SlicPandora

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slicPandora

- Frontend to the PandoraPFANew project.
  - LCIO binding, Geometry format, Sampling Fractions
- Uses geometry XML file generated by GeomConverter from compact detector.
- Reads input LCIO file with simulated events, tracks, and track states.
- Outputs LCIO file with Reconstructed Particles.
- Uses standard XML configuration file for PandoraPFA algorithm settings.
  - Pandora PFA (M. Thomson, J. Marshall)
  - slicPandora (N. Graf, J. McCormick, P. Speckmayer, C. Grefe, M. Stanitzki, J. Strube)

Workflow

- Generate LCIO events using slic and detector of your choice.
- Run SLIC output through LCSim tracking to generate Track and Track State collections.
- Take LCSim LCIO output and run in slicPandora to generate PFOs.
- Take LCSim LCIO output and run in uipfa to generate PFOs.

Same Events

- Use LCIO analysis tool of your choice to work with PFOs (JAS3, ROOT, etc.).

slicPandora as analysis tool

- Same simulated Events can be analyzed using uipfa or slicPandora
  - study effect of algorithms/code on identical input

- Same stdhep input Events can be analyzed in different detectors
  - same input events can be processed through different detectors
    - compare digital to analog HCal with identical code

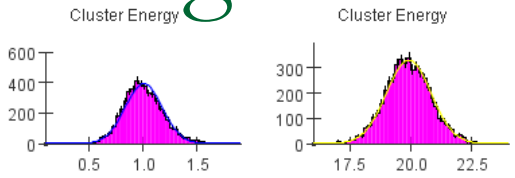
Calorimeter Calibration

- The lcsim-cal-calib package is used to generate sampling fractions from single particle data.
  - Range of single particle types and energies simulated in slic.
  - Events are analyzed in lcsim using simple fixed-cone clustering algorithm to derive sampling fractions.
- Same events are run in slicPandora and fit again.
  - PandoraPFA uses different clustering algorithm, so sampling fractions must be refitted to match final cluster energies.
  - Final sampling fractions put into CalorimeterCalibration.properties file.

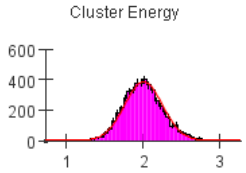
Optimization Data Sets

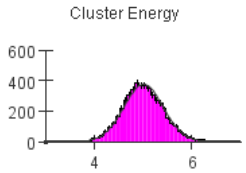
- Single $\mu^{\pm}$, γ, K^0_L, at fixed angles and energies for sampling fraction determination.
- Single particles (as above, plus $e^{\pm}$, $\pi^{\pm}$,$K^{\pm}$,$p^{\pm}$,…) at variable angles and energies to study clustering and tracking efficiency and resolution.
- Simple resonances (π^0,η,$\rho^{\pm}$) to study efficiency and resolution of two-particle states.
- Single quarks at fixed energies to study jet energy resolution (u,d,s).
- Single Z^0 at fixed energies to study dijet mass resolution.

