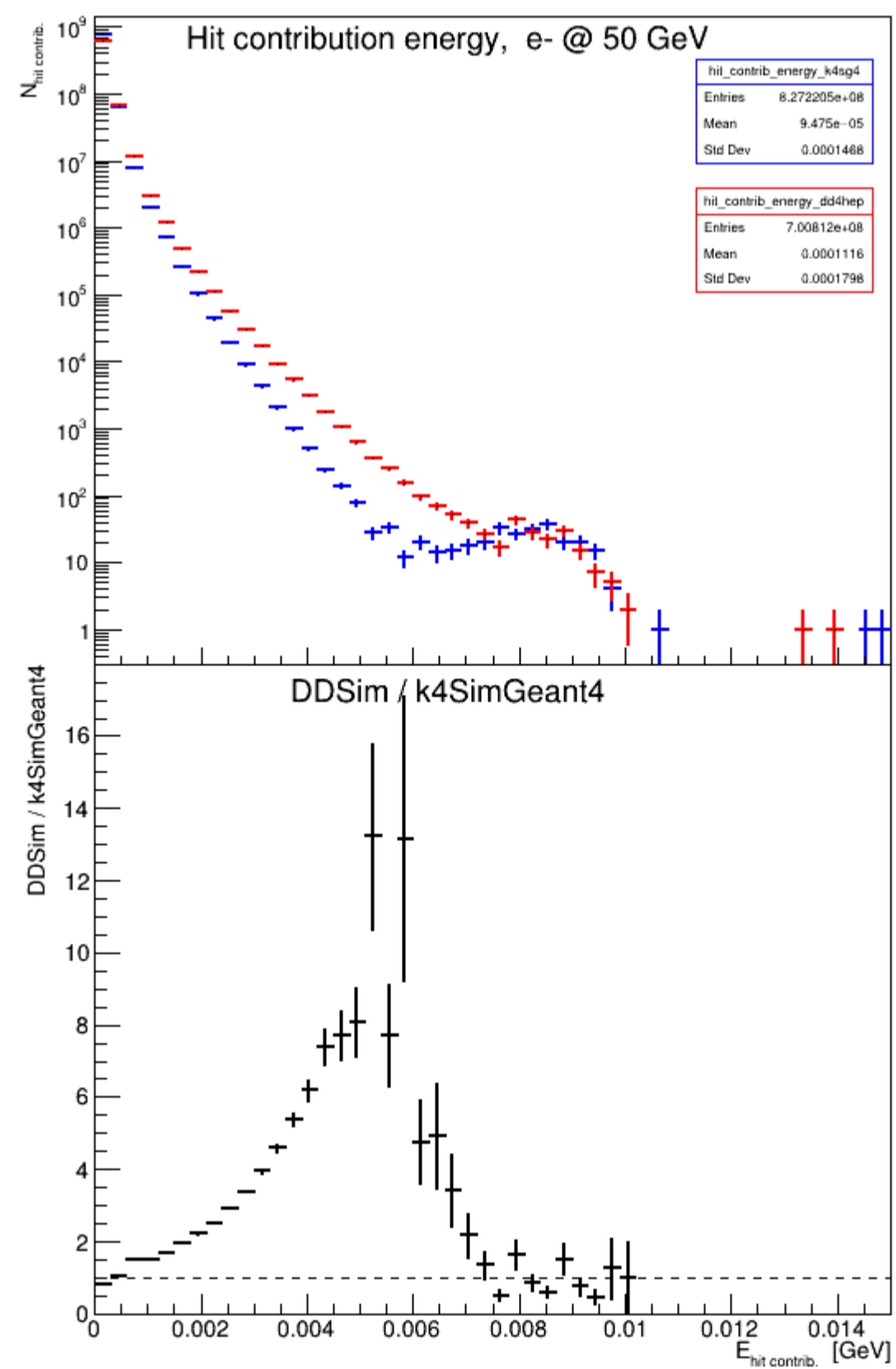
PION @ 50 GEV

ECAL HITS



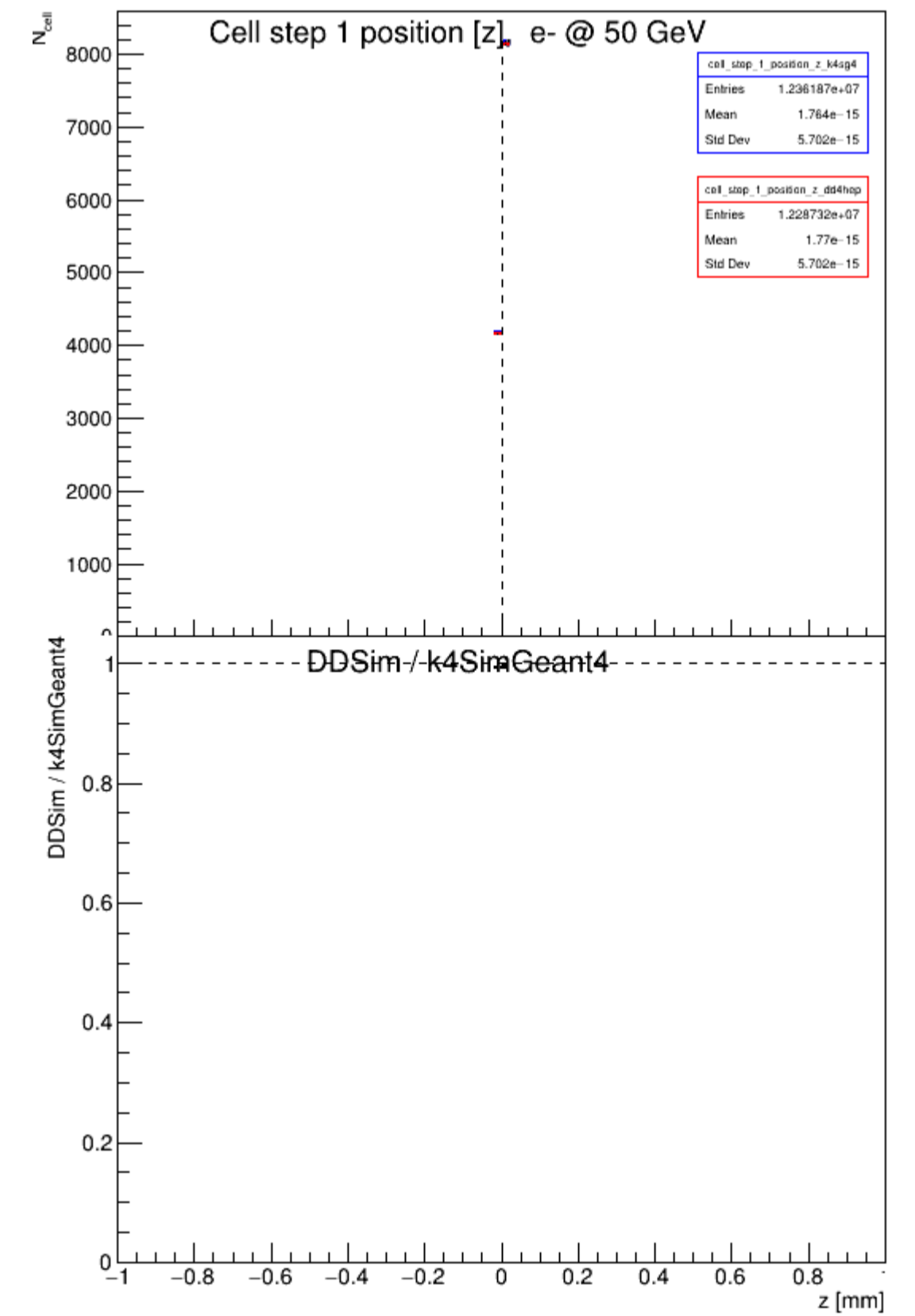
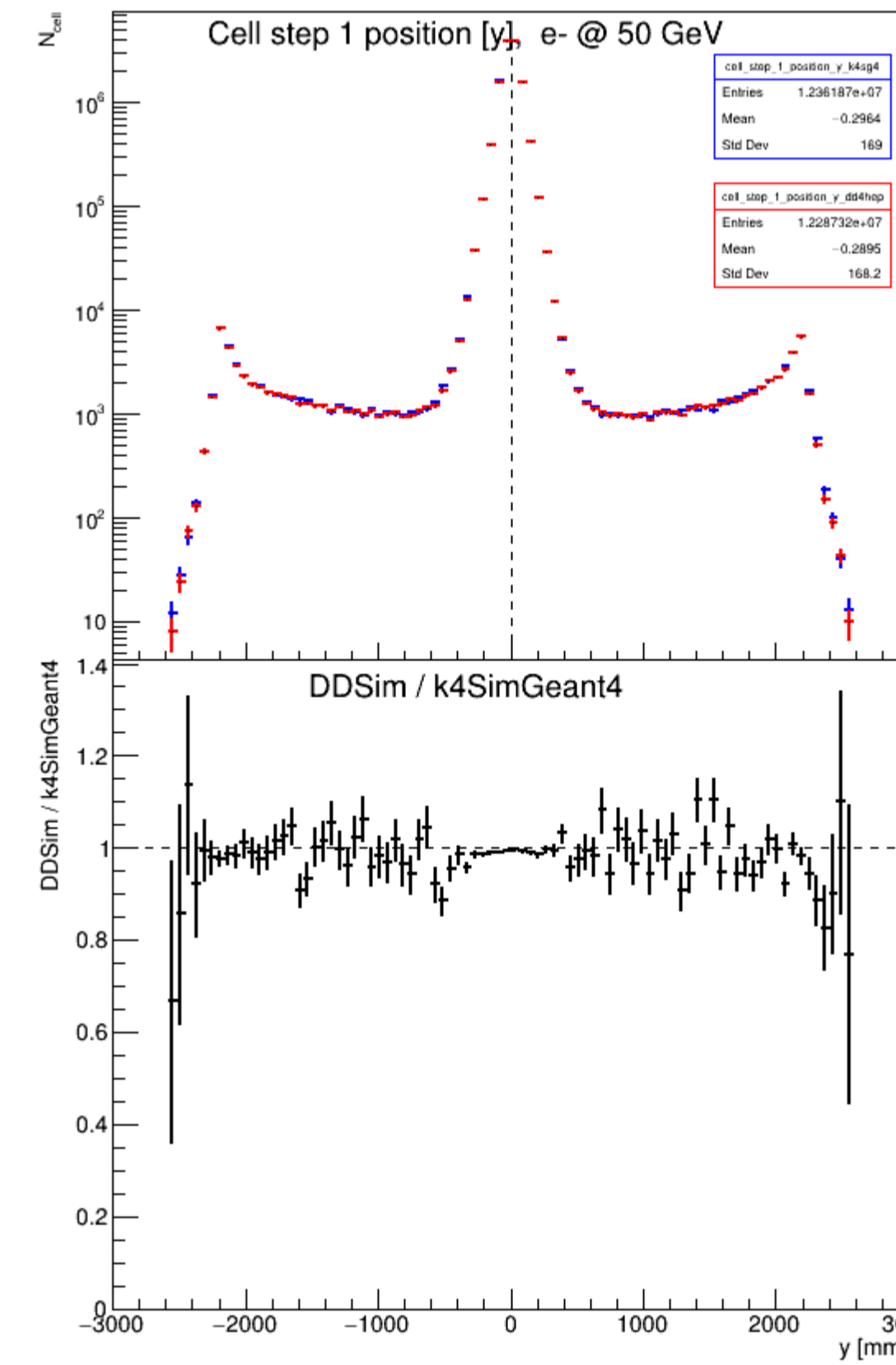
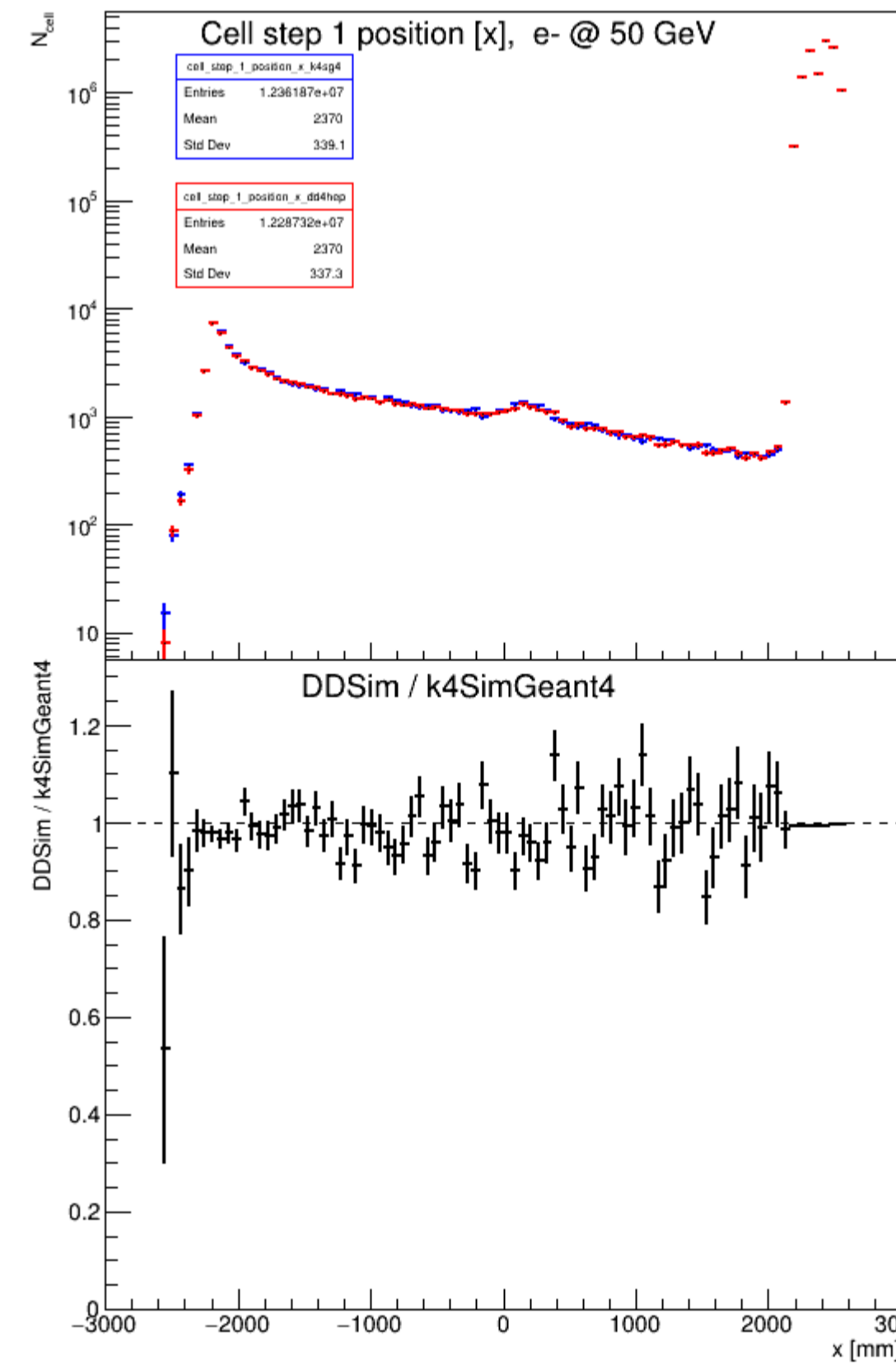
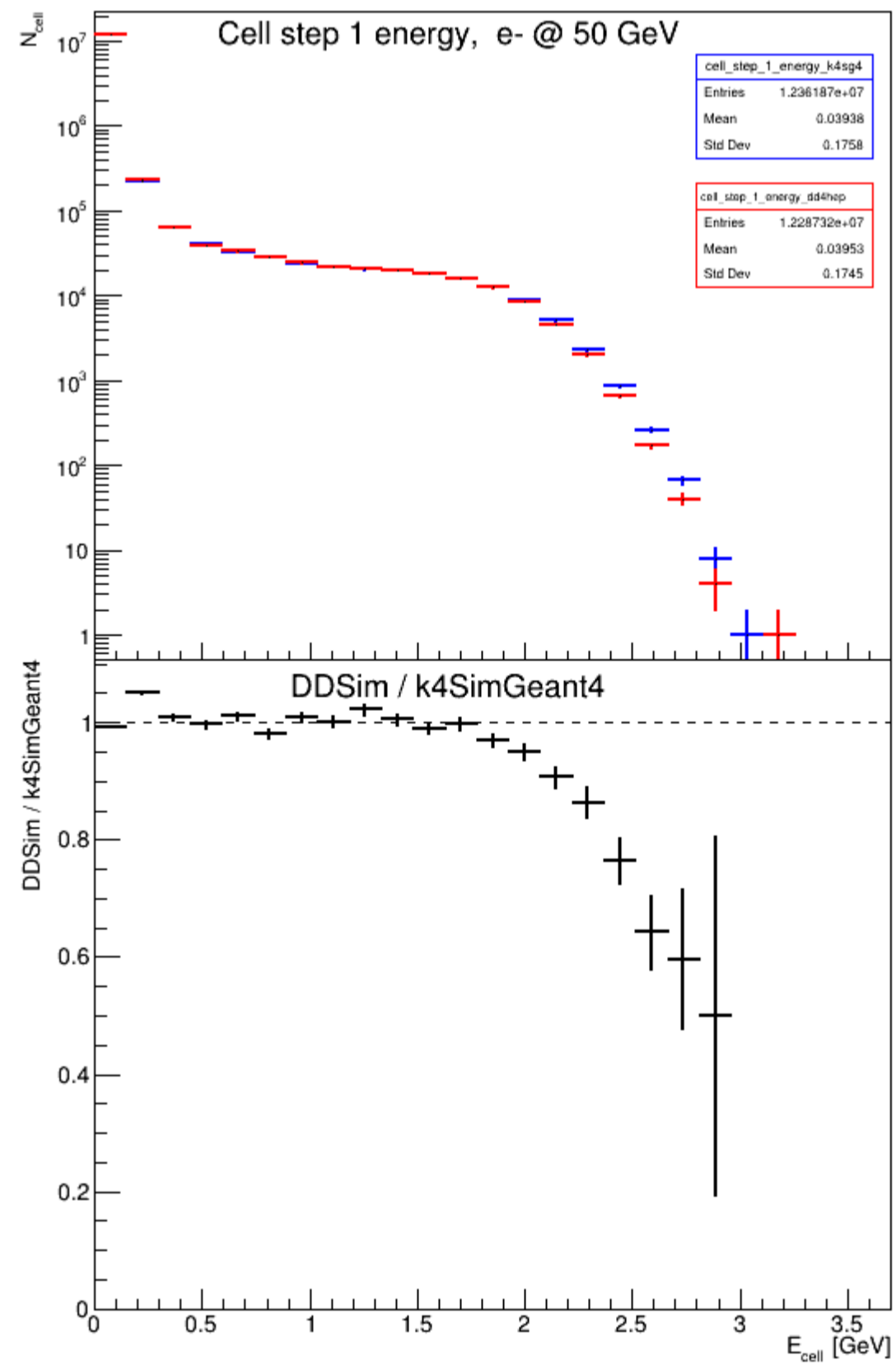
PION @ 50 GEV

