Subject: Momentum resolution and reconstruction efficiency of LHE tracking
Posted by David Pohl on Wed, 10 Feb 2010 18:21:56 GMT
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Hi everybody,

at the moment I try to investigate the MVD particle identification capabilities. Therefore I study the Lhe track reconstruction efficiency and
the reconstructed momentum resolution for low momentum particles (p < 1 GeV/c). I found out that the reconstruction efficiency is much worse
than it was in the old BaBar framework (p. 47, Physics Performance Report). In order to compare the results I did a simulation with the
same parameters, which are:

- fixed theta = 60
- phi = 0..360
- transverse momentum pt = 0..1 GeV/c
- Lhe ideal track finder and Lhe Kalman track fitting
- 1 primary pions per event with box generator

- standard macros in the tutorials/lhetrack/ folder for STT
- PandaRoot: revision 7731 and external packages: January 2010

The criterion for a successful track reconstruction is that the MC pt value is within the 3 sigma region of the reconstructed pt value.
The following plots show the ratio between successfully reconstructed tracks divided by the total number of tracks as a function of the MC pt:

Physics Performance Report (first); Panda Root (second)

The reconstruction efficiency, especially for low momentum particles, is much worse (200MeV/c: 40% instead of 90%).

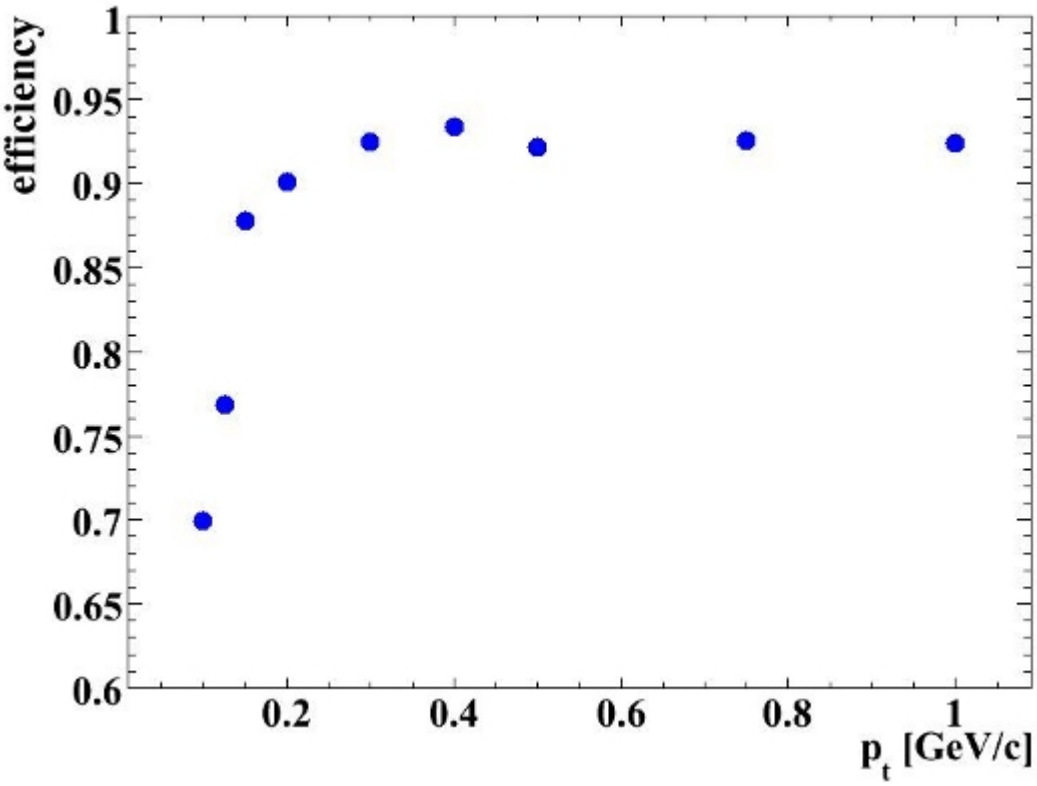
For the momentum error of the reconstructed track in comparison to the MC values I did a simulation with Pions@250 MeV/c:

One can easily see that only under 60% of the entries are in the 3 sigma region of the Gauß Fit. Or the other way round that
the intended momentum resolution of a few percent can only be achieved for 60% of the events. I'm really lost at the moment
due to the fact that so many events cannot be used and the momentum resolution is that bad...
Has anybody any idea?