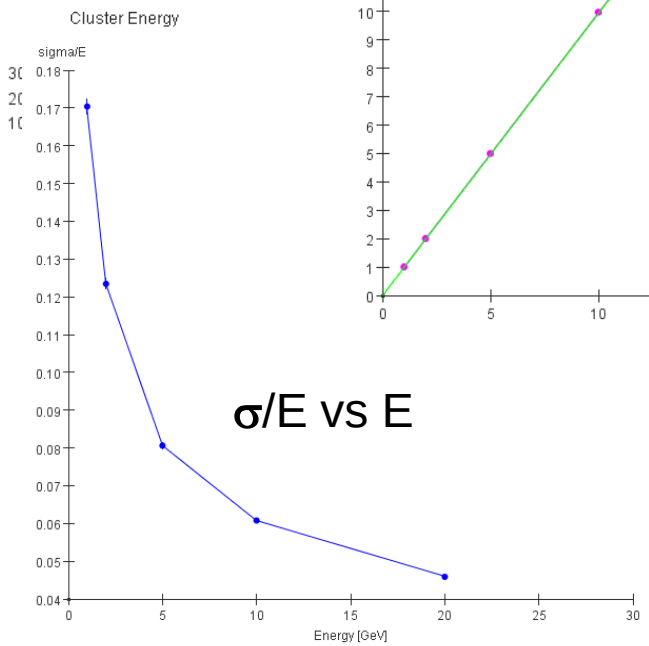
Diagnostic Plots



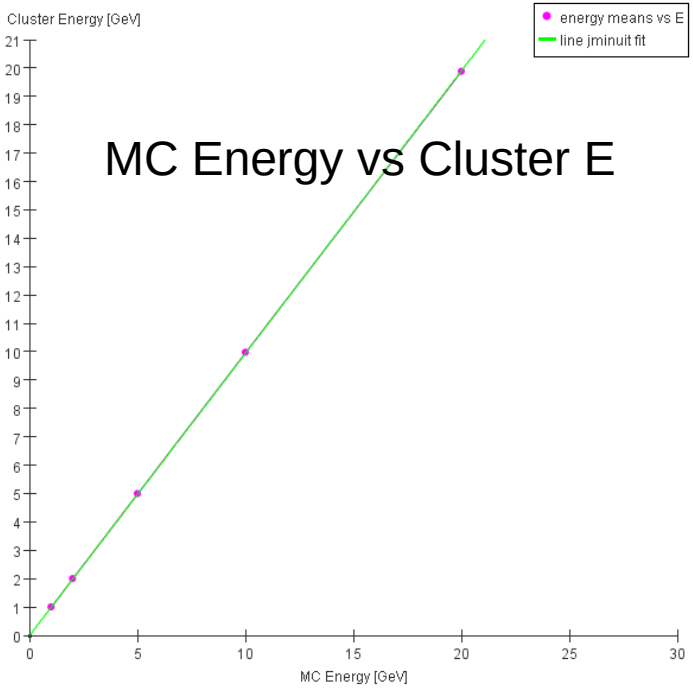
Cluster Energy



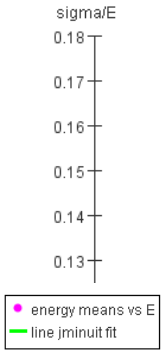


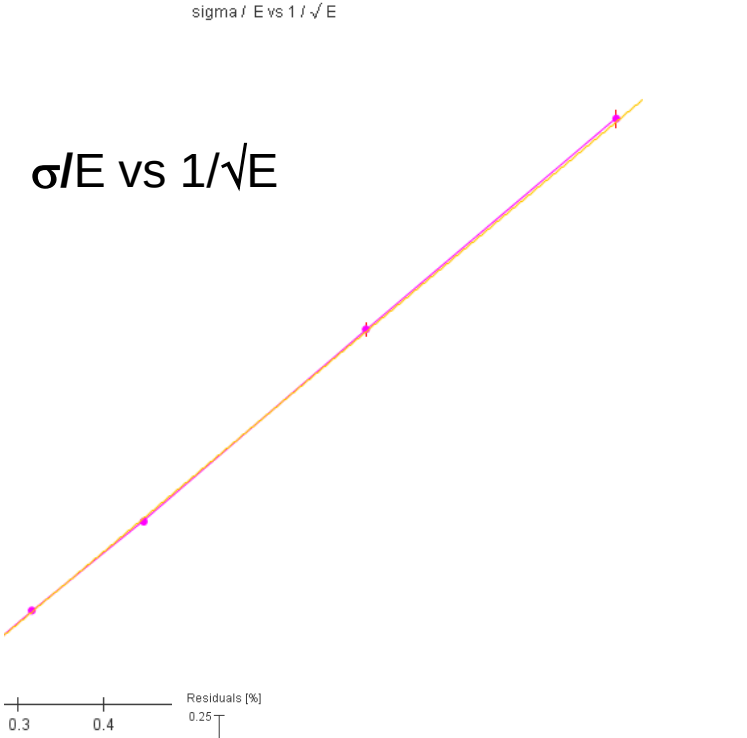


σ/E vs E

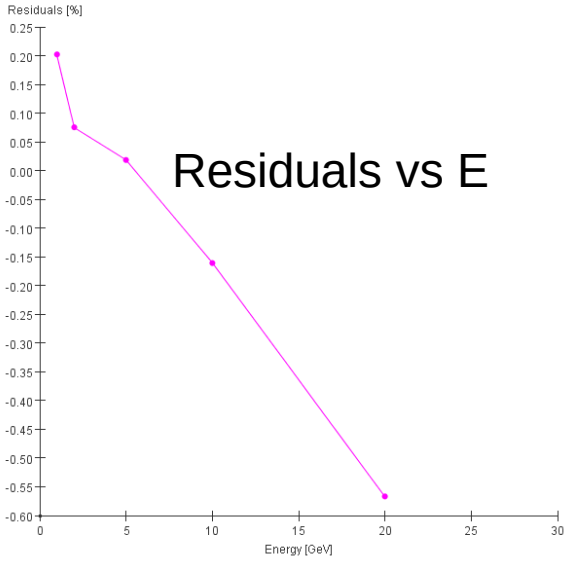


MC Energy vs Cluster E



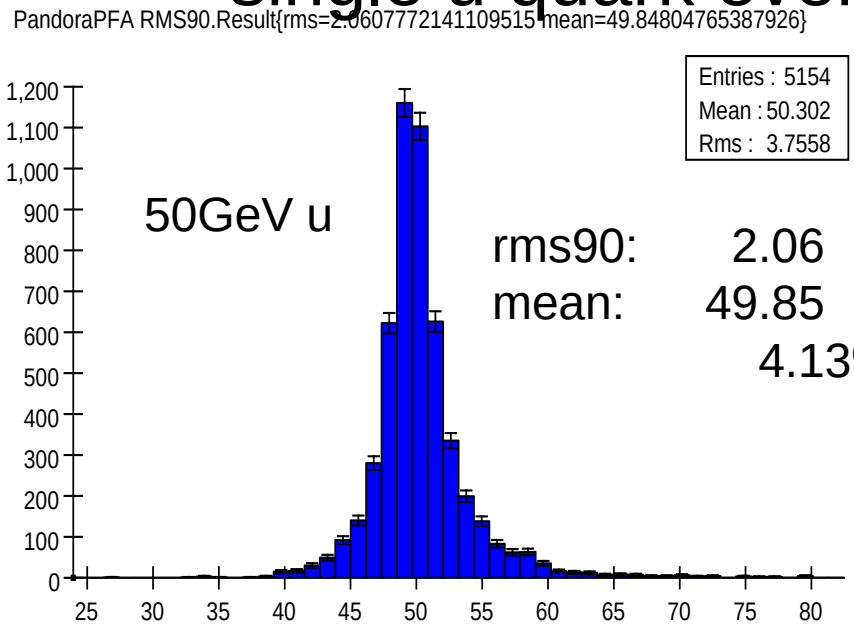


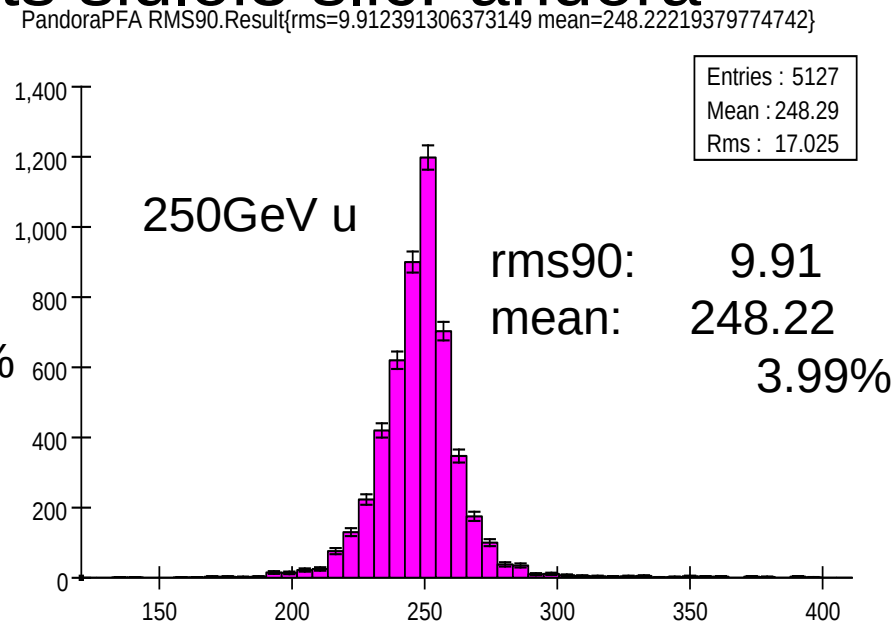
σ/E vs 1/√E

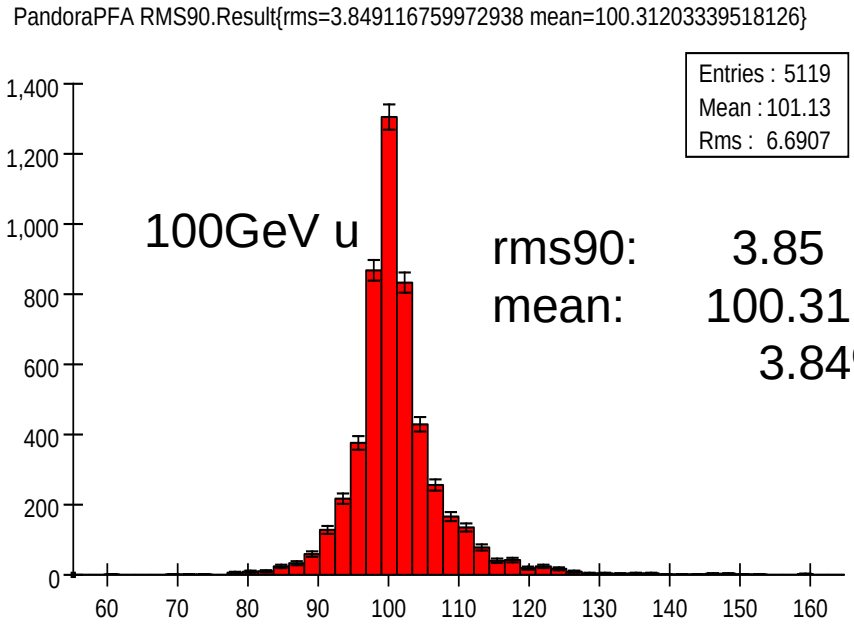