ECAL HIT CONTRIBUTIONS



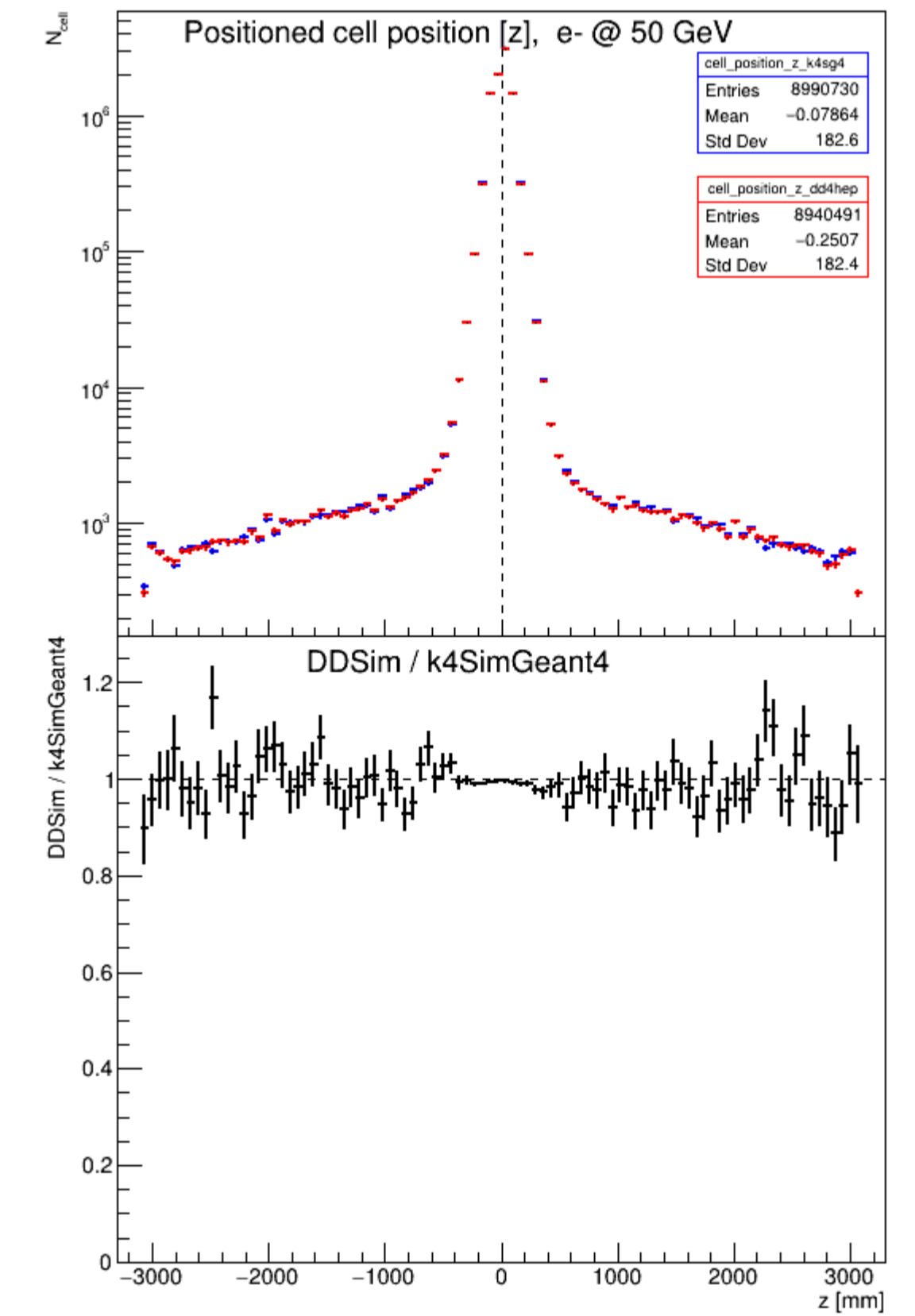
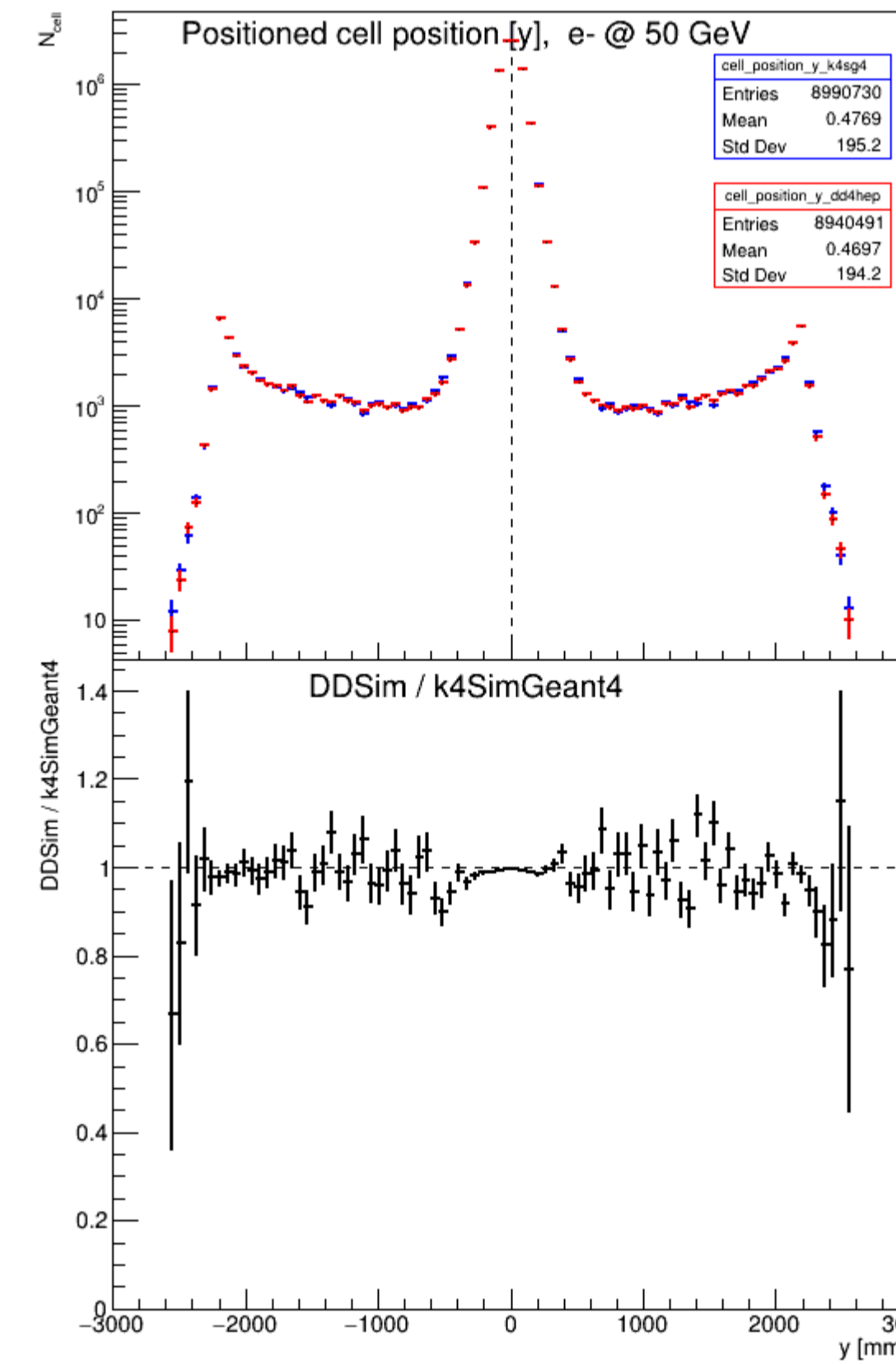
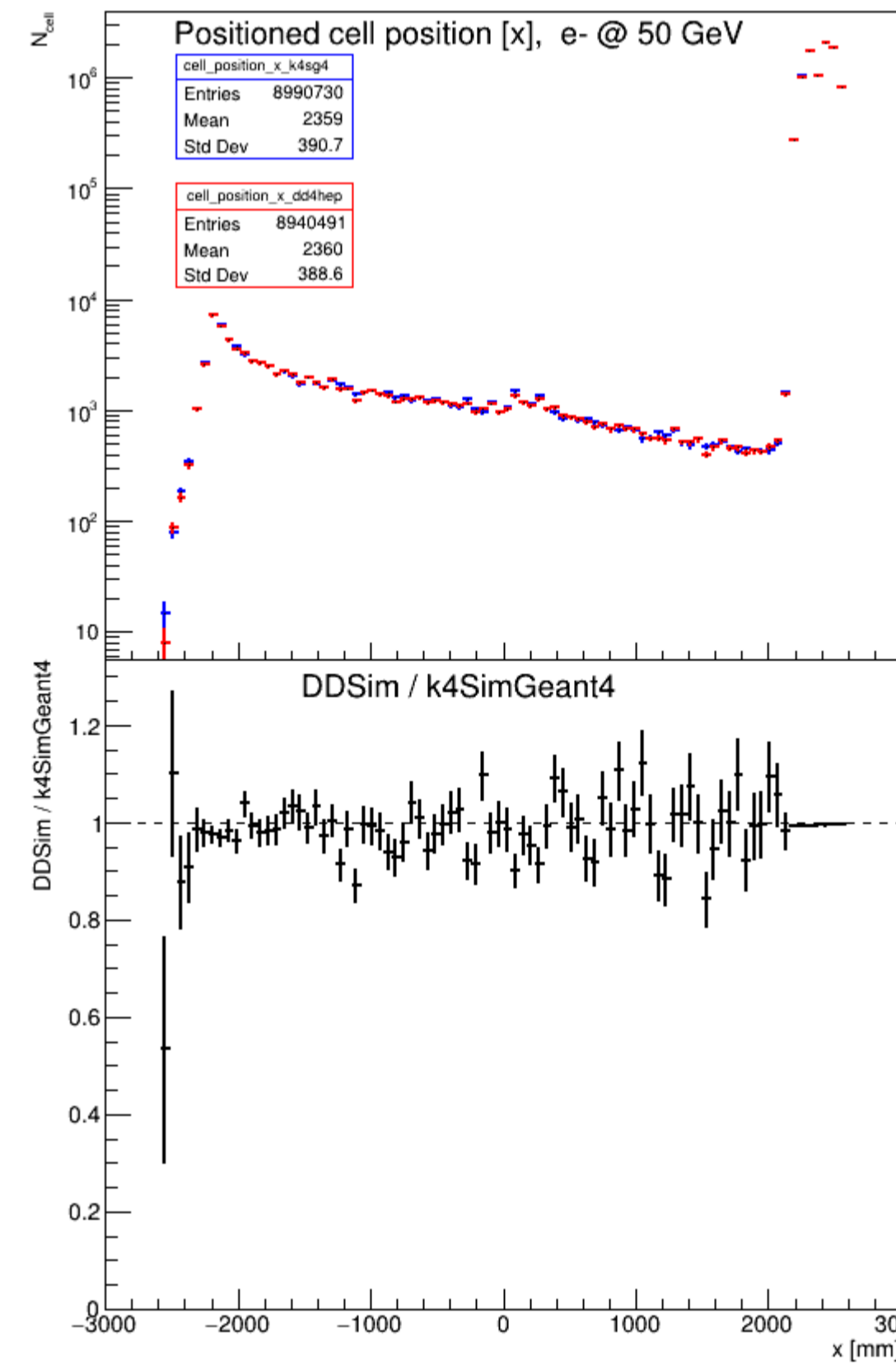
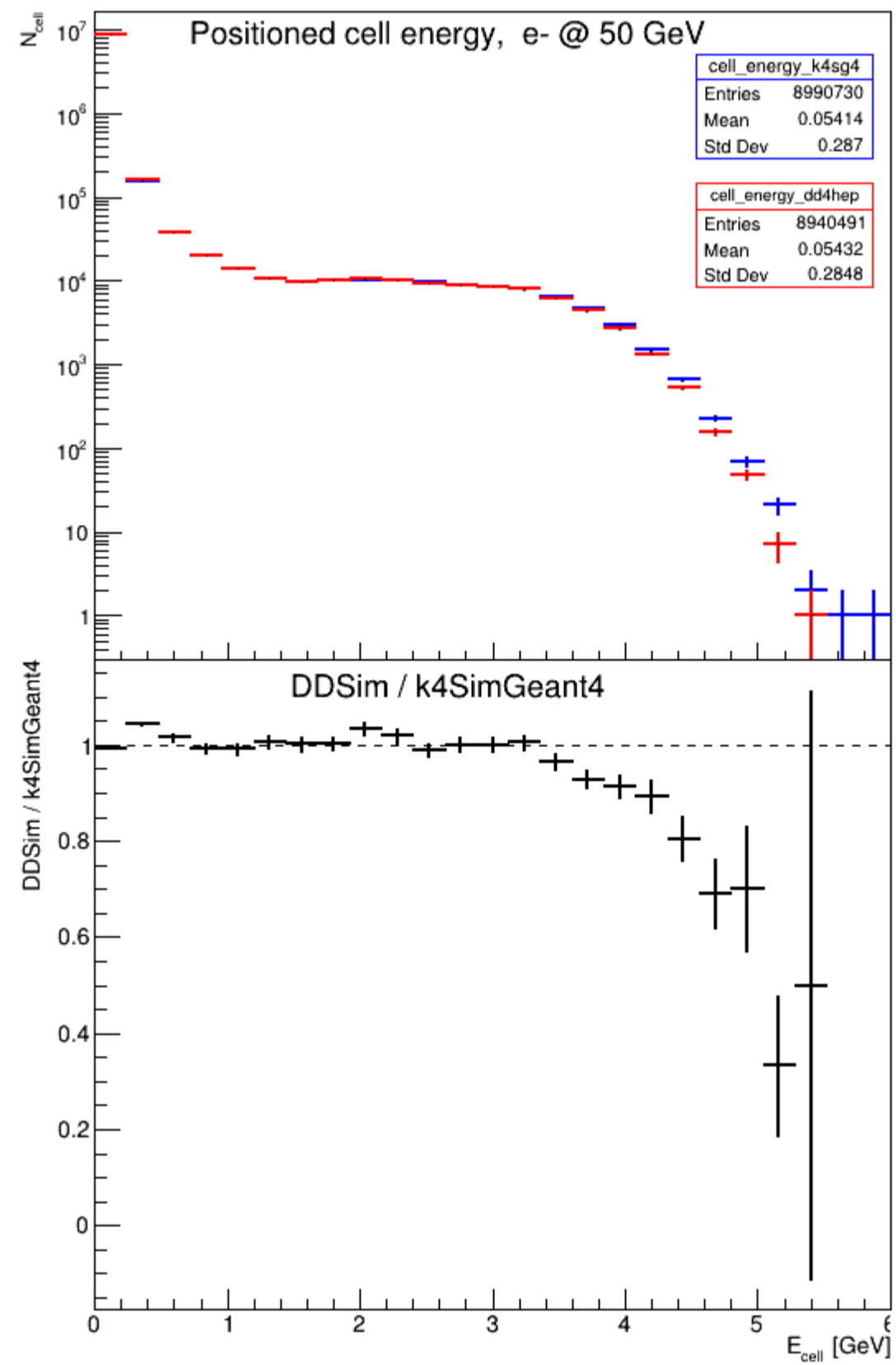
PION @ 50 GEV