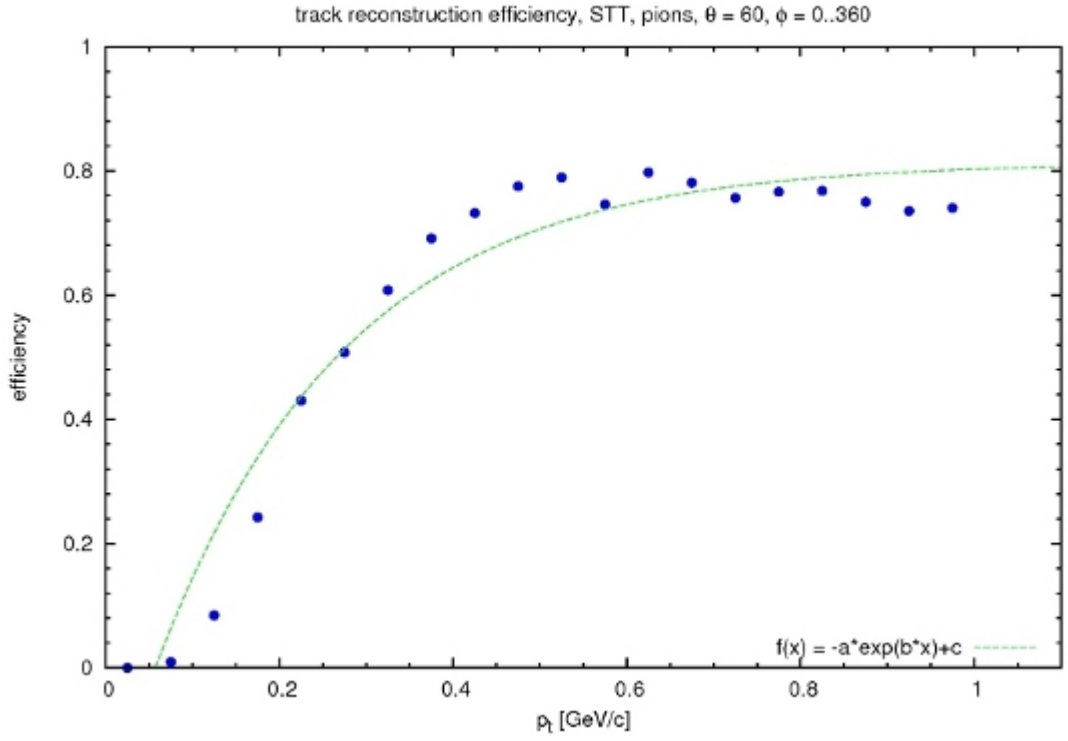
greetings,
David

File Attachments

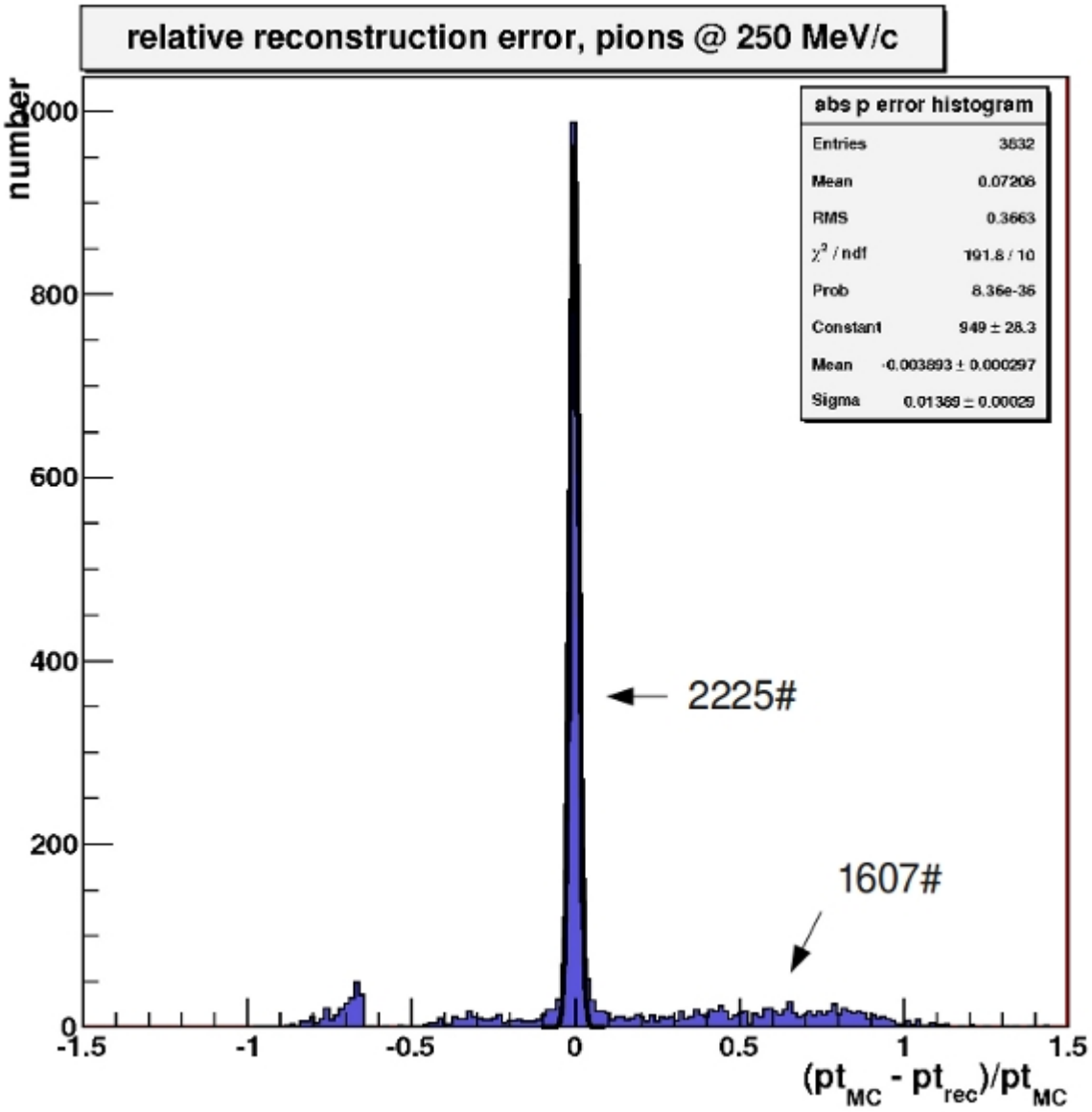
1) report.jpeg, downloaded 1177 times



2) trackefficiency.jpg, downloaded 1158 times



3) 250MeV2.jpg, downloaded 1194 times


relative reconstruction error, pions @ 250 MeV/c
abs p error histogram
Entries 3532
Mean 0.07206
RMS 0.3663
χ² / ndf 191.8 / 10
Prob 8.36e-36
Constant 949 ± 28.3
Mean -0.003893 ± 0.000297
Sigma 0.01389 ± 0.00029
number
2225#
1607#
(pt_MC - pt_rec)/pt_MC