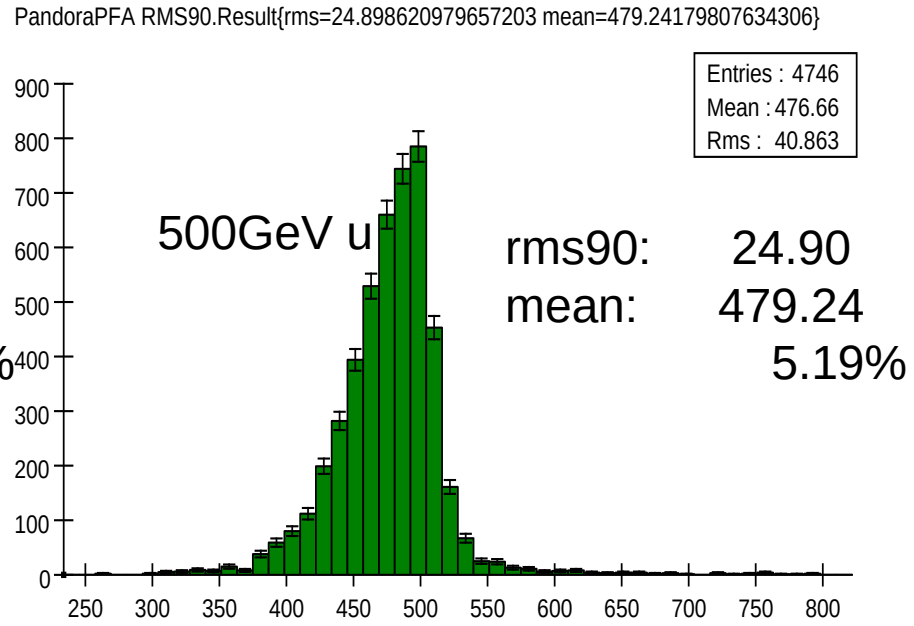
Residuals vs E

single u quark events sidloi3 slicPandora

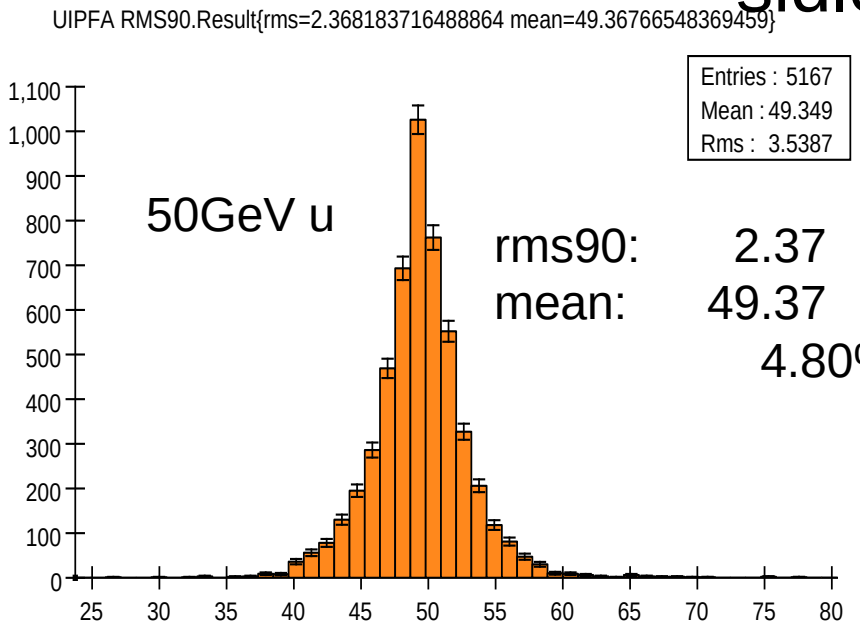


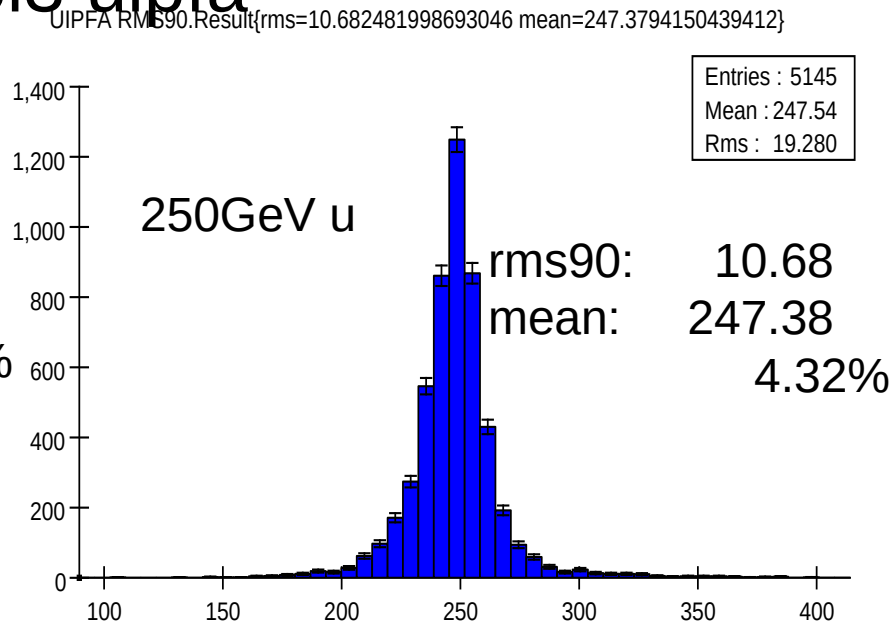


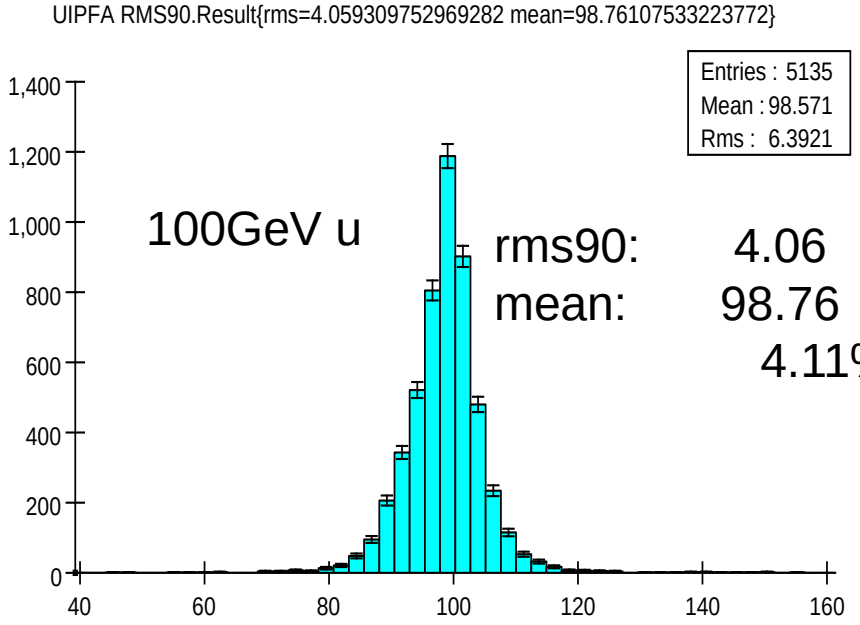


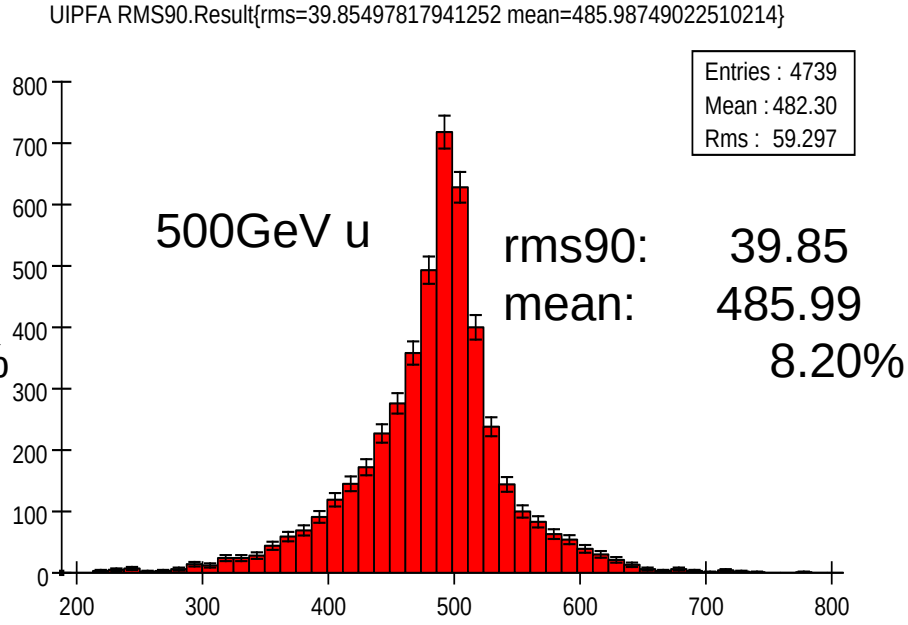


sidloi3 uipfa









clic_sid_cdr pandora

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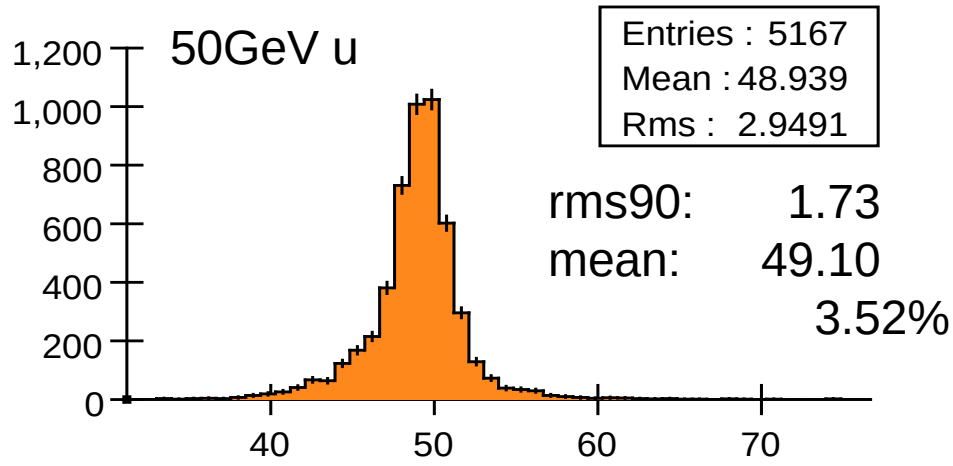