ECAL CELLS



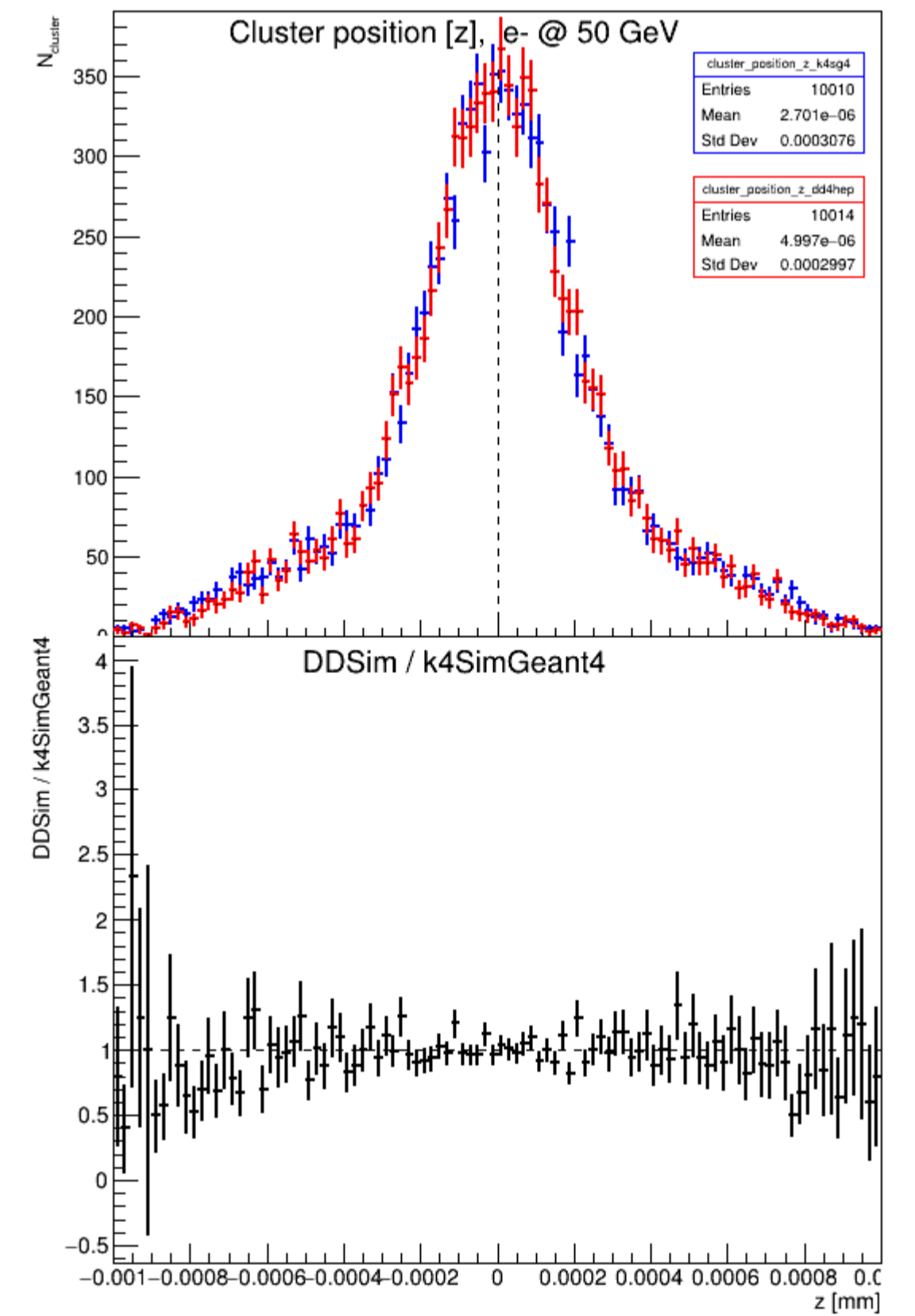
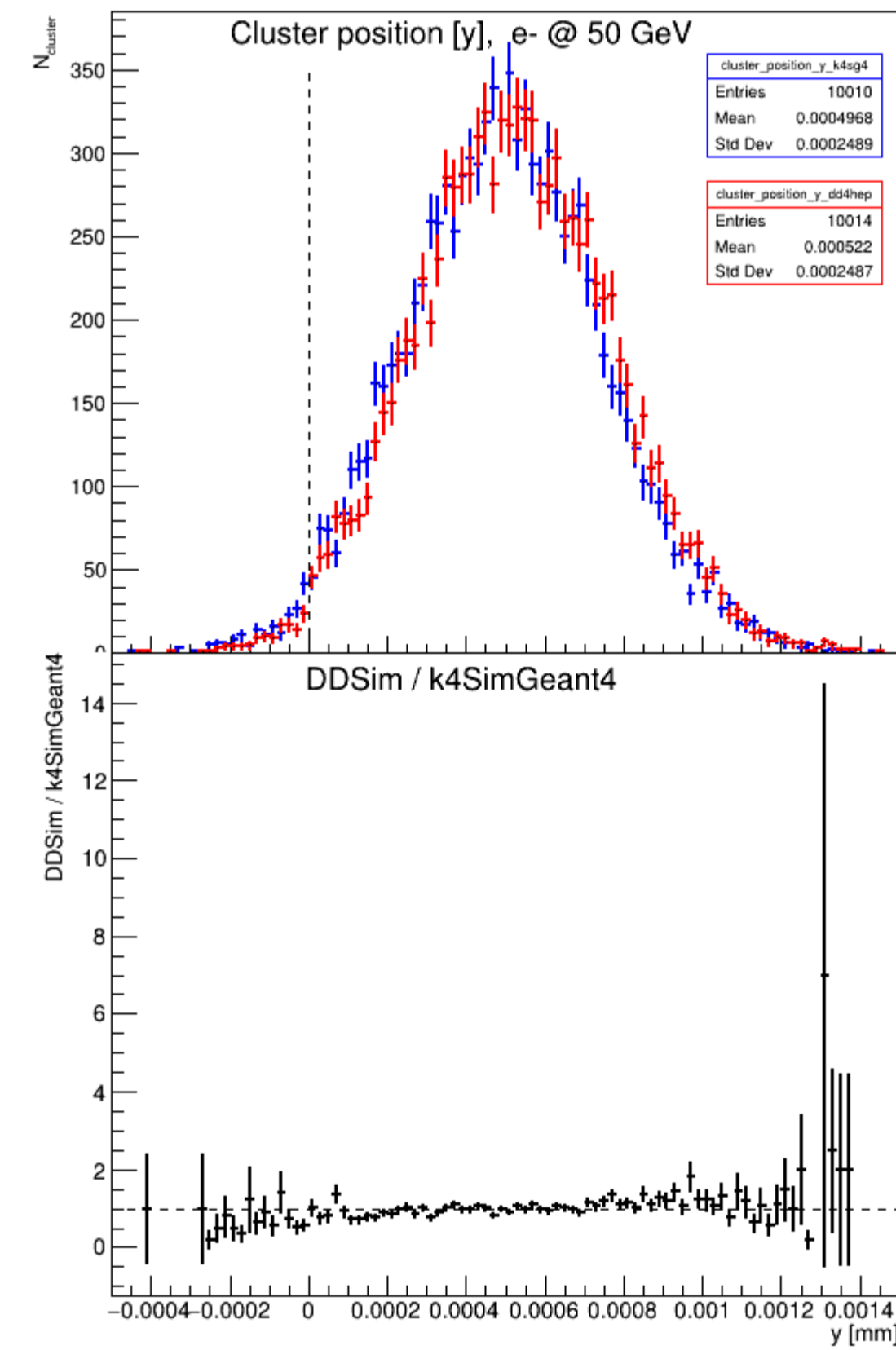
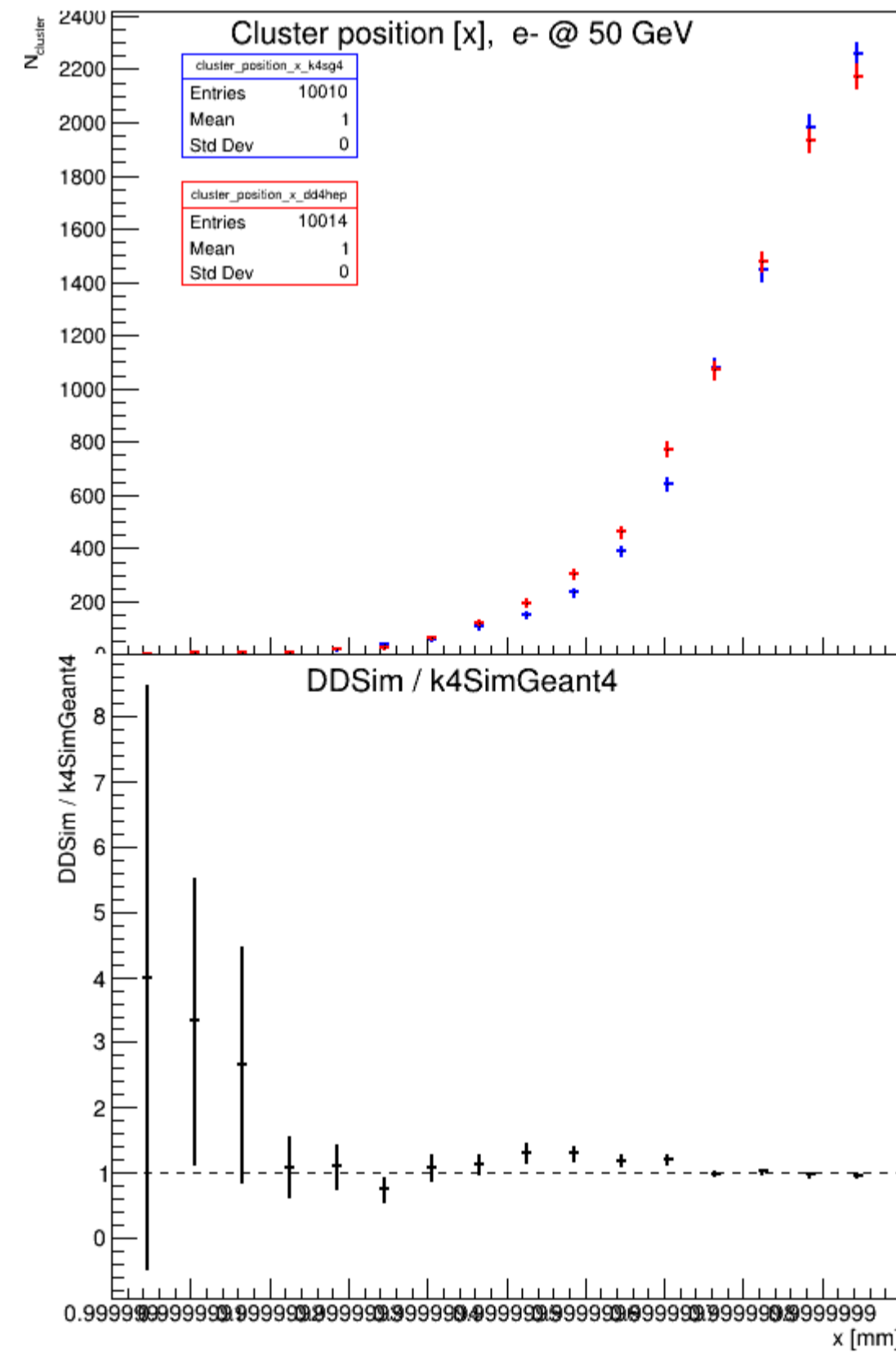
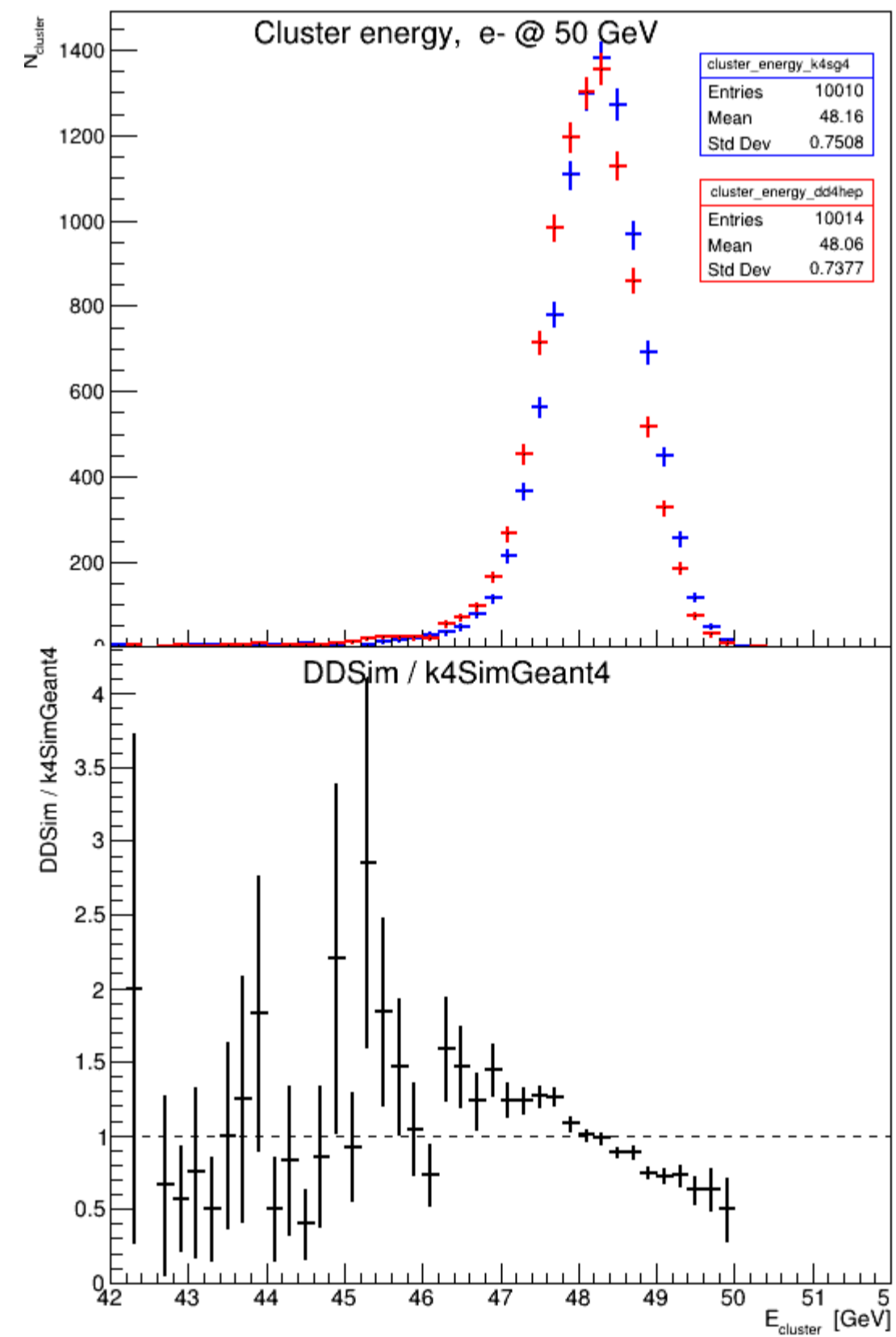
PION @ 50 GEV

ECAL POSITIONED CELLS



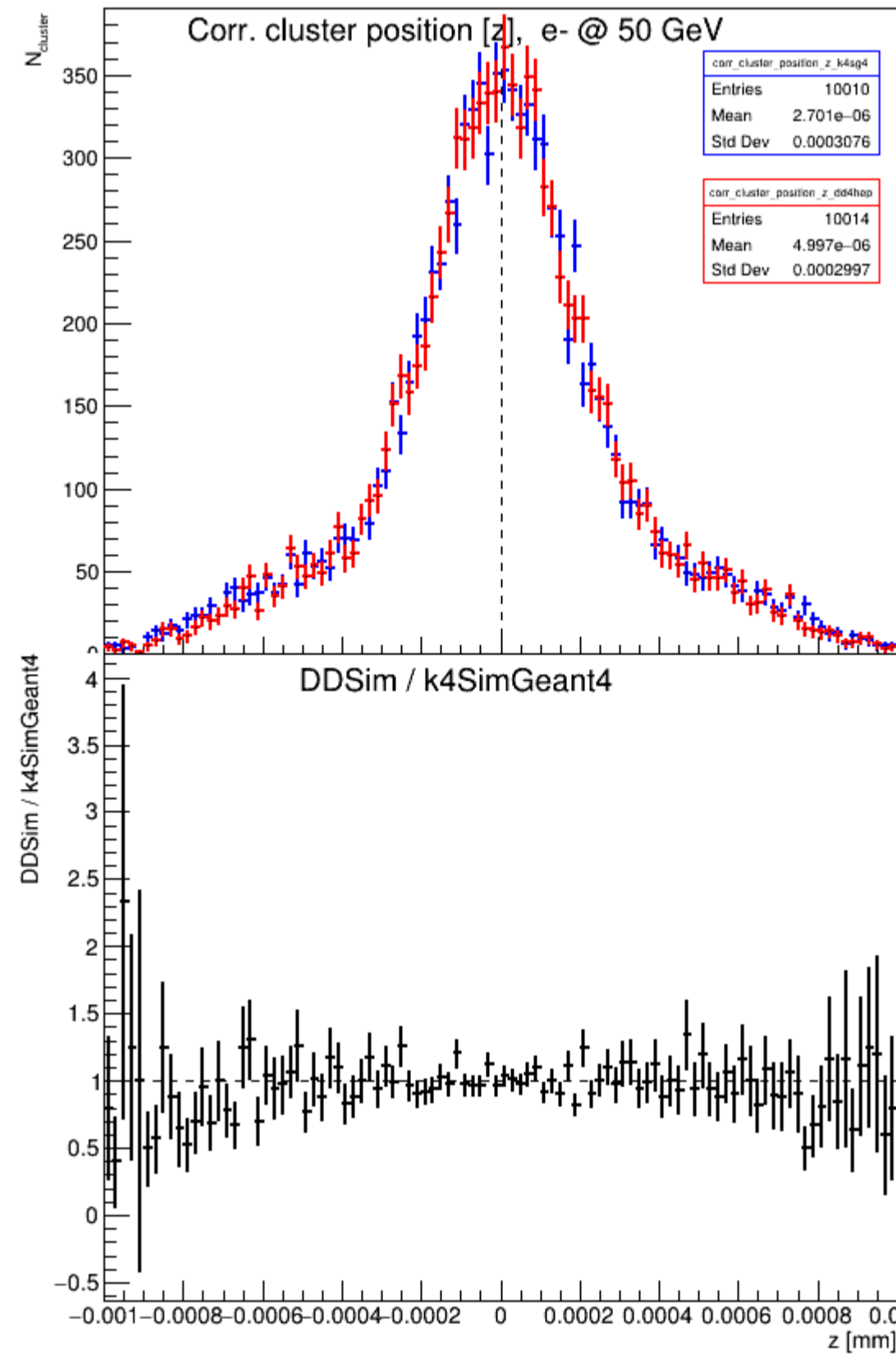
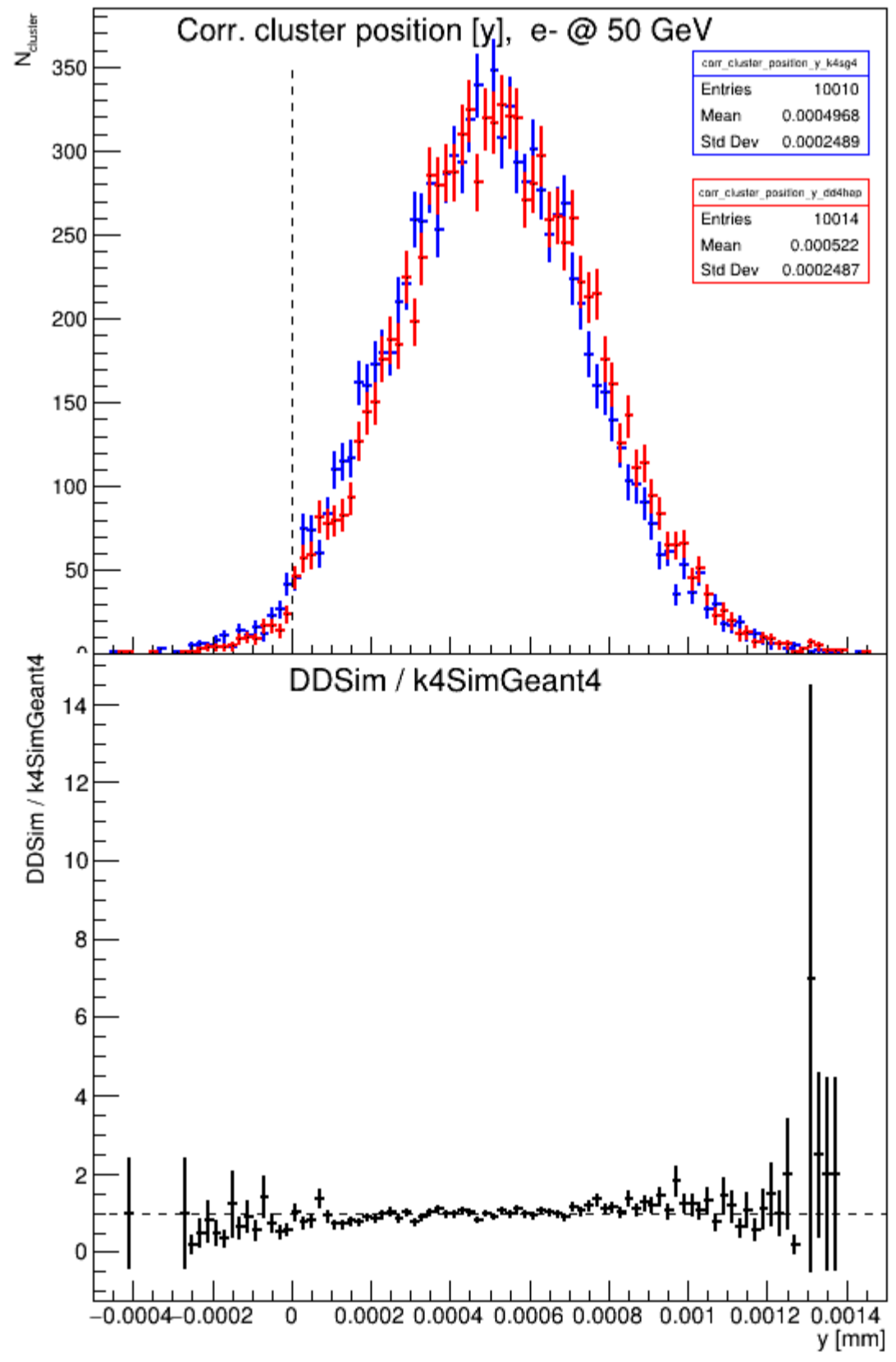
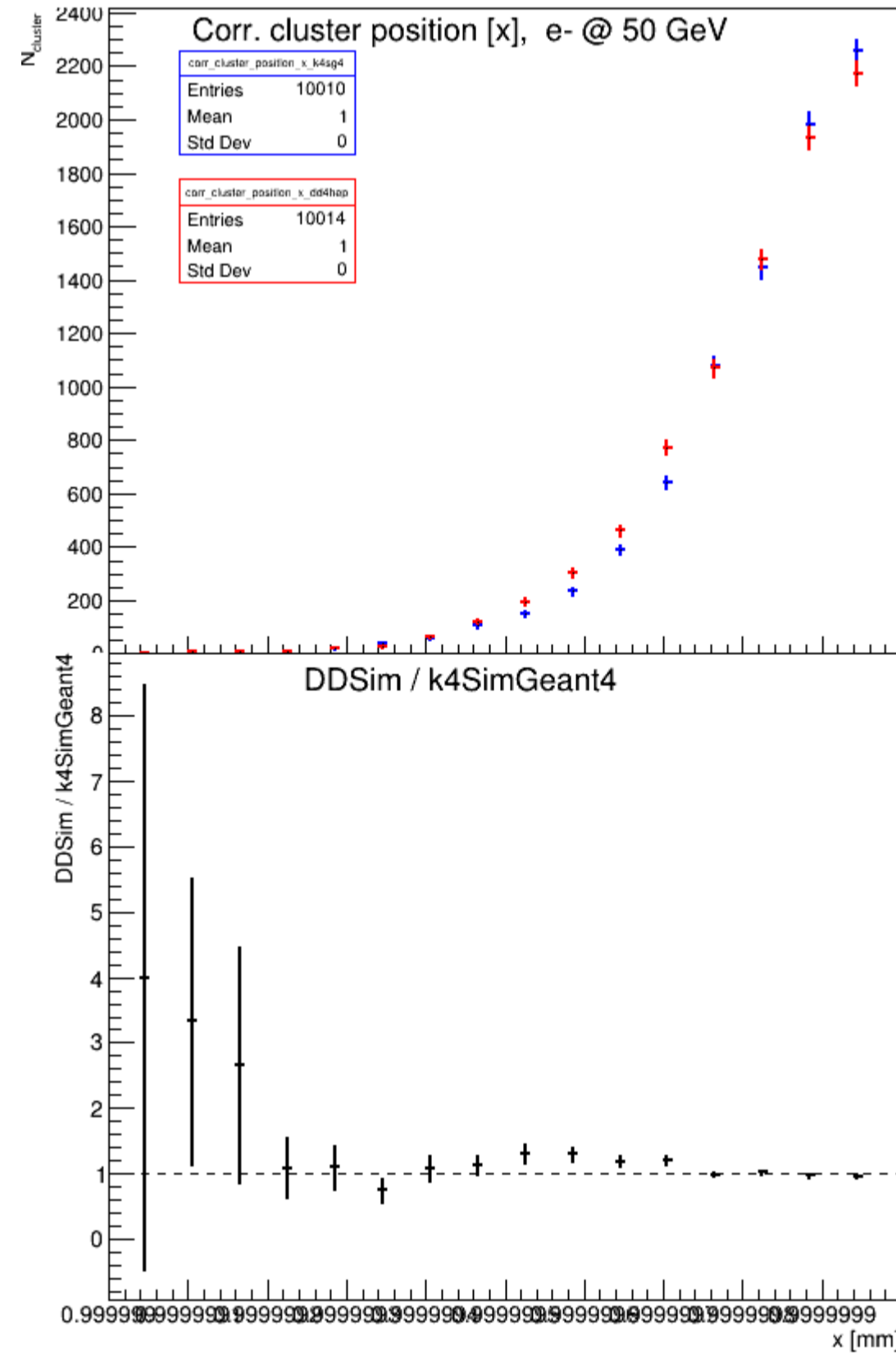
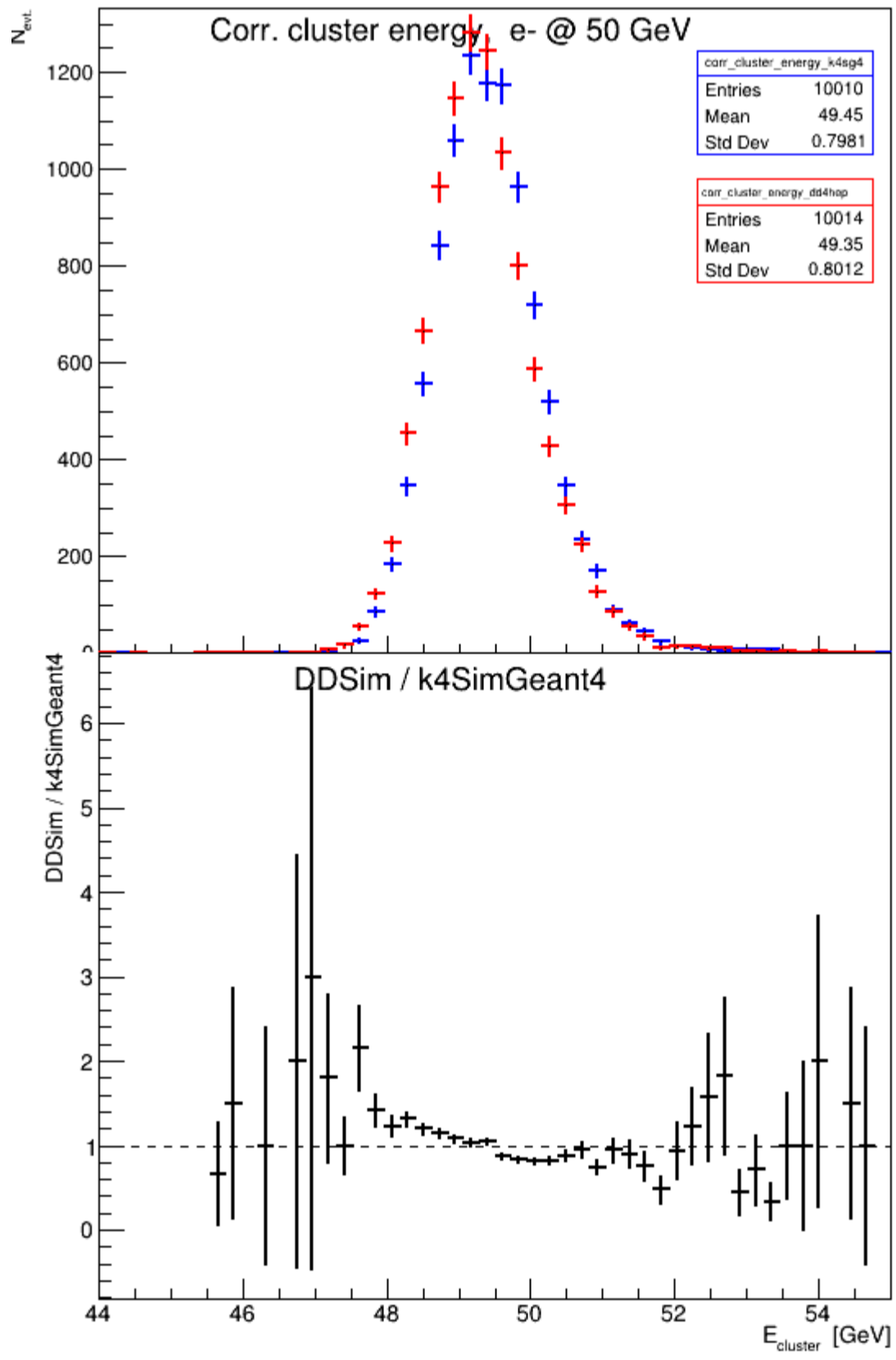
PION @ 50 GEV

