

Energy Reconstruction at High Energies

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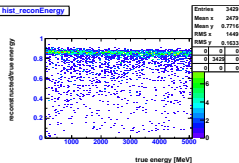
May 2, 2014

KLG4 e-type lepton energy reconstruction using KAT

vertex $R < 600$ cm, no residual nucleus

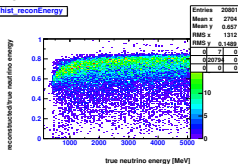
e^-

hist_reconEnergy



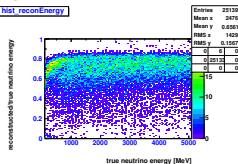
$\nu_e + {}^1\text{H} \rightarrow e^- + ?$

hist_reconEnergy

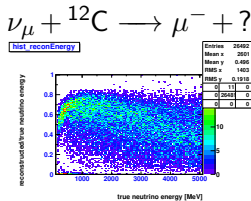
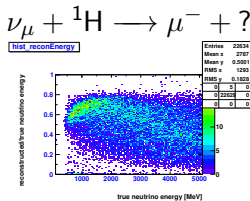
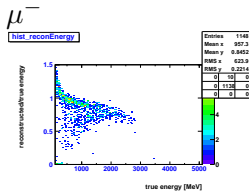


$\nu_e + {}^{12}\text{C} \rightarrow e^- + ?$

hist_reconEnergy

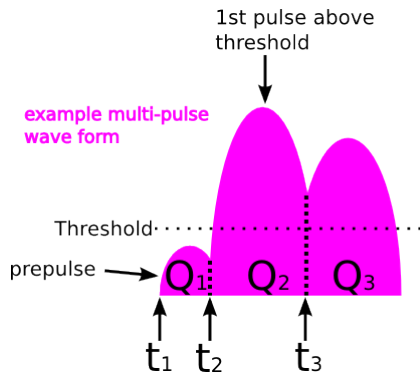


KL G4 μ -type lepton energy reconstruction using KAT
vertex $R < 600$ cm, no residual nucleus



Energy calibration using cosmic ray μ

Can we find more accurate μ speed when prepulse is filtered out?

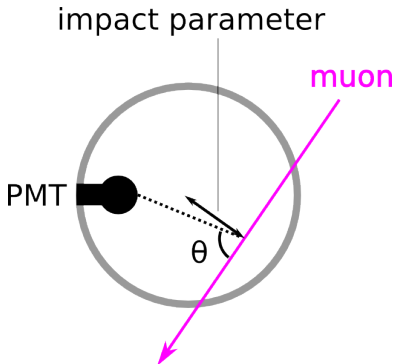


Algorithm:

1. threshold $\equiv 0.3 \times (\text{charge of largest pulse } Q_2)$
2. choose first pulse above threshold
3. let $T = t_2$
4. let $Q = Q_1 + Q_2 + Q_3$

Energy calibration using cosmic ray μ

Plot PMT hit time vs angle wrt middle point of muon track



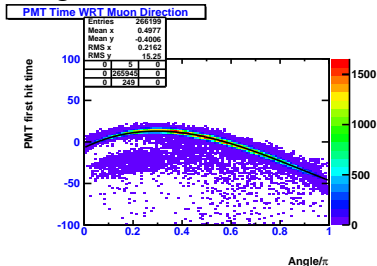
Conditions:

- ▶ runs 5000 to 5009
- ▶ impact parameter < 50 cm
- ▶ muon fitter badness < 20

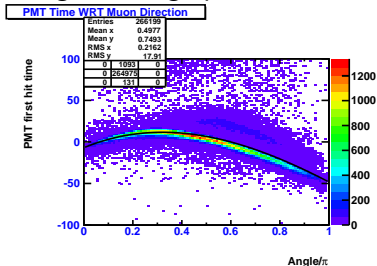
PMT hit time vs angle wrt μ center point

run 5000 to 5009, 204 events

Using first hits



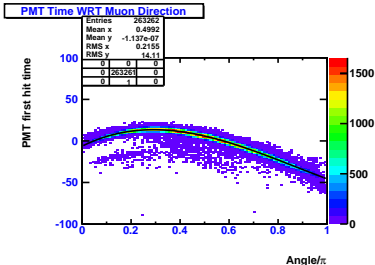
Using first large pulse hits



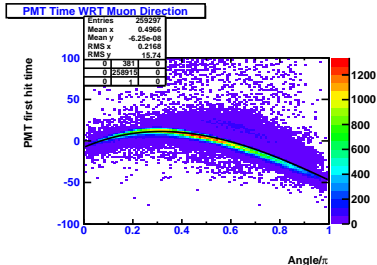
PMT hit time vs angle wrt μ center point

run 5000 to 5009, 204 events, 3σ cut wrt neighbor PMTs

Using first hits



Using first large pulse hits



Notes

- ▶ what was defined as “prepulse” previously is successfully removed
- ▶ first hit time is less precise where prepulse previously existed ($\text{Angle}/\pi < 0.4$)
- ▶ many secondary pulses are included in first hits for $\text{Angle}/\pi > 0.5$ (can be seen by second rainbow shape above main first hits streak)
- ▶ prepulses are removed around area of muon entrance?