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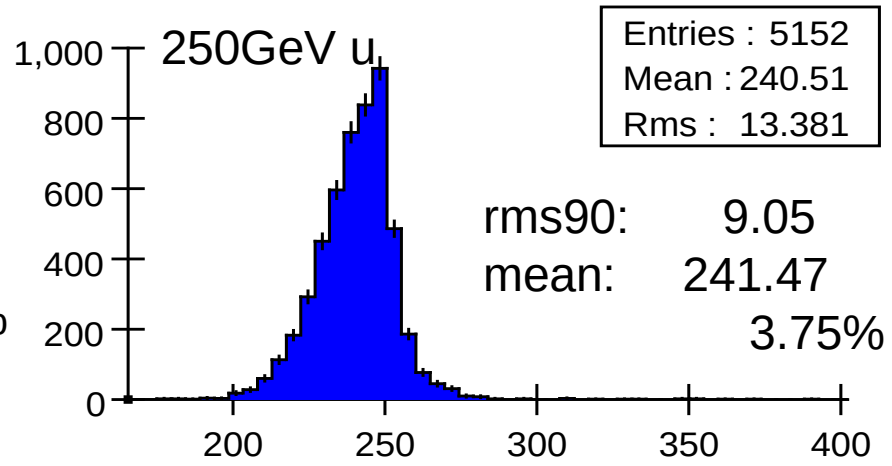

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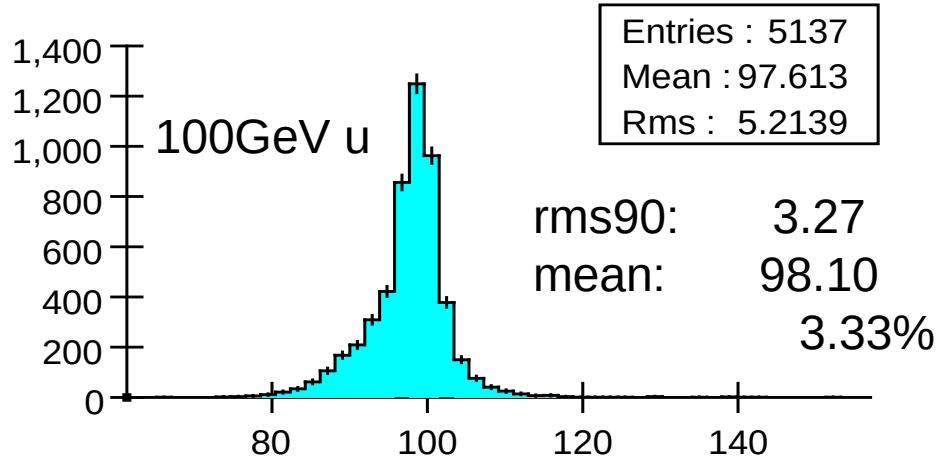

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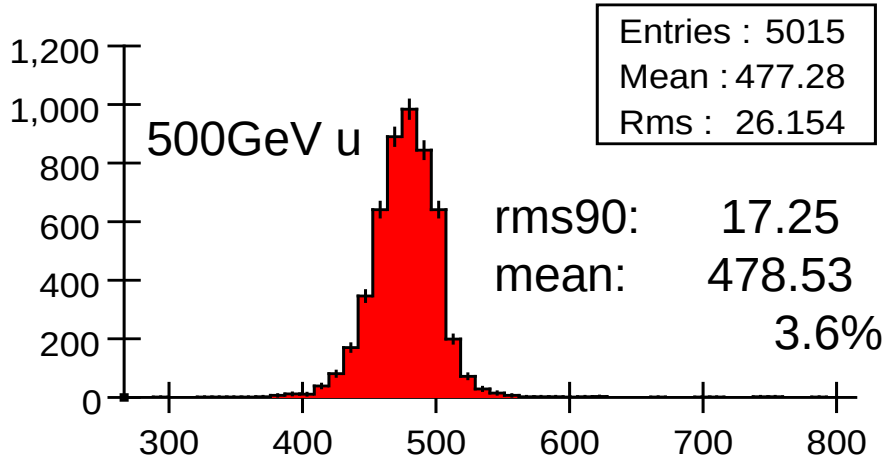
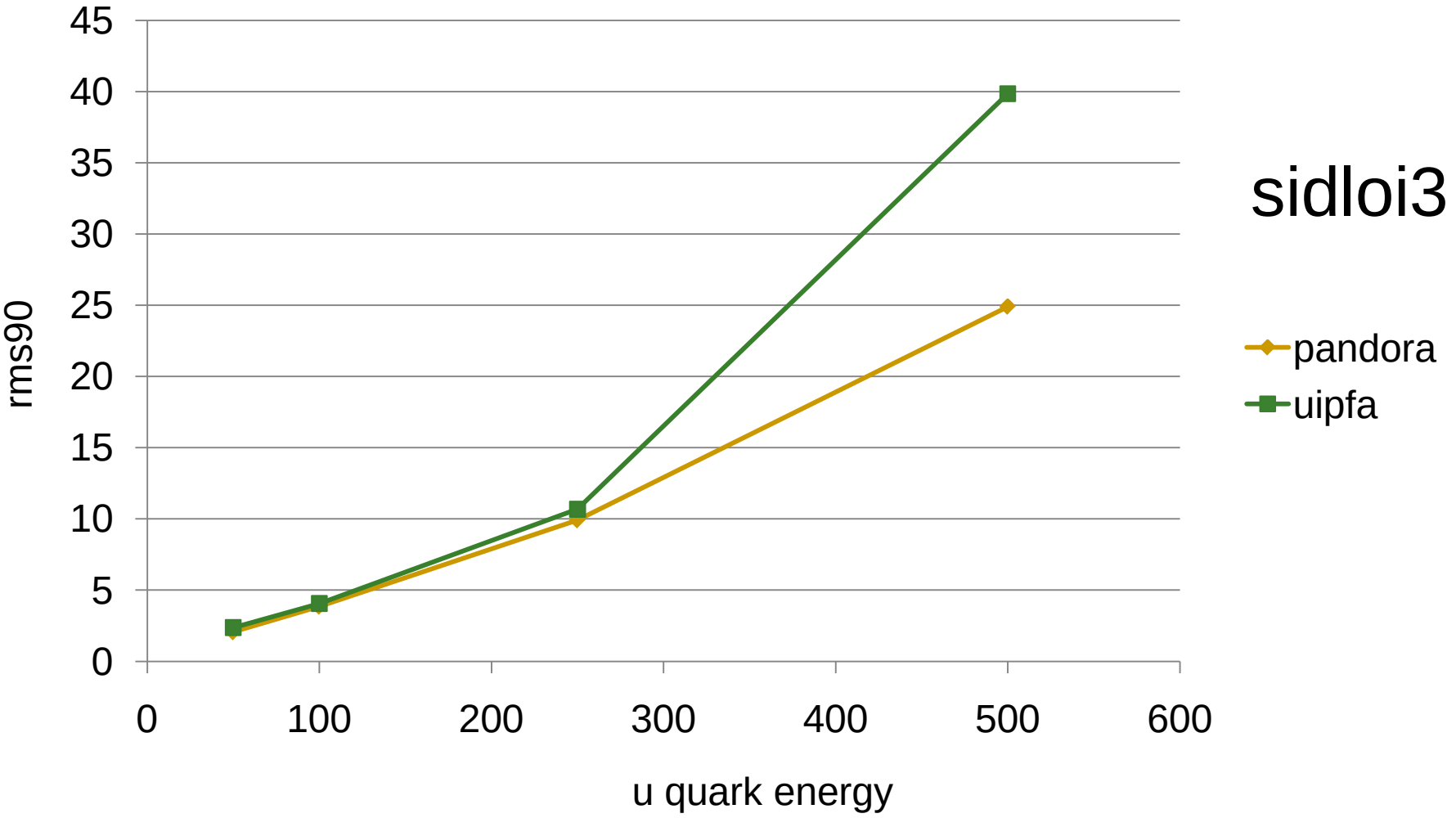
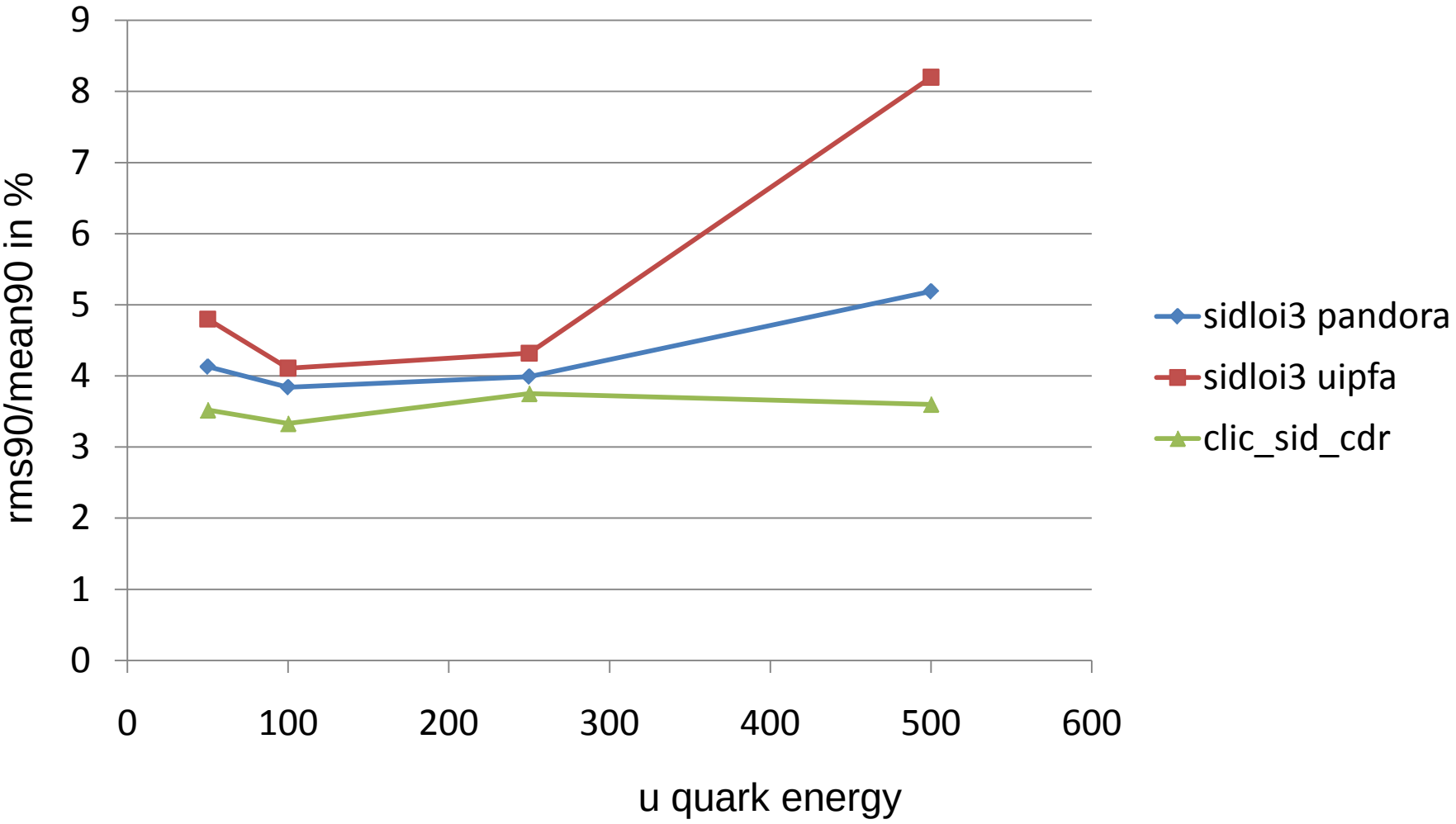