ECAL CLUSTER



PION @ 50 GEV

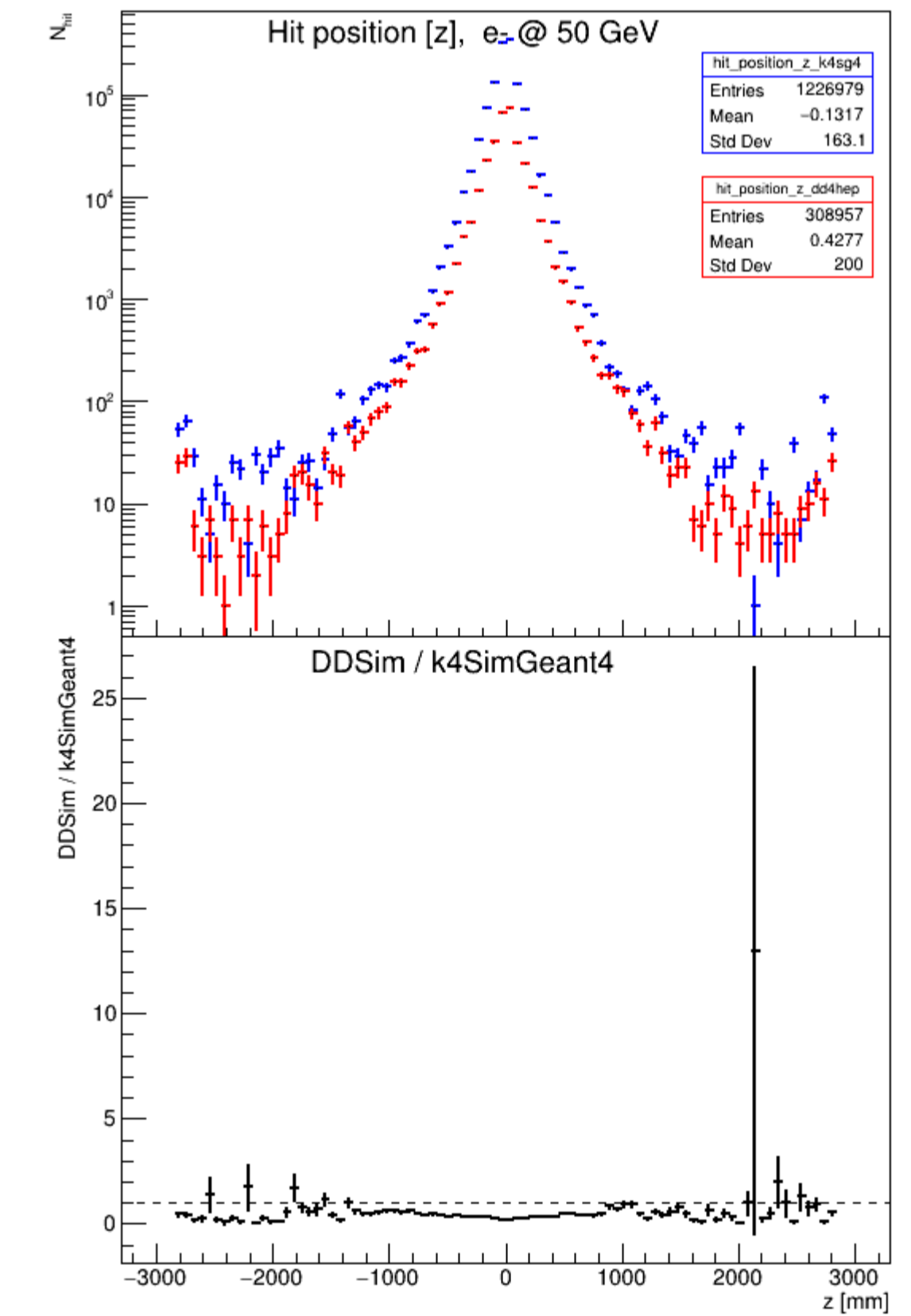
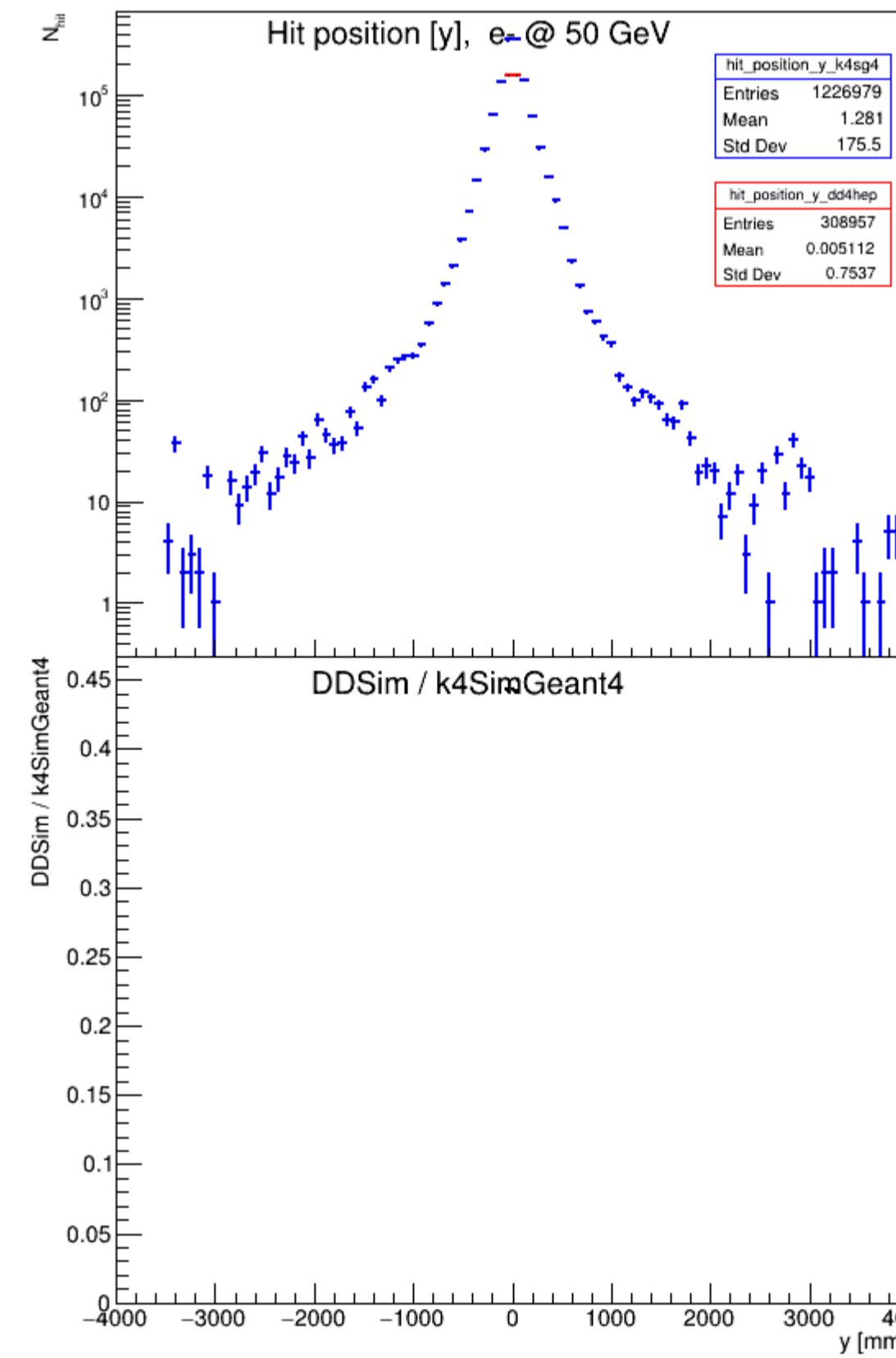
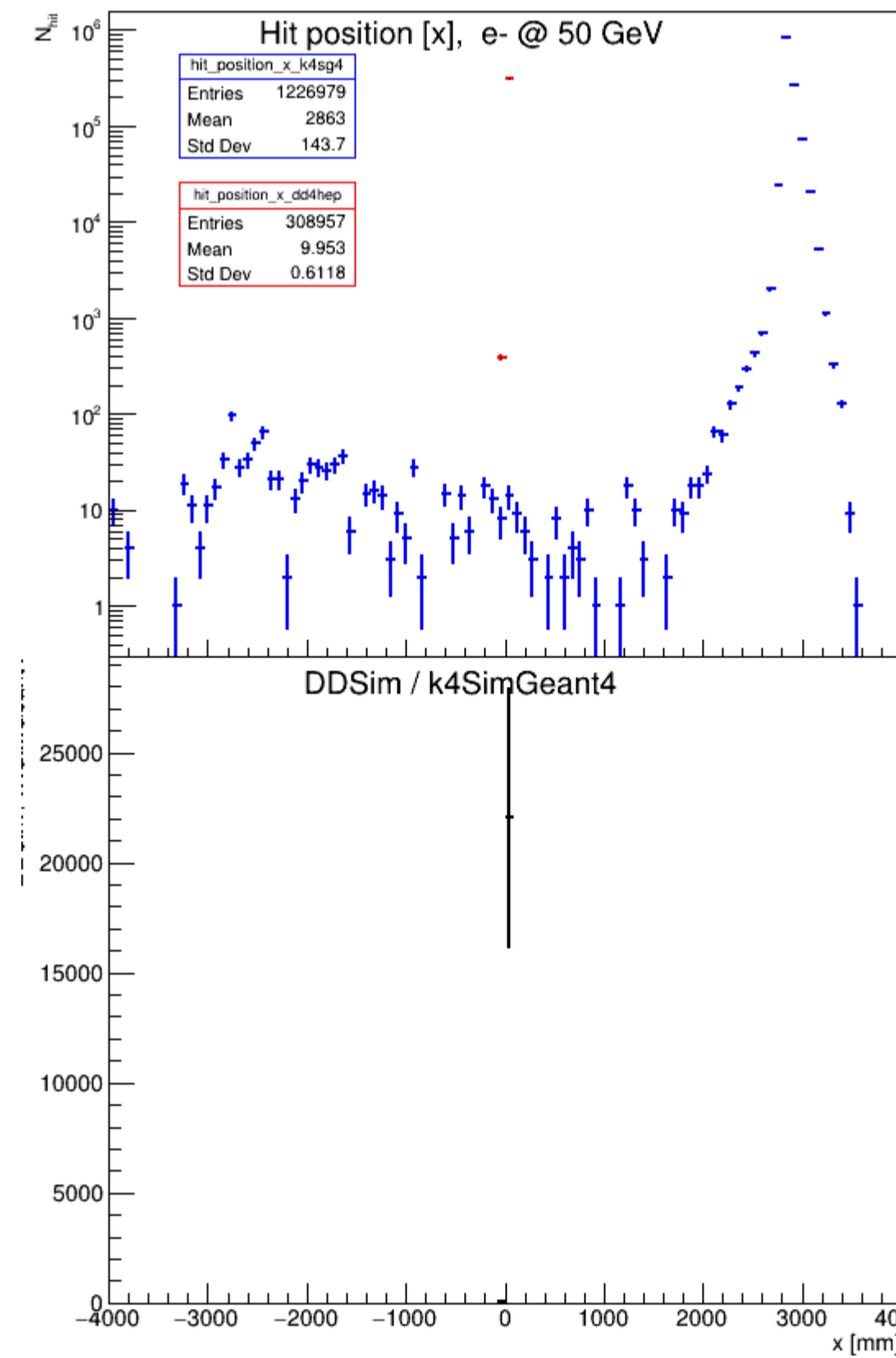
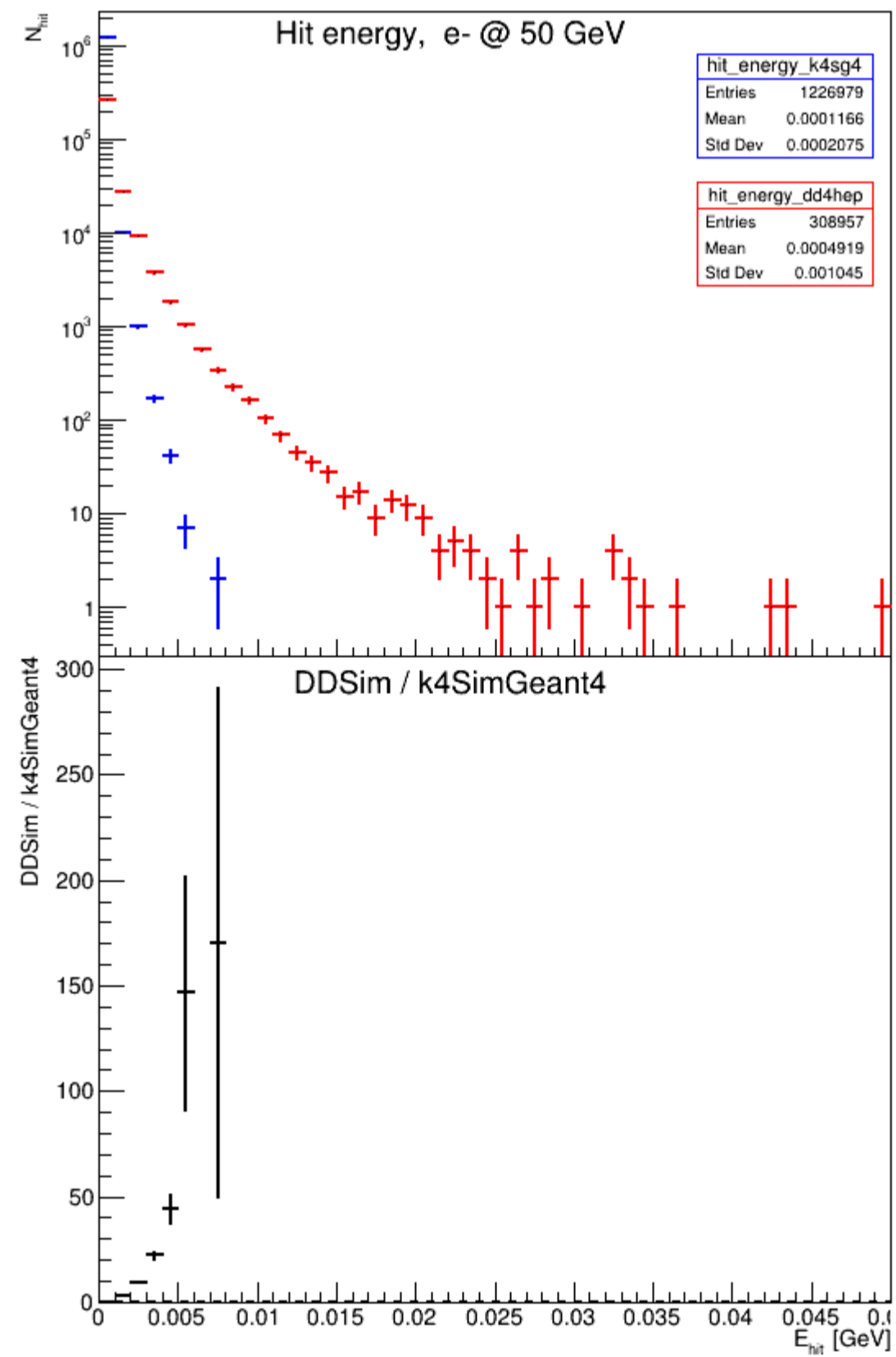
ECAL CORR. CLUSTER