single u quark rms90



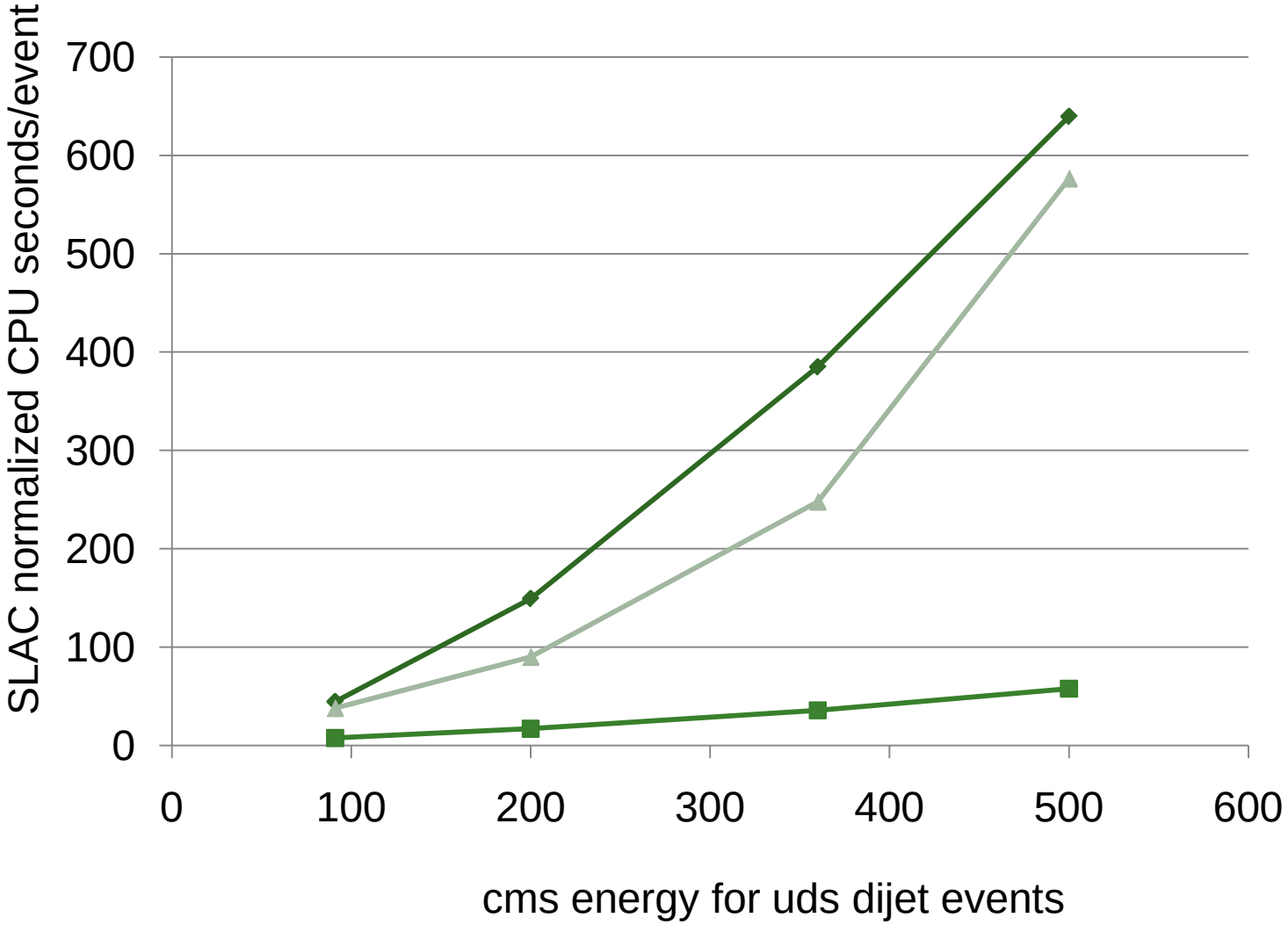
single u quark rms90/mean90 in %



Dijet Performance

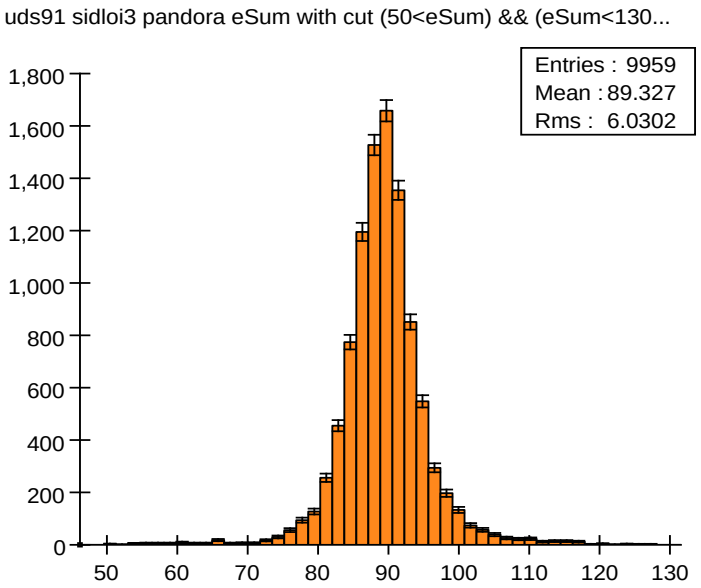
- light quark dijet events at fixed center-of-mass energies
- uds91, uds200, uds360, uds500
- Plot event energy, simple sum of energies of ReconstructedParticles

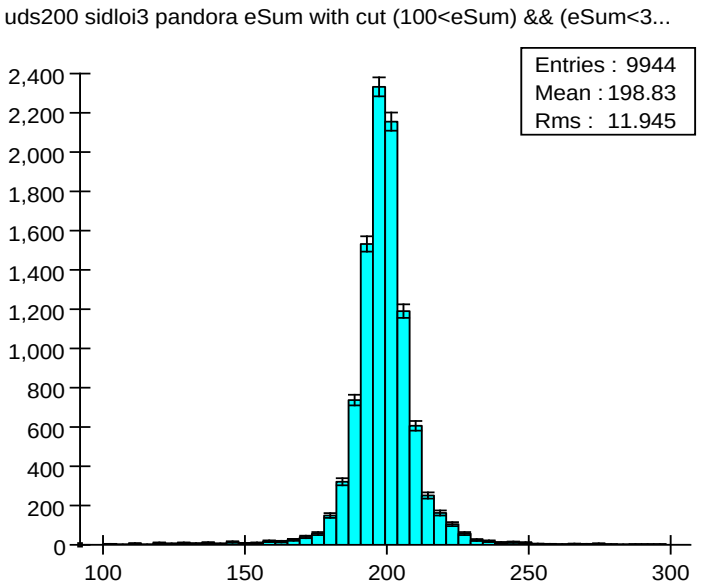
uds dijet Reconstruction Times

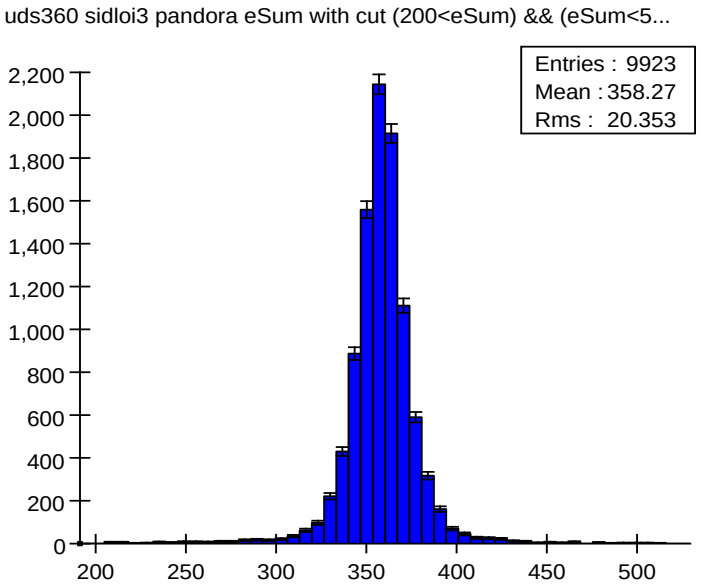


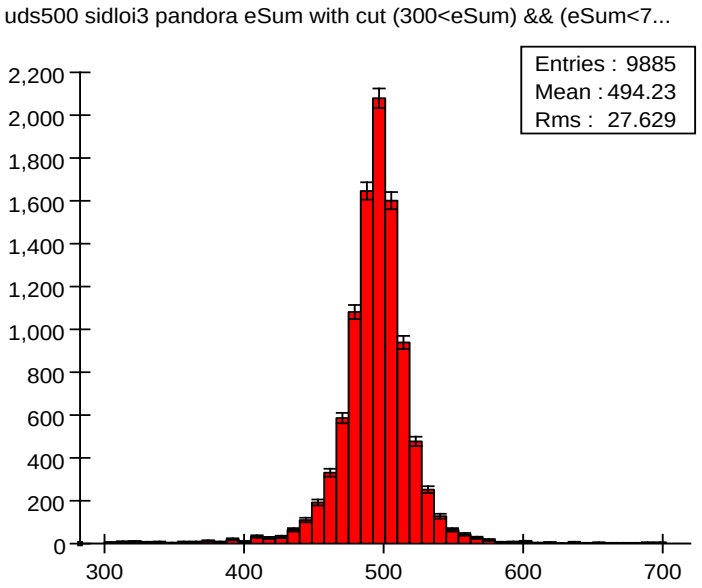
* times do not reflect most recent code
See talk by R. Partridge