HCAL

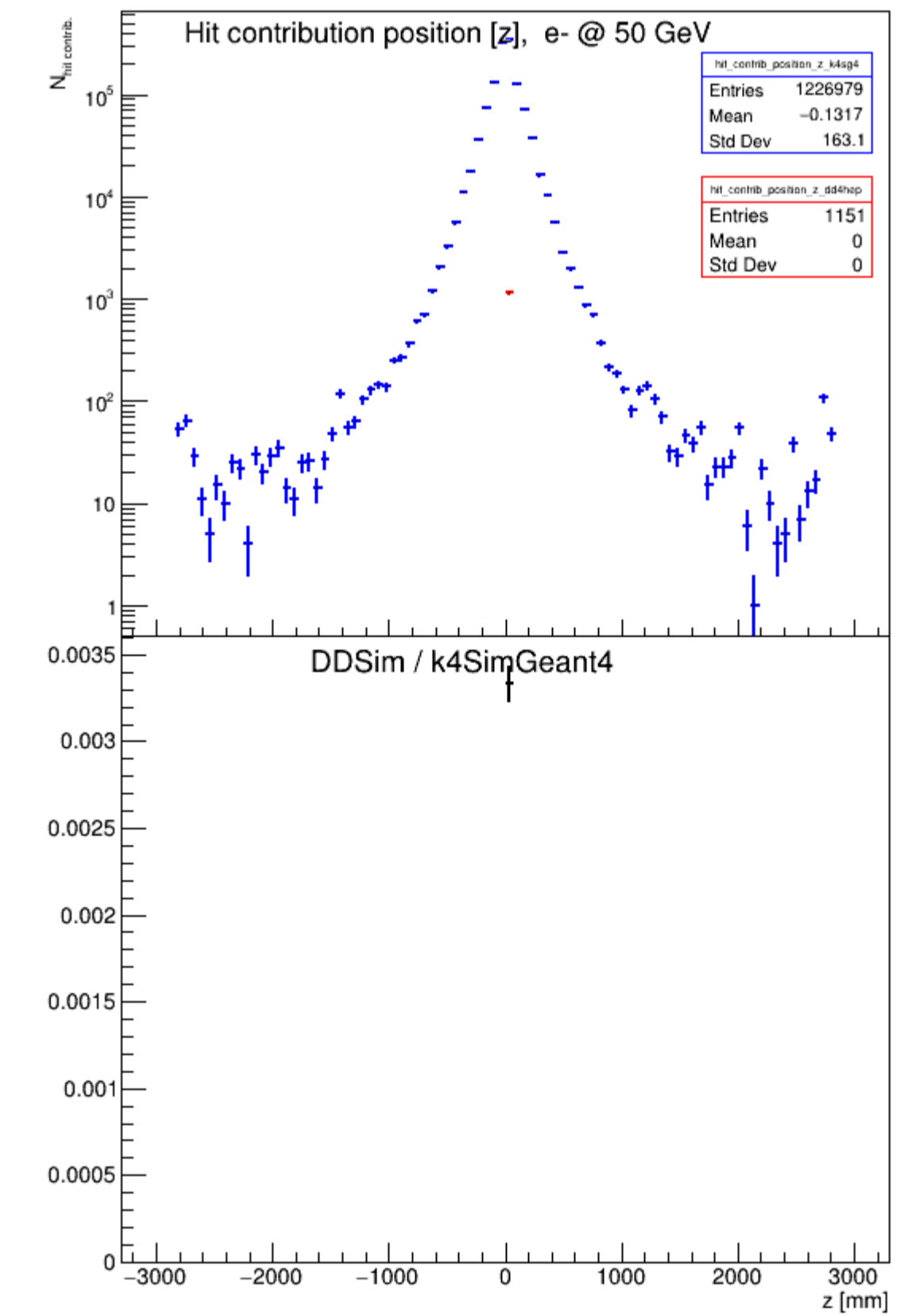
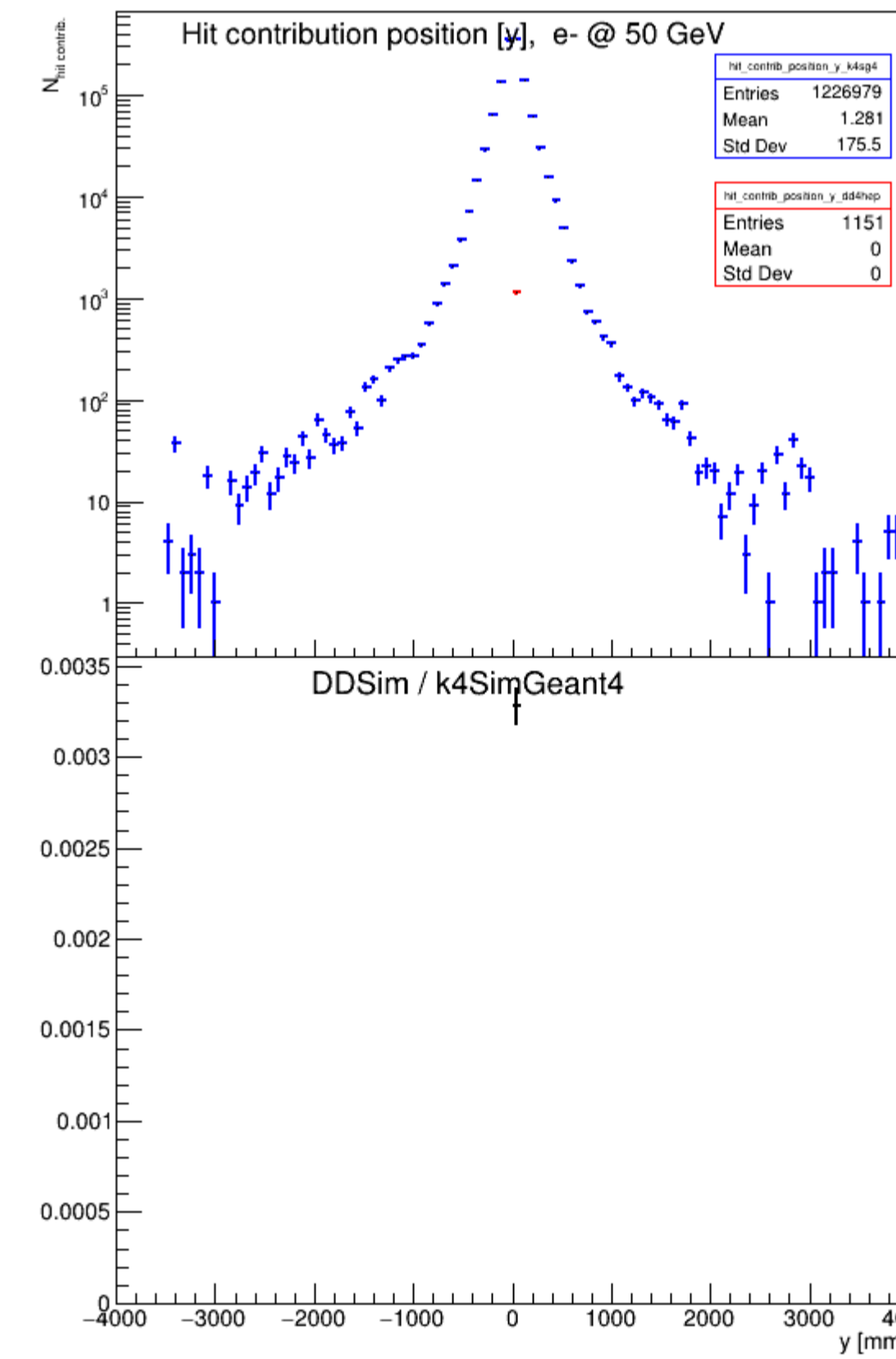
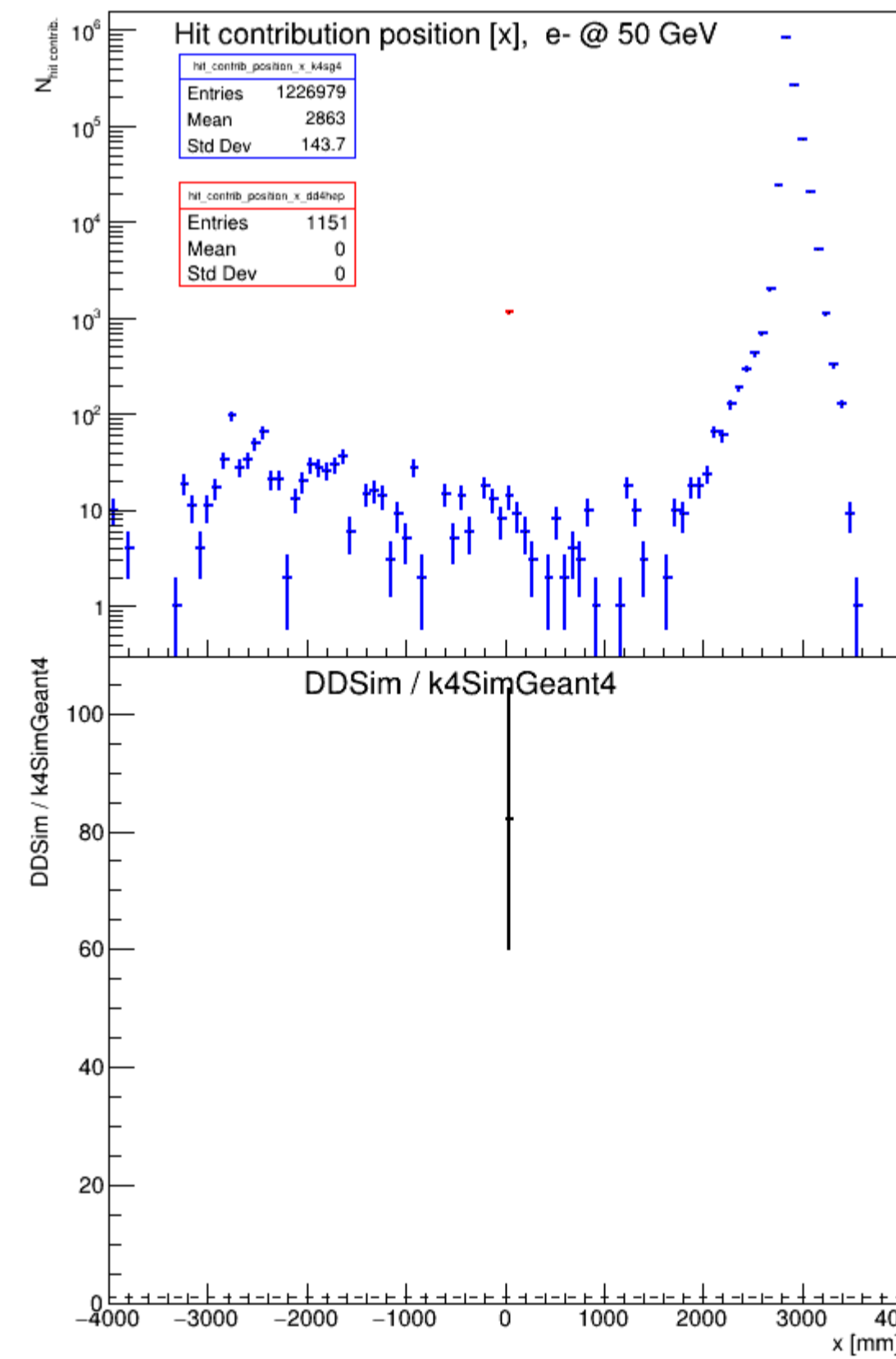
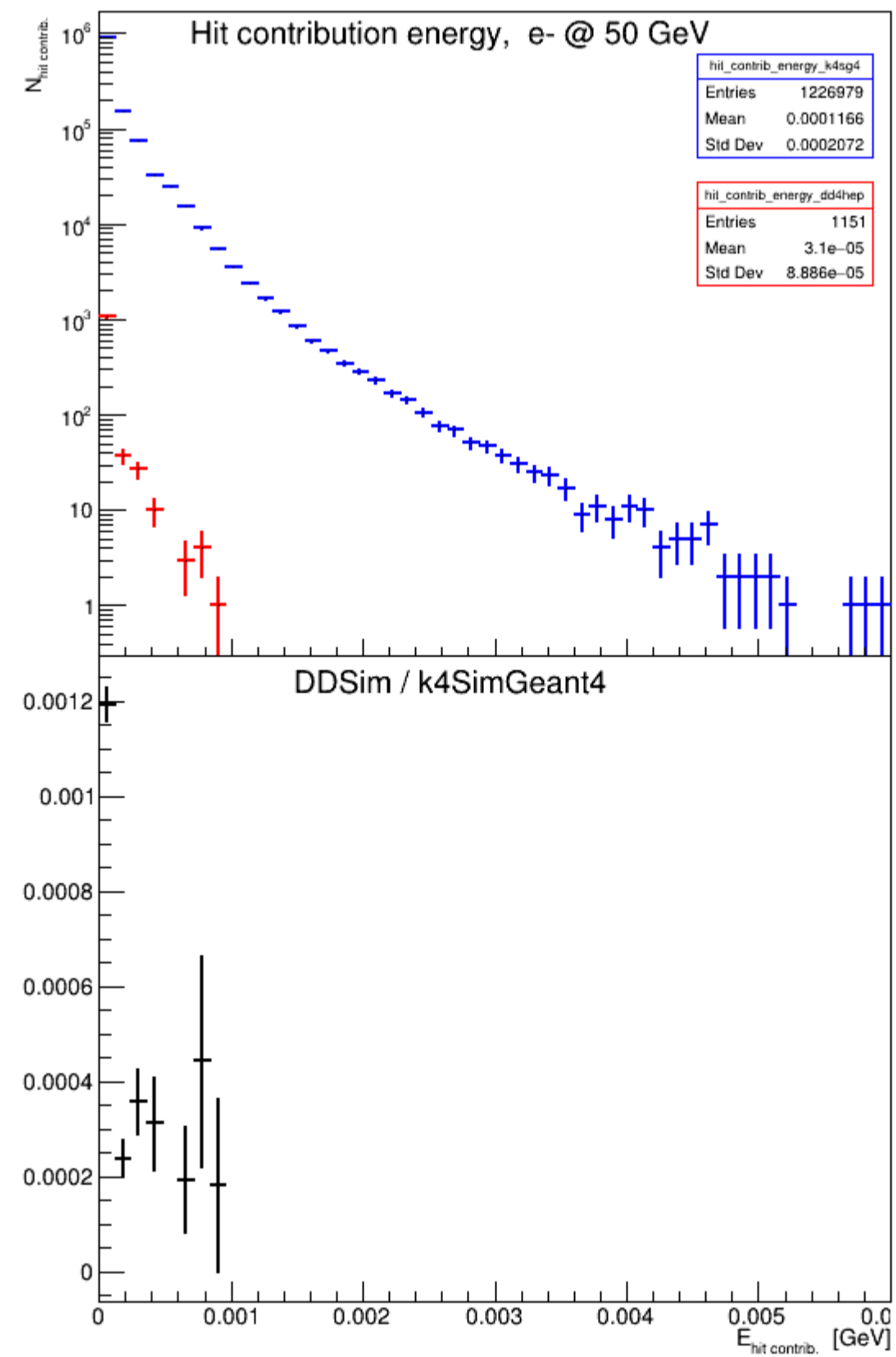
ELECTRON @ 50 GEV

HCAL HITS



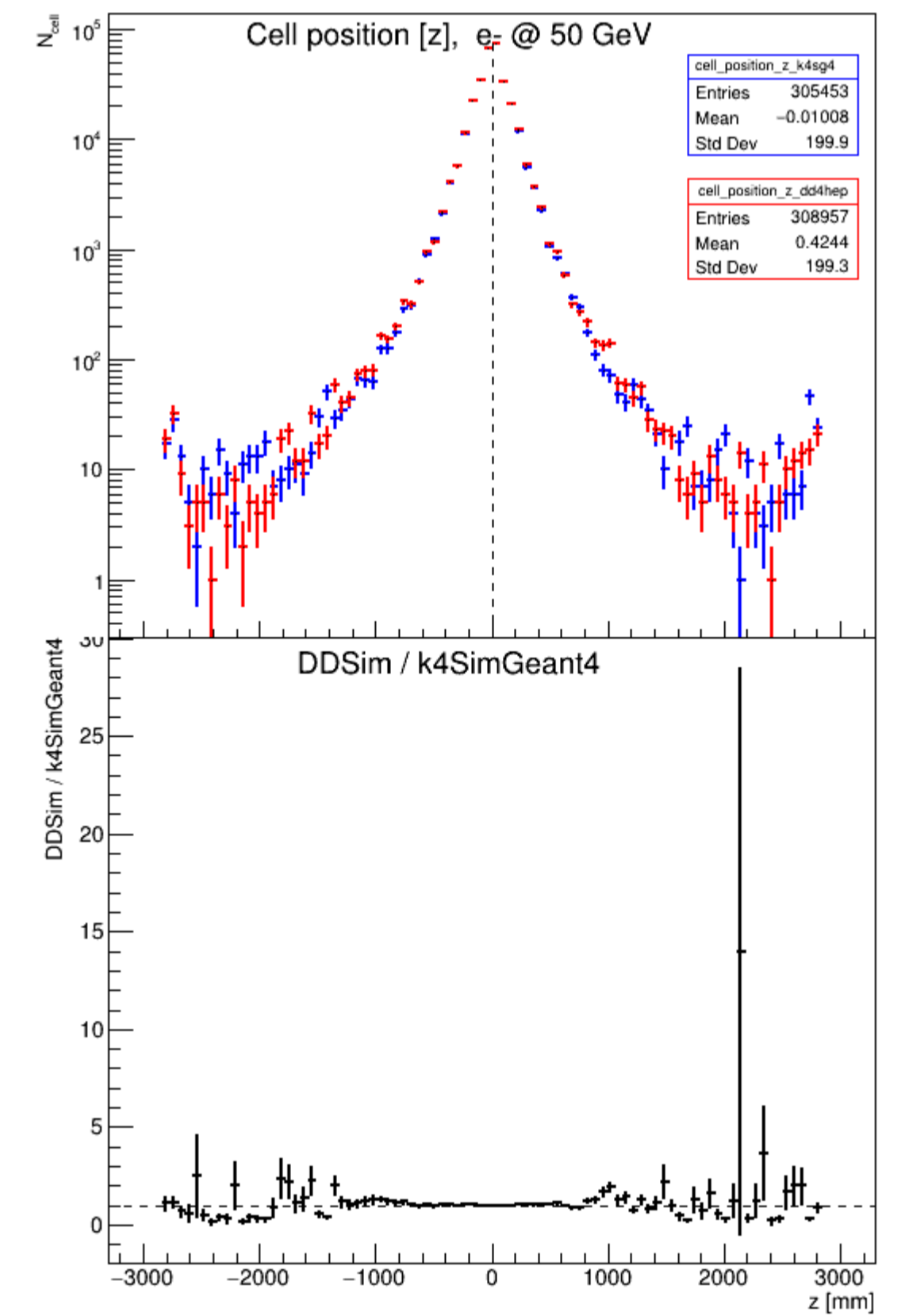
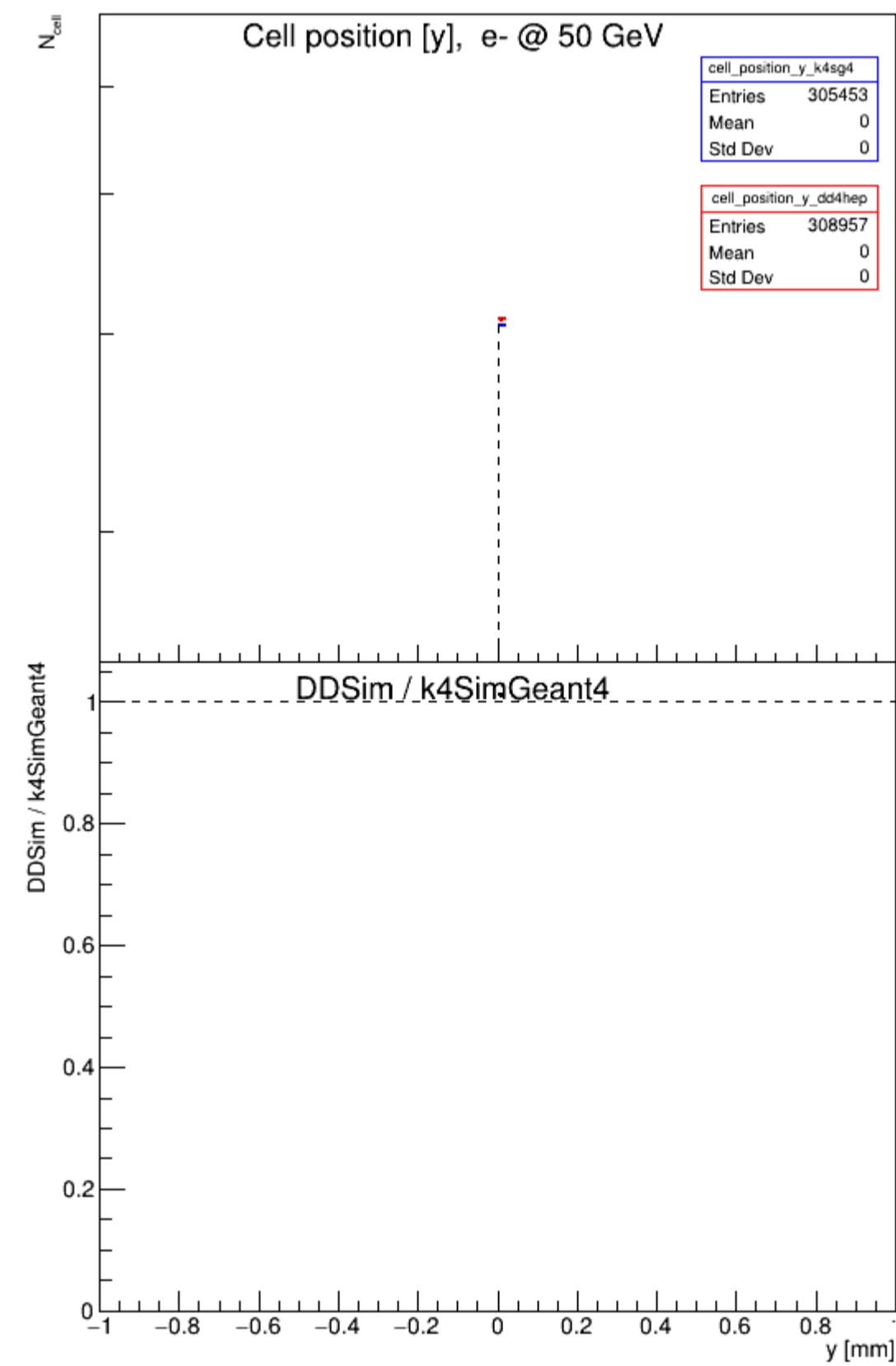
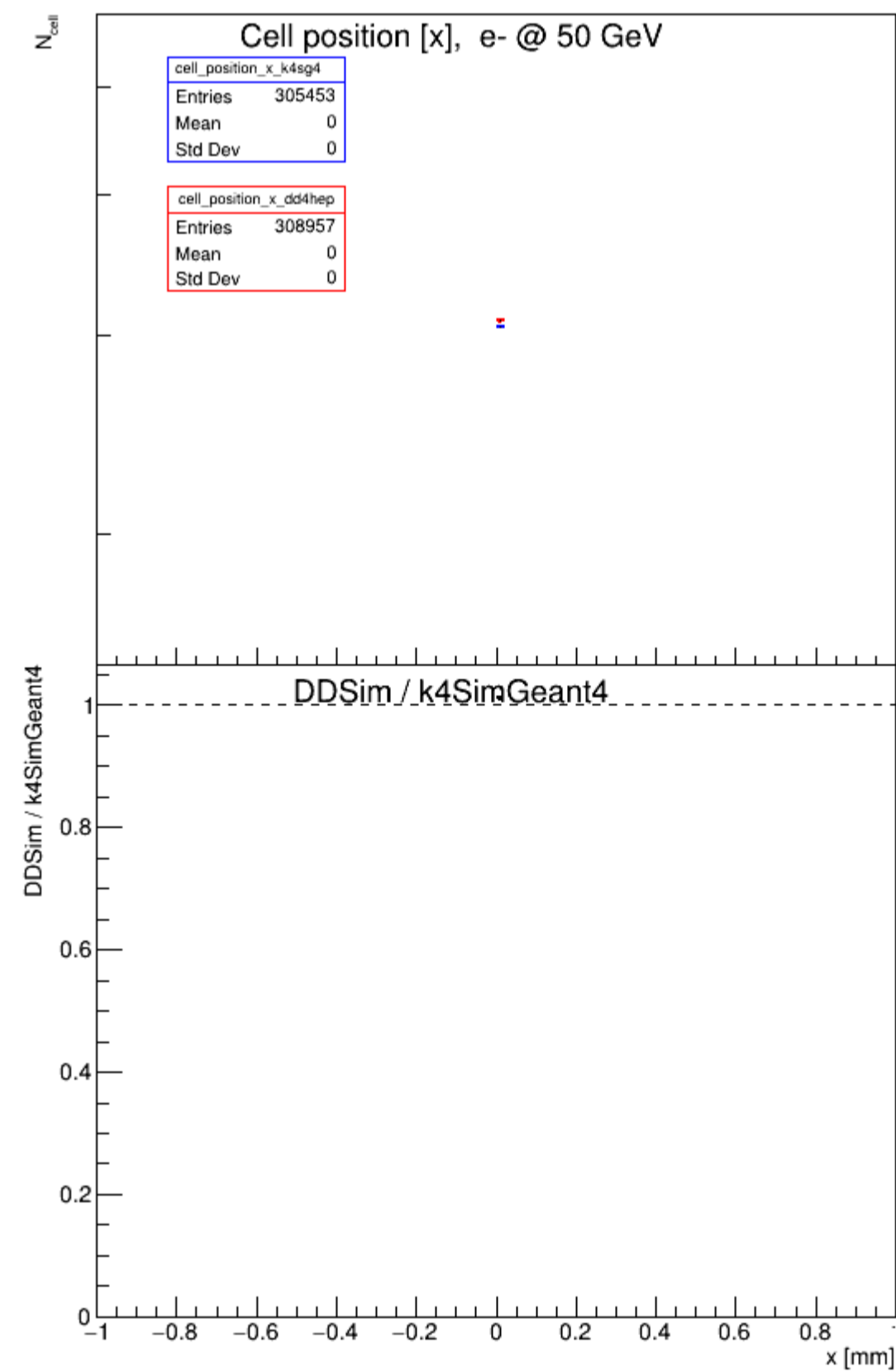
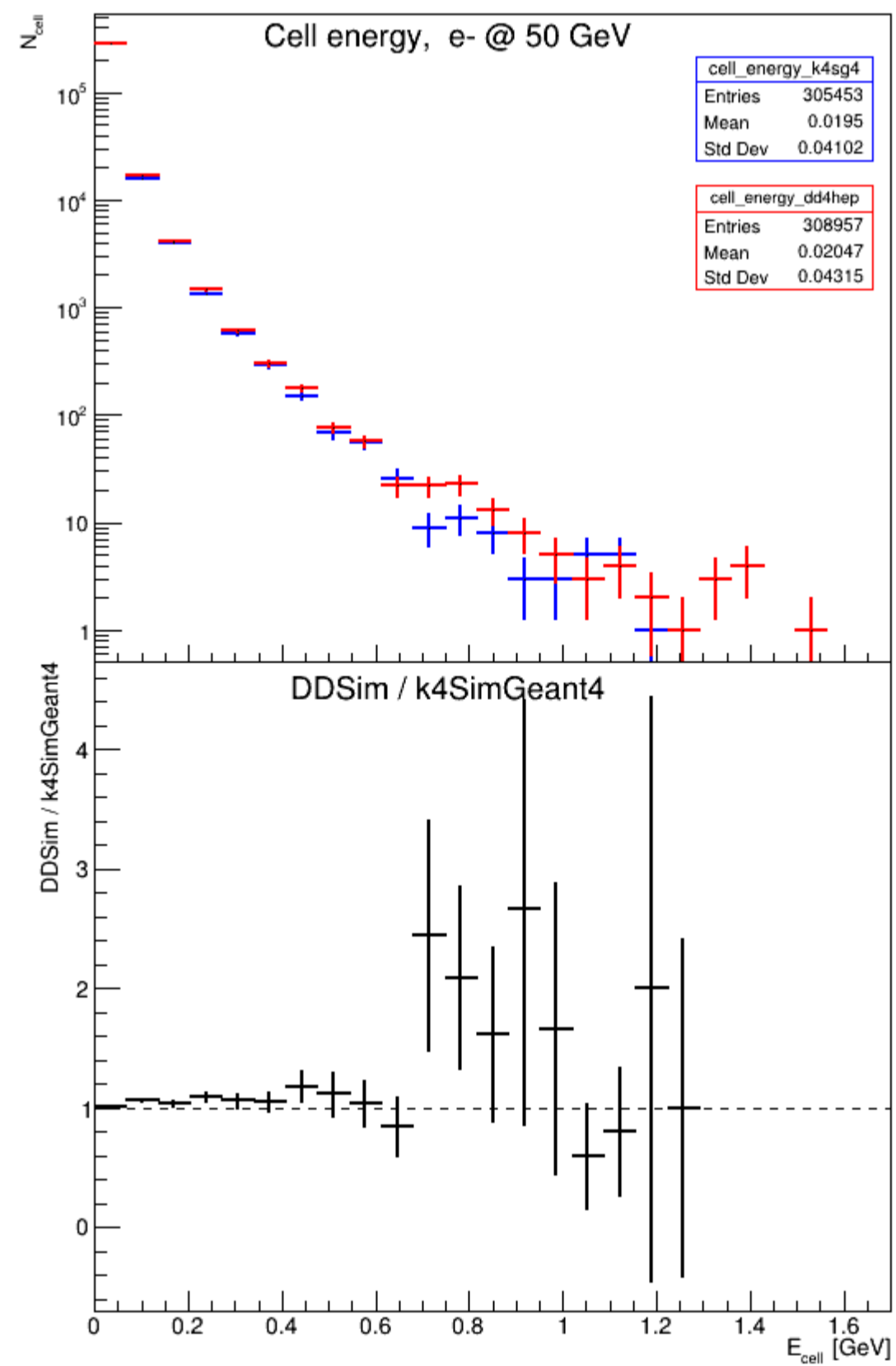
ELECTRON @ 50 GeV