sidloi3 slicPandora event energy sum

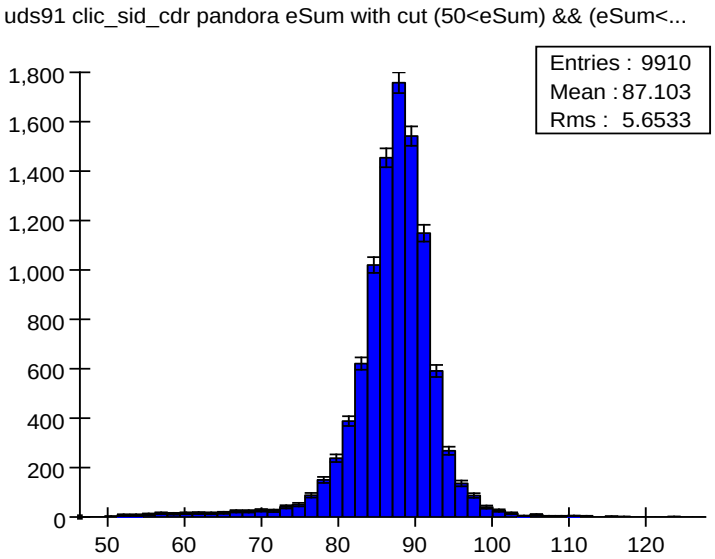


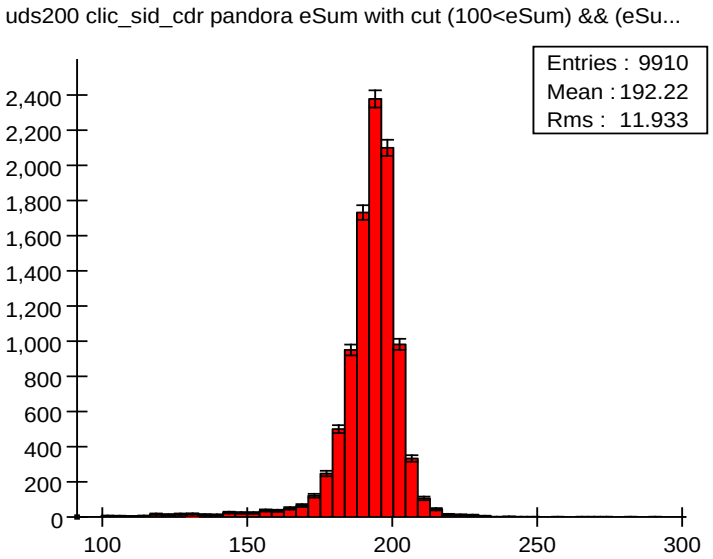


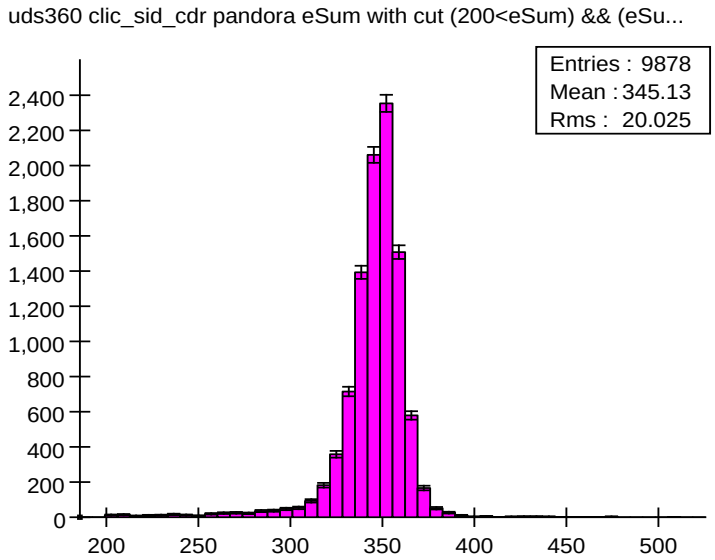


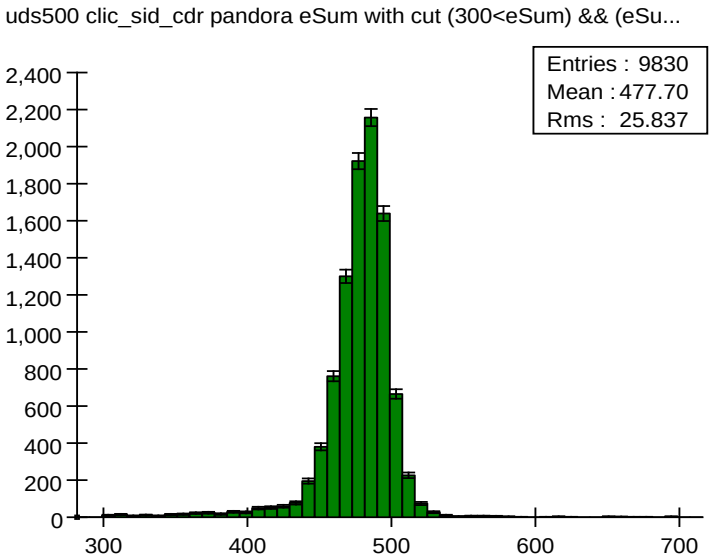


clic_sid_cdr slicPandora event energy sum

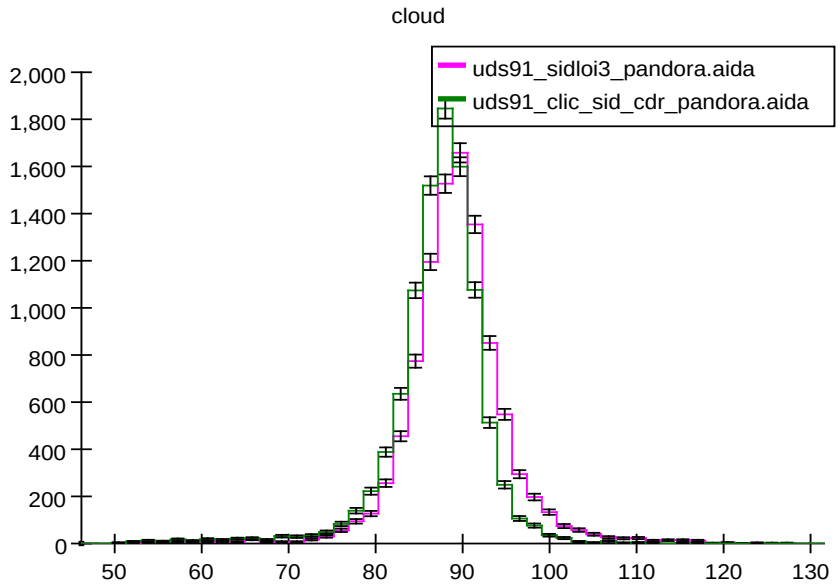


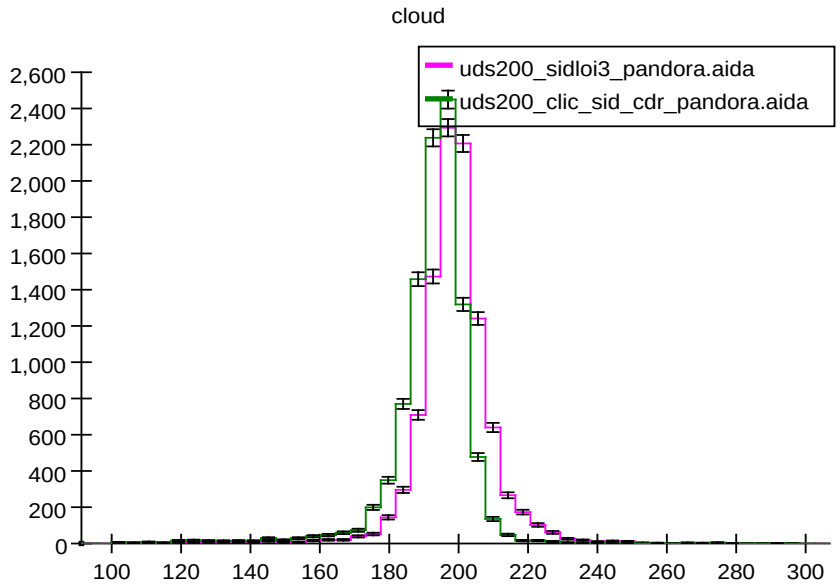


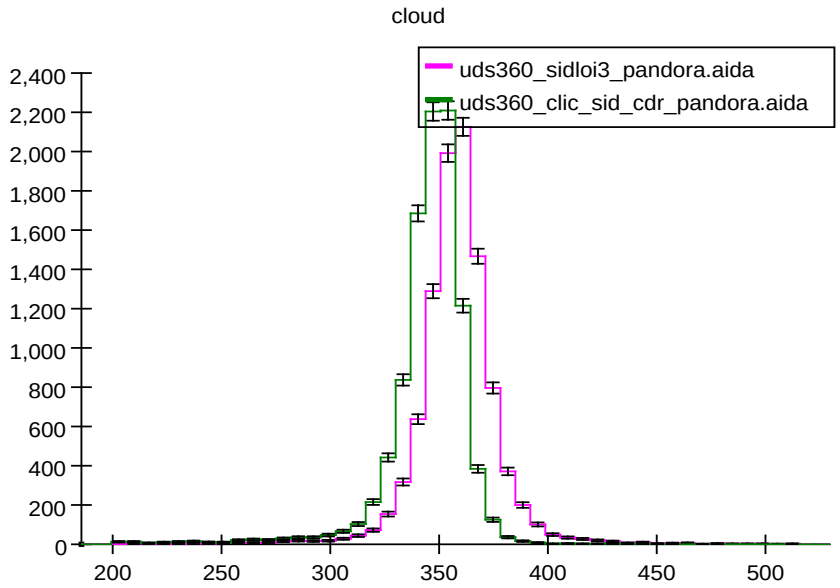


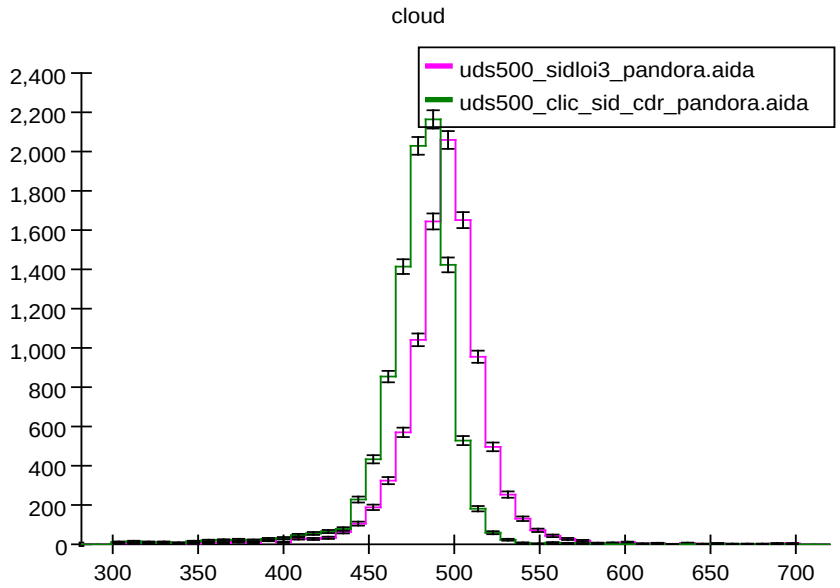


sidloi3 & clic_sid_cdr event energy sum

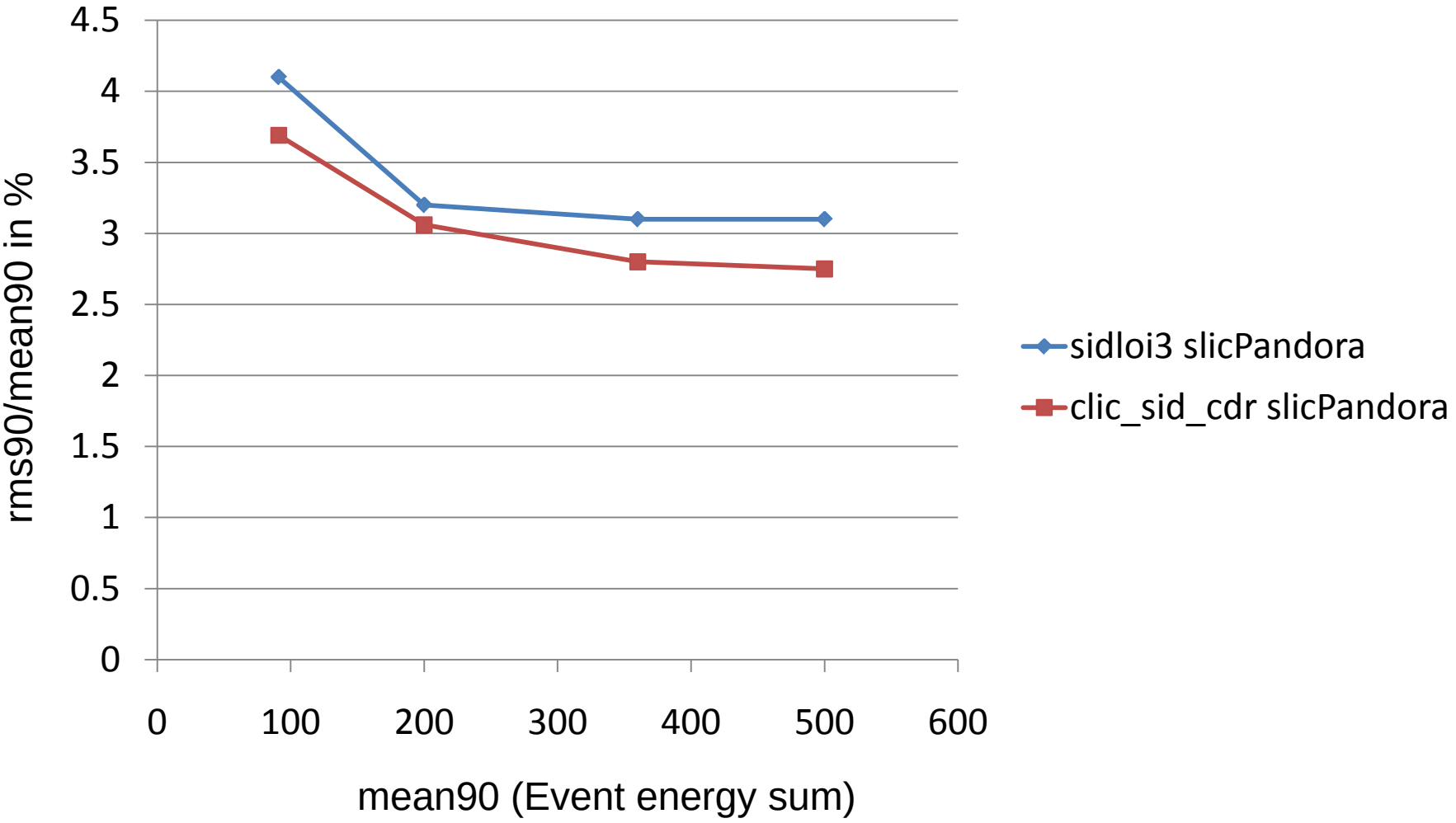








uds Event Energy rms90/mean90 in %



DBD Physics Benchmarking Preparations

- Final details of the common event sample for the DBD Physics Benchmarking exercise are still being resolved.
- Interim solution was to generate a small sample (~10k events) of each of the signal processes
  - obtain data about processing times to inform planning for production
  - find bottlenecks in the sim→reco→analysis chain.
  - develop analysis strategies
  - optimize the detector?

DBD Events @ 1 TeV

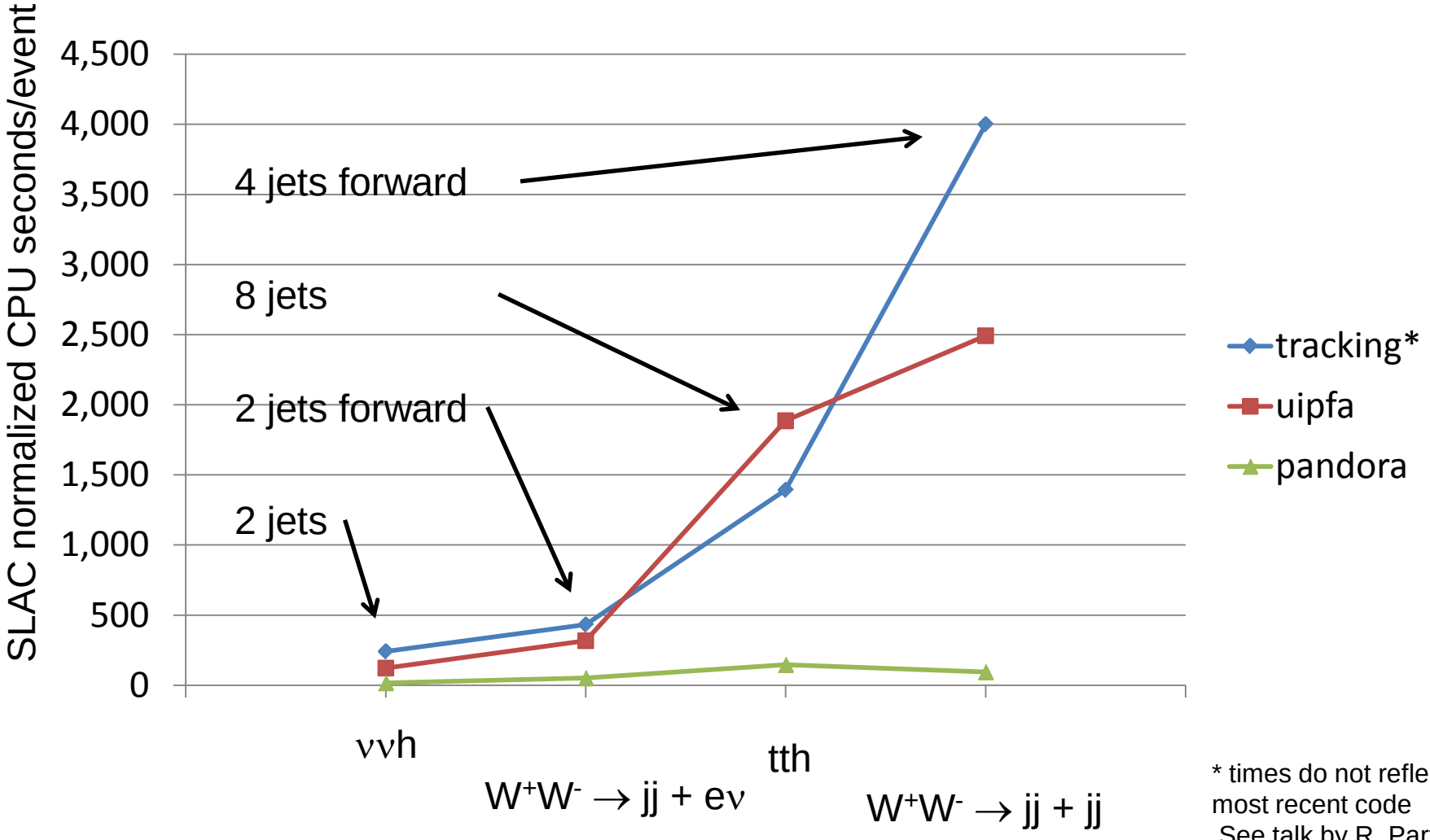
- Following Event Samples available
  - w33001 n1 n1 H $\nu\nu h$
  - w33002 n1 n1 H $\nu\nu h$
  - w33005 t T H tth
  - w33006 t T H tth
  - w33129 u D e1 N1 $W^+W^- \rightarrow jj + e\nu$
  - w33130 u D e1 N1 $W^+W^- \rightarrow jj + e\nu$
  - w33133 u D d U $W^+W^- \rightarrow jj + jj$
  - w33134 u D d U $W^+W^- \rightarrow jj + jj$

stdhep files generated by T. Barklow

DBD Events @ 1 TeV

- Events processed through sidloi3 detector model.
- lcsim track reconstruction (including latest fix to endcap hits) has been run.
- SlicPandora has been run.
- Collections of ReconstructedParticles are available for analysis.
- Events have also been processed through clic_sid_cdr as an *ad hoc* detector optimization exercise (and perhaps inclusion in CDR/DBD?).
  - Using slac batch resources (N.Graf)
  - Will use Grid (Dirac?) for full production.

1TeV DBD Reconstruction Times



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See talk by R. Partridge

Summary

- The technical interface between the lcsim simulation environment and the PandoraPFA reconstruction is essentially complete.
  - Geometry definition is automated
    - compact.xml → GeomConverter → detector_pandora.xml
  - Sampling fraction derivation is automated
    - lcsim-cal-calib + single particle generation
- Detector response of sidloi3 and clic_sid_cdr being studied, (detector optimization planned).
- Tuning & algorithm iteration ongoing.
  - expect to see improvements soon for use in SiD.
- Getting ready for CDR/DBD physics analyses.