HCAL HIT CONTRIBUTIONS



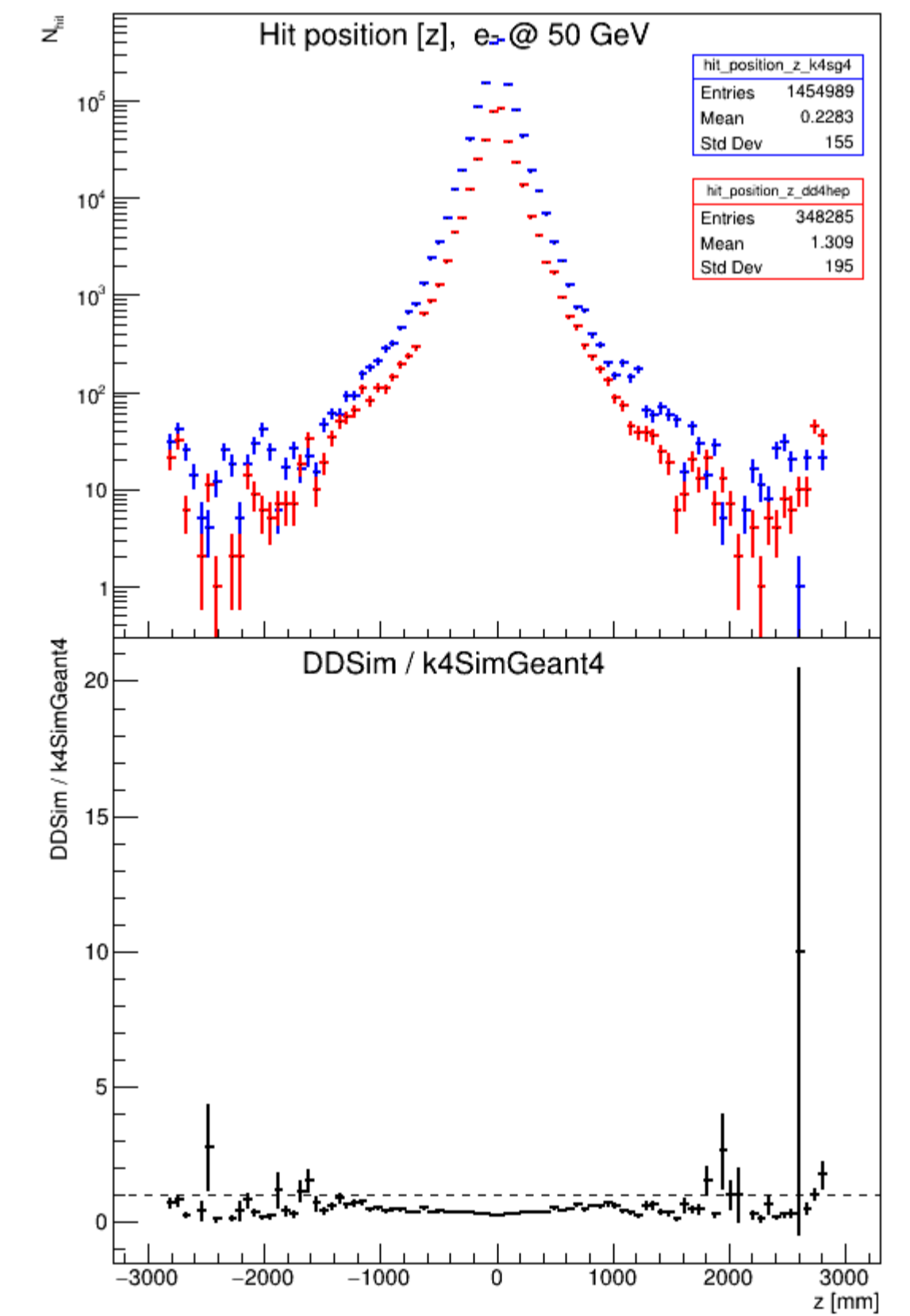
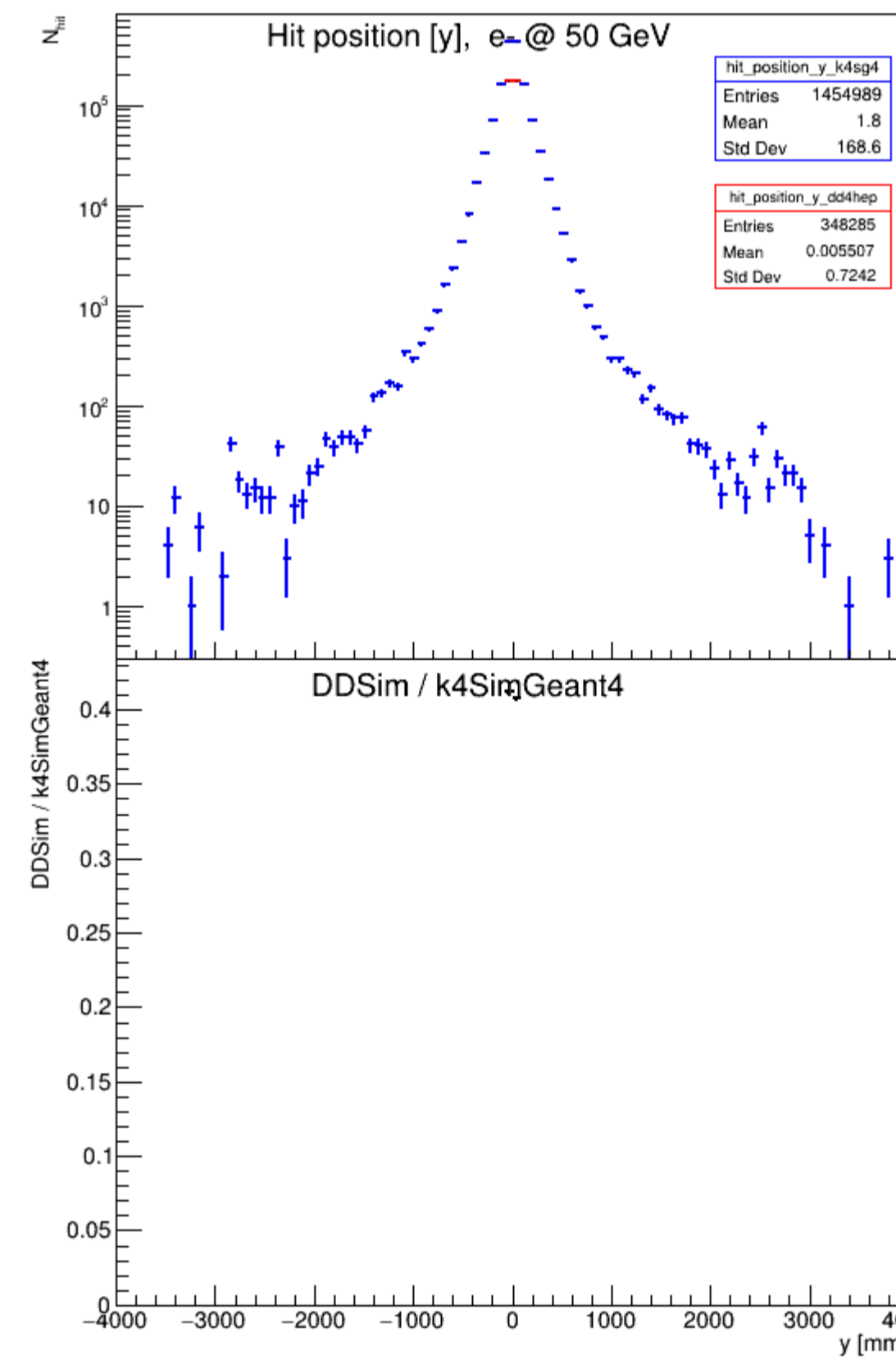
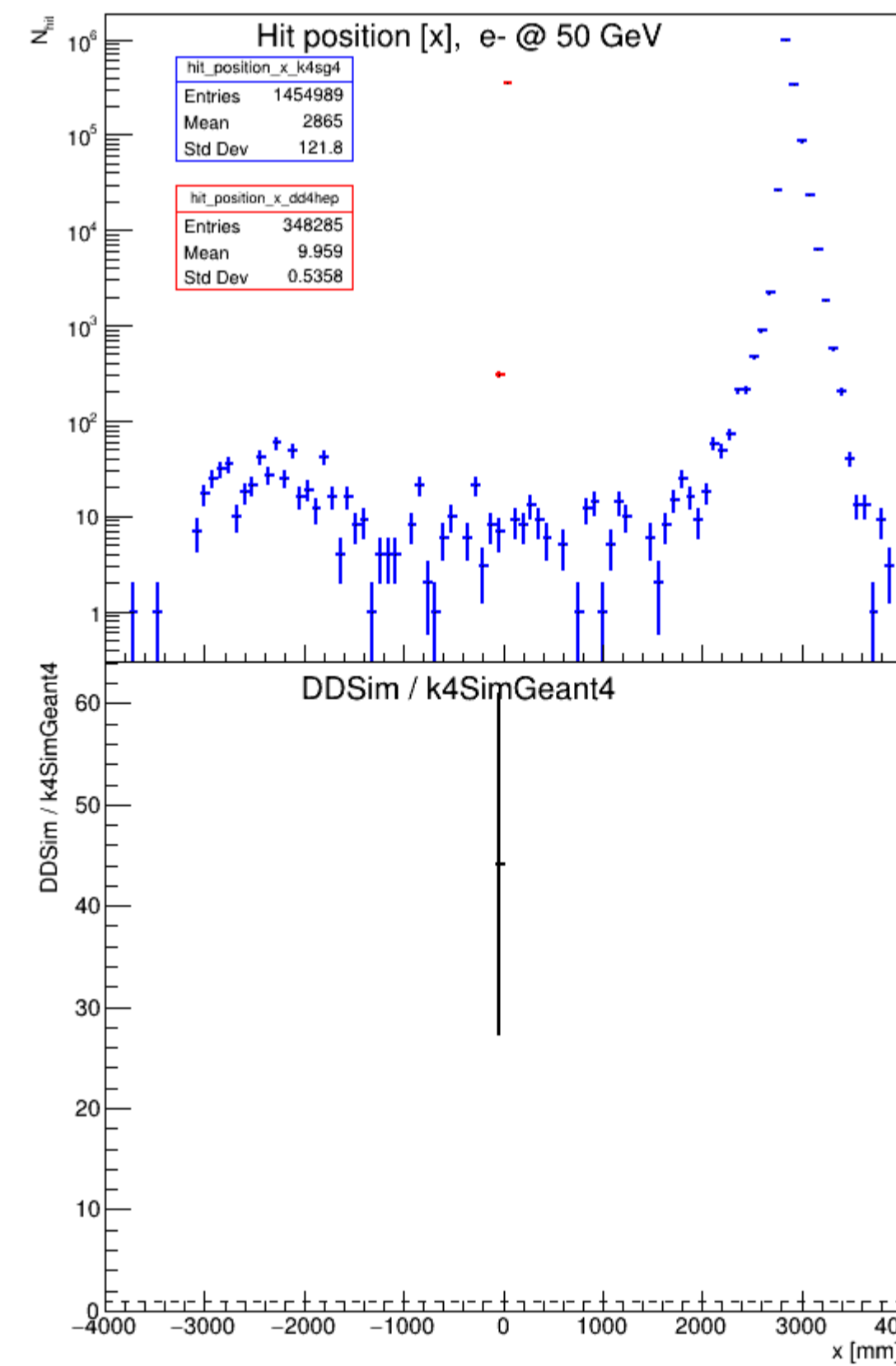
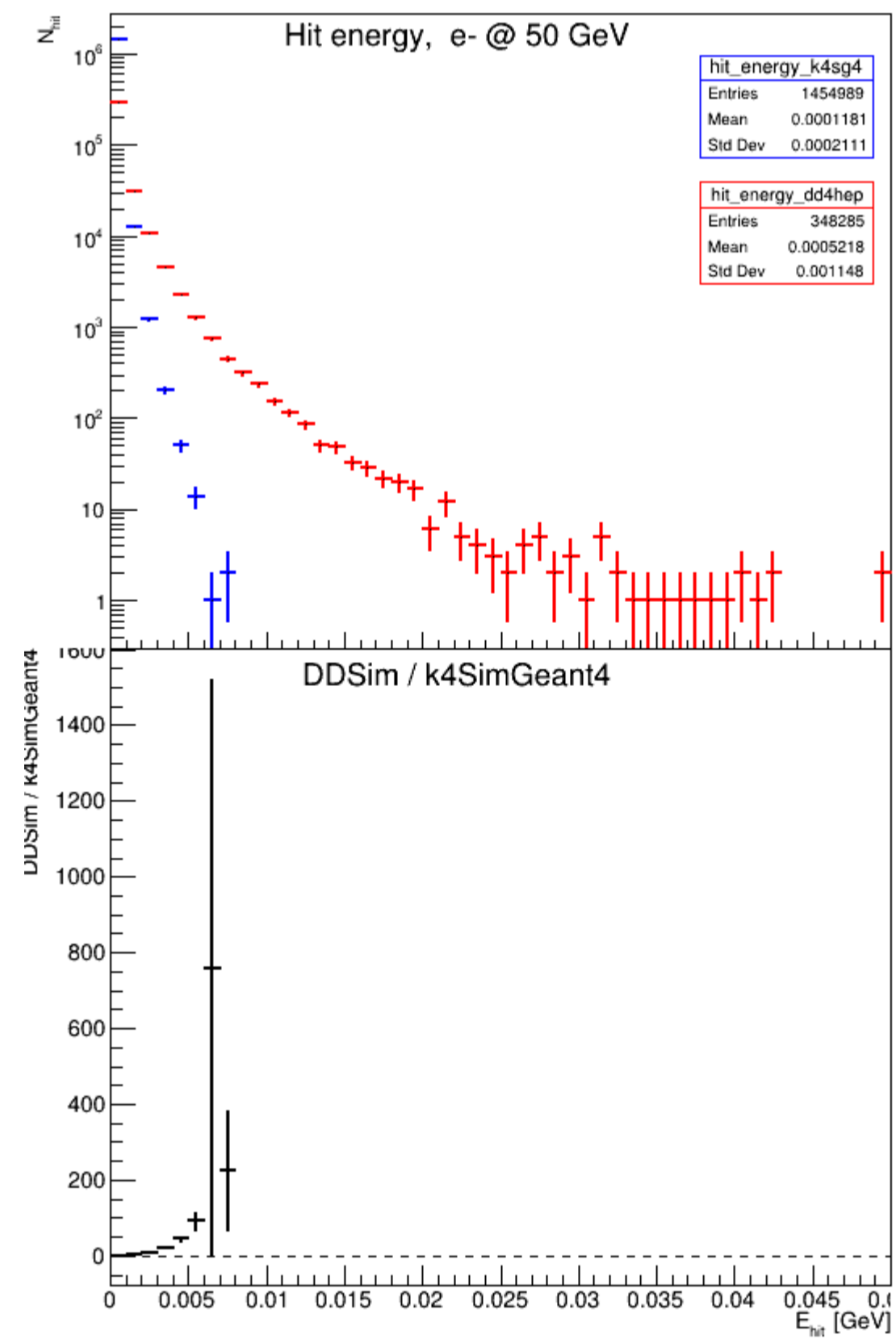
ELECTRON @ 50 GEV

HCAL CELLS



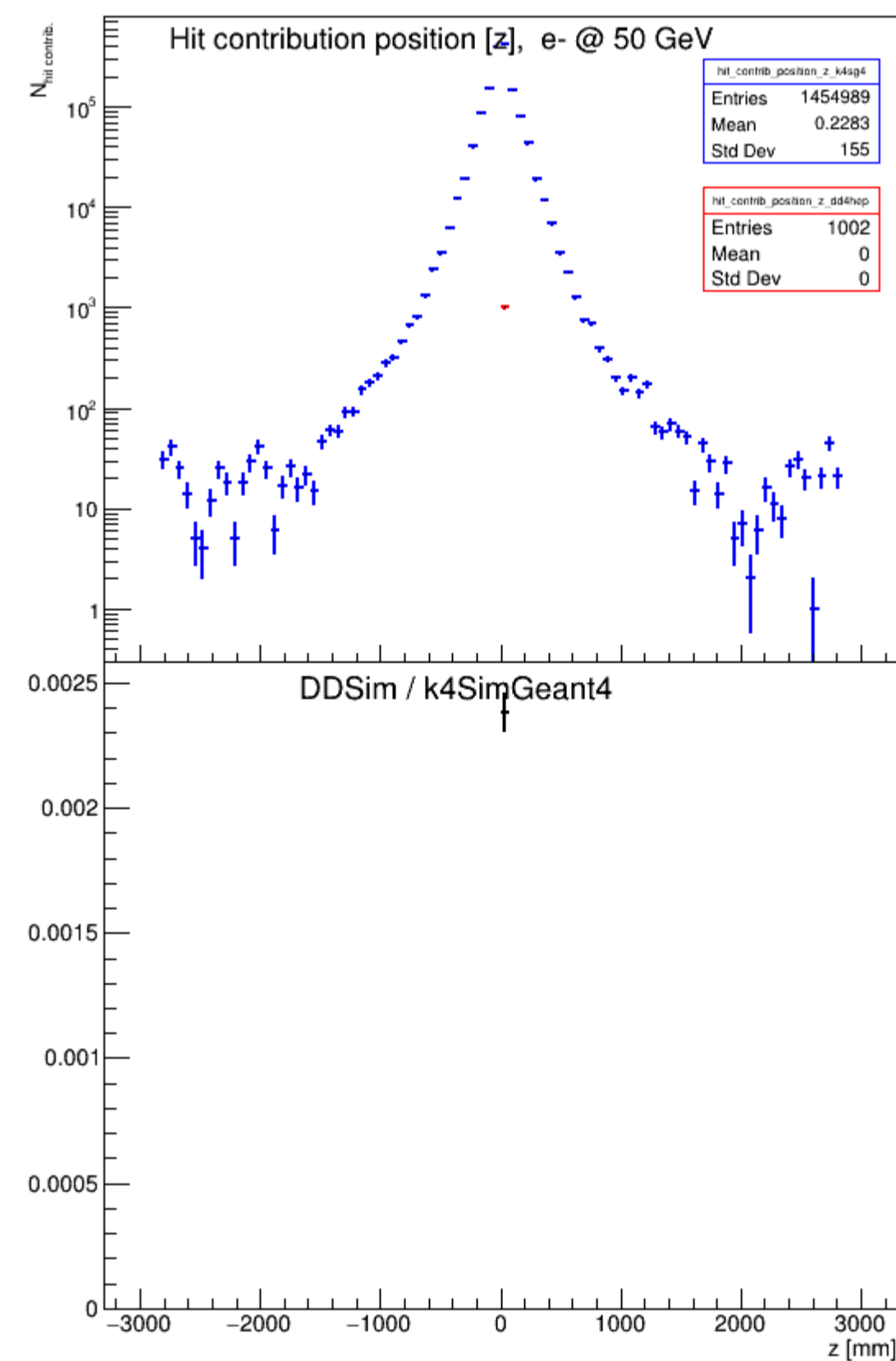
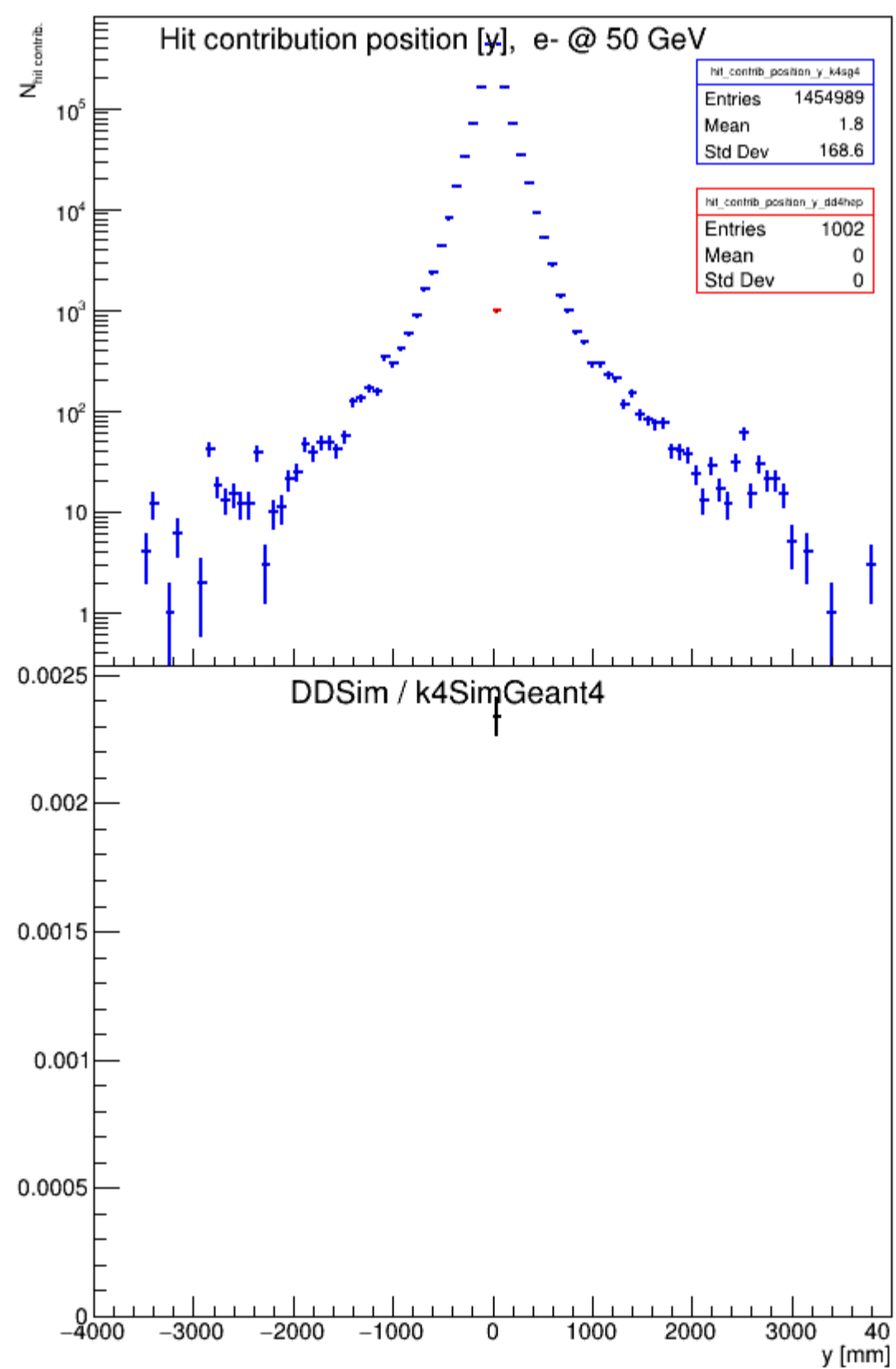
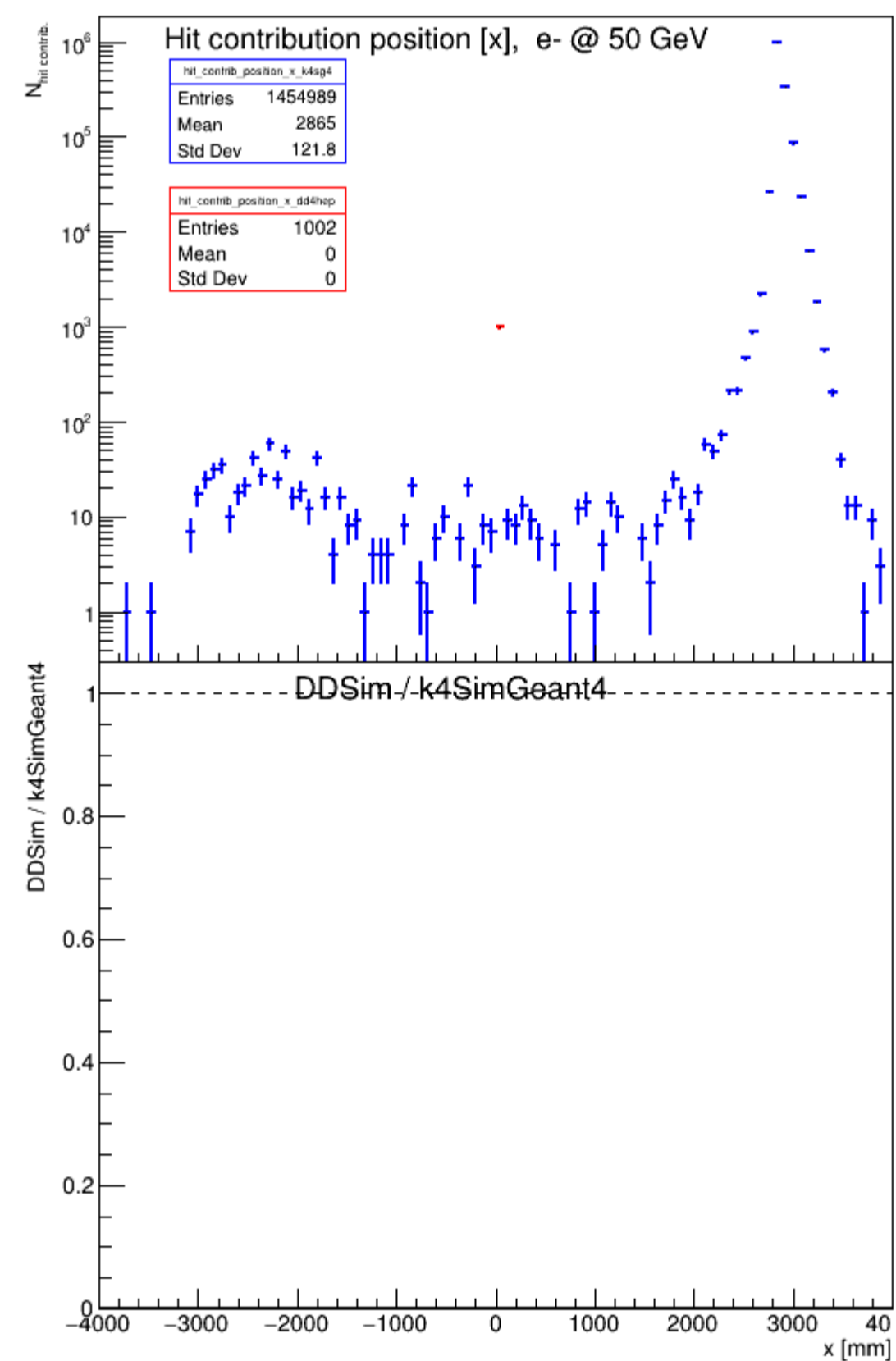
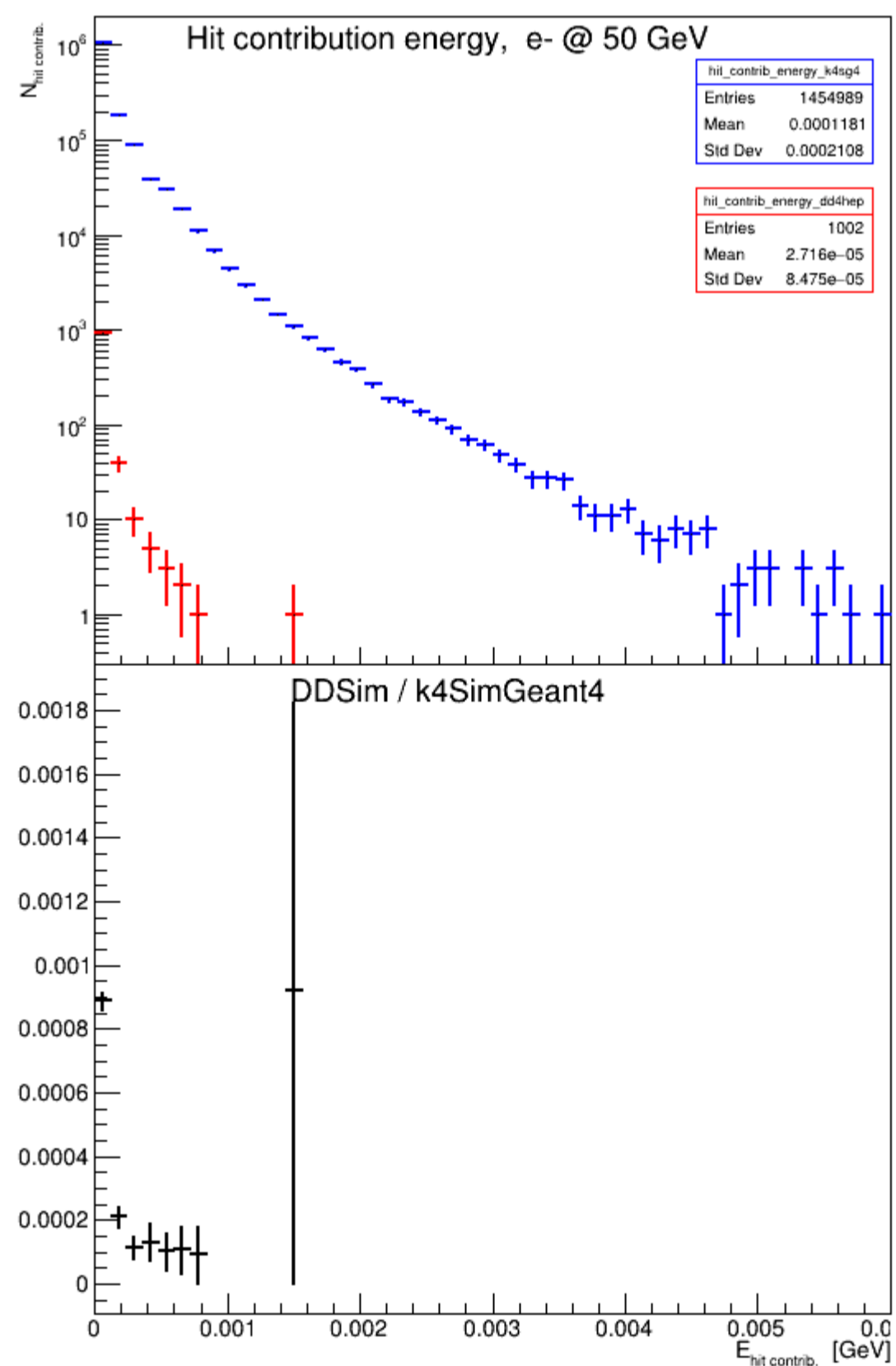
PION @ 50 GEV

HCAL HITS



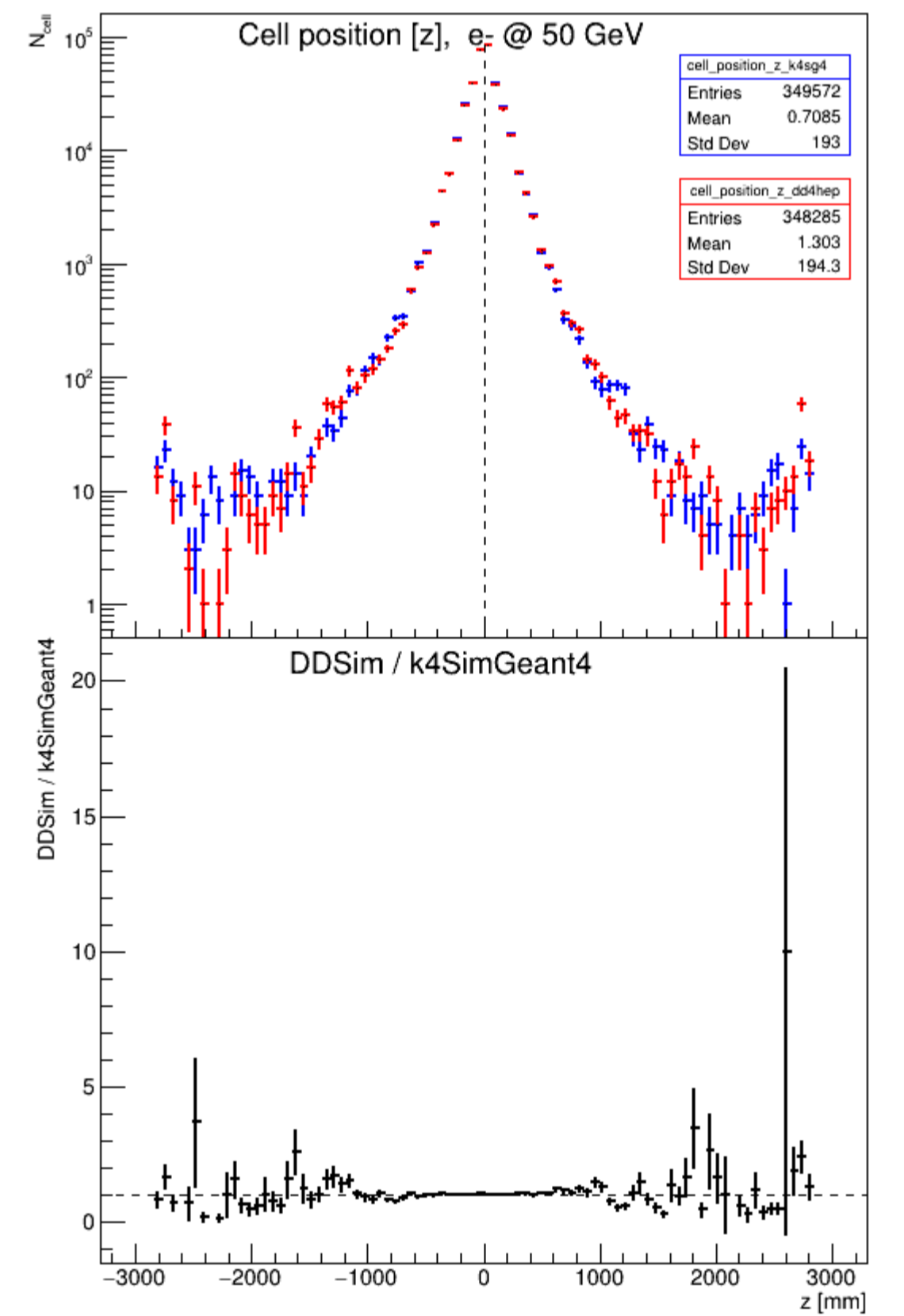
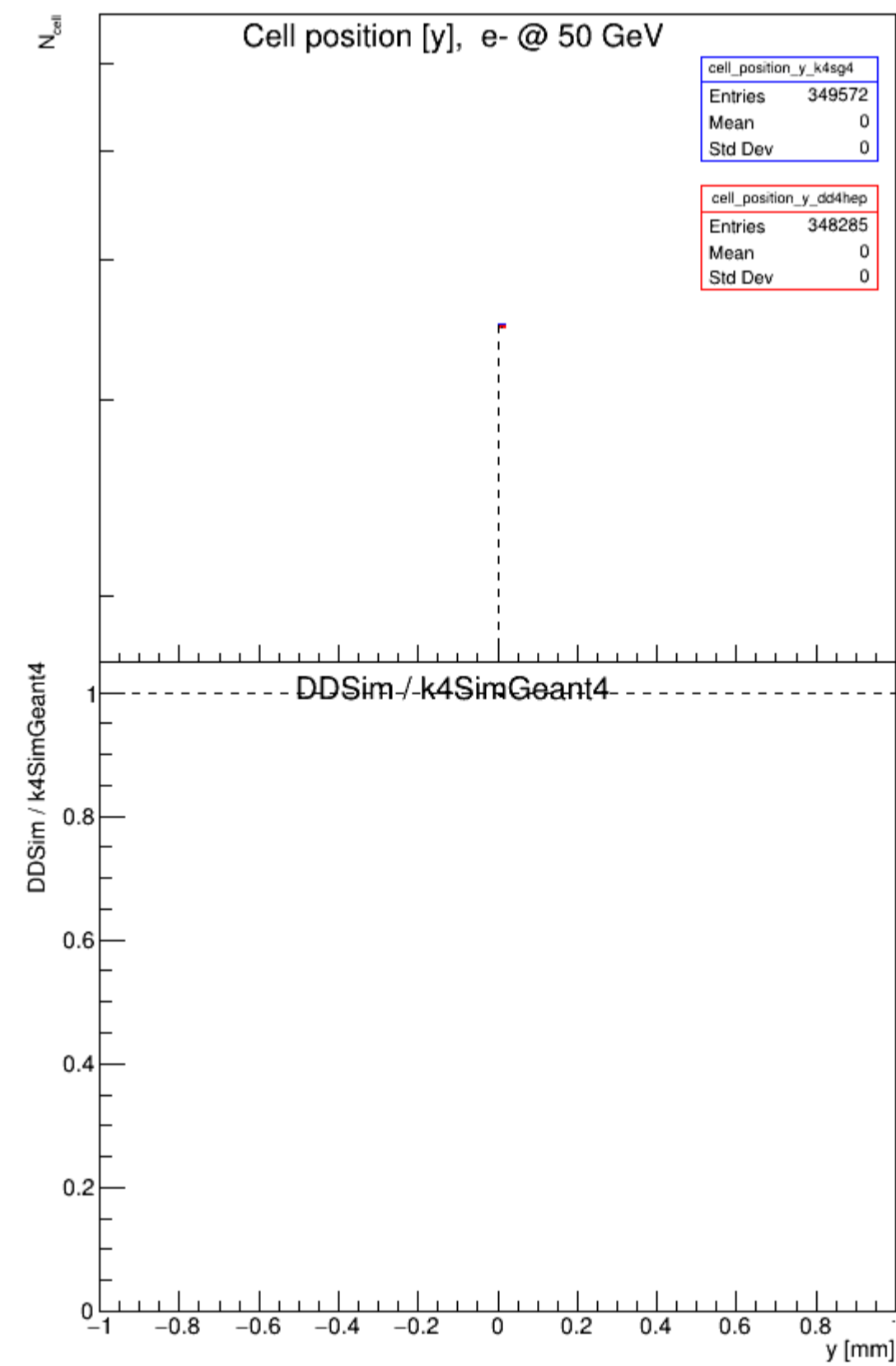
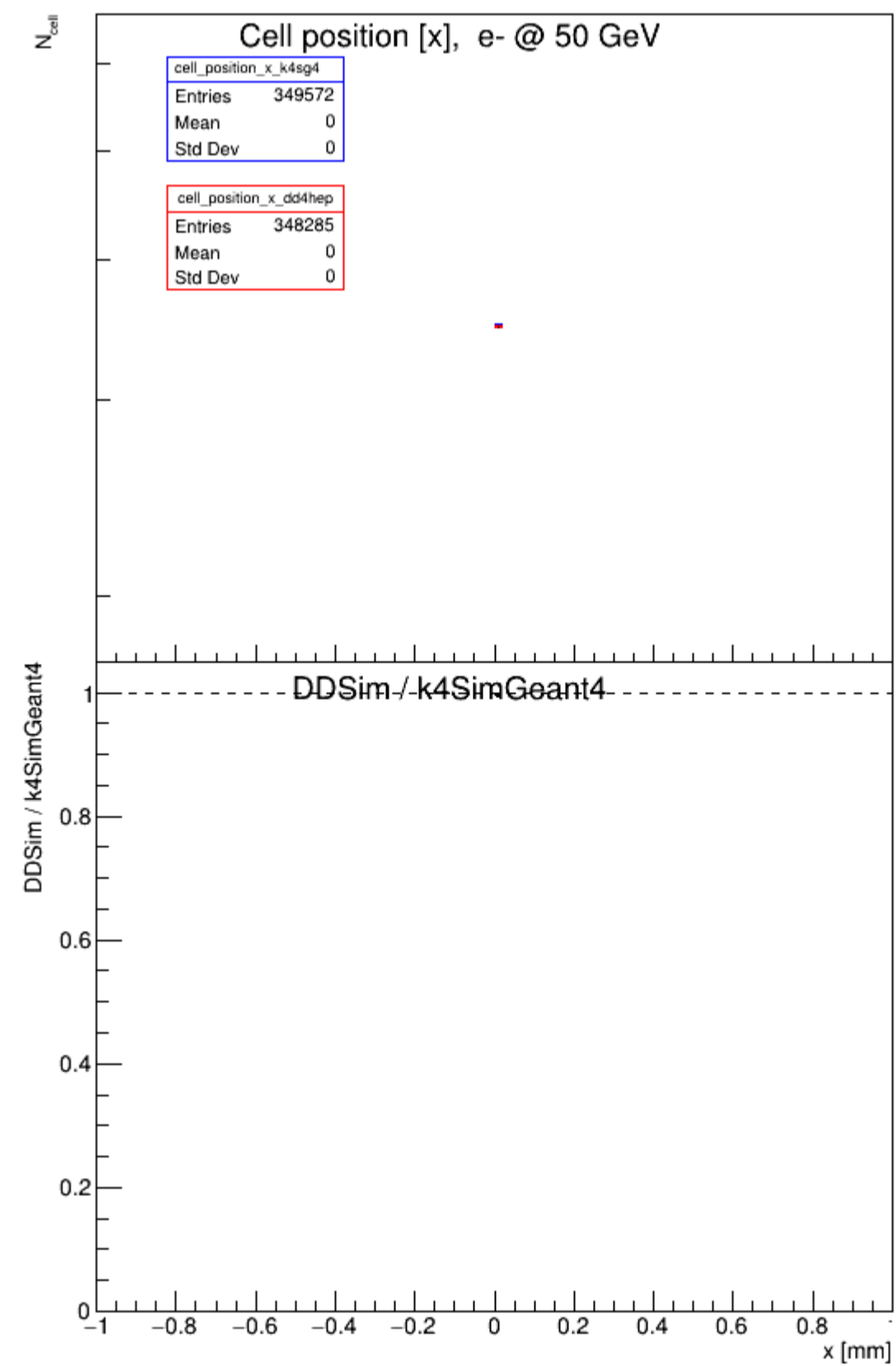
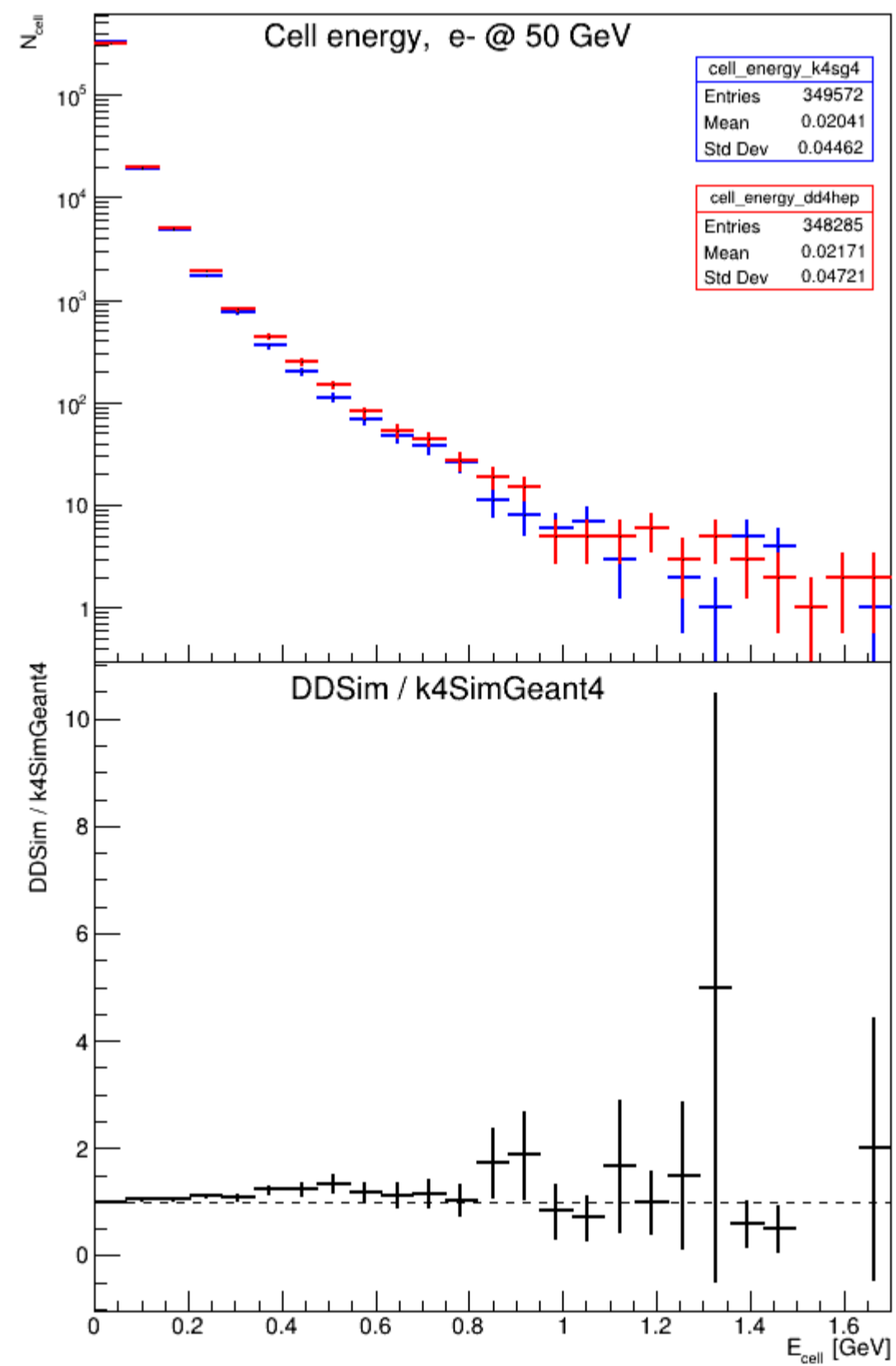
PION @ 50 GEV

HCAL HIT CONTRIBUTIONS



PION @ 50 GEV

HCAL CELLS



CONCLUSIONS / OPEN QUESTIONS

- Running DDSim with default settings will get you close
 - Investigate sensitive actions
 - Differences in simulation settings?
 - Step length? Filters? Mag. field?
 - Effects of hit deduplication?
 - Can we drop positioning tools?

