Tracking speedup

Mikhail Zhabitsky, JINR

09.09.2020

SPD track reconstruction

- GenFit2 to reconstruct track
- macro/fullchain/FitIdealTracks.C by Igor Denisenko
  J/Ψ sample
- $\sim$ 0.3 sec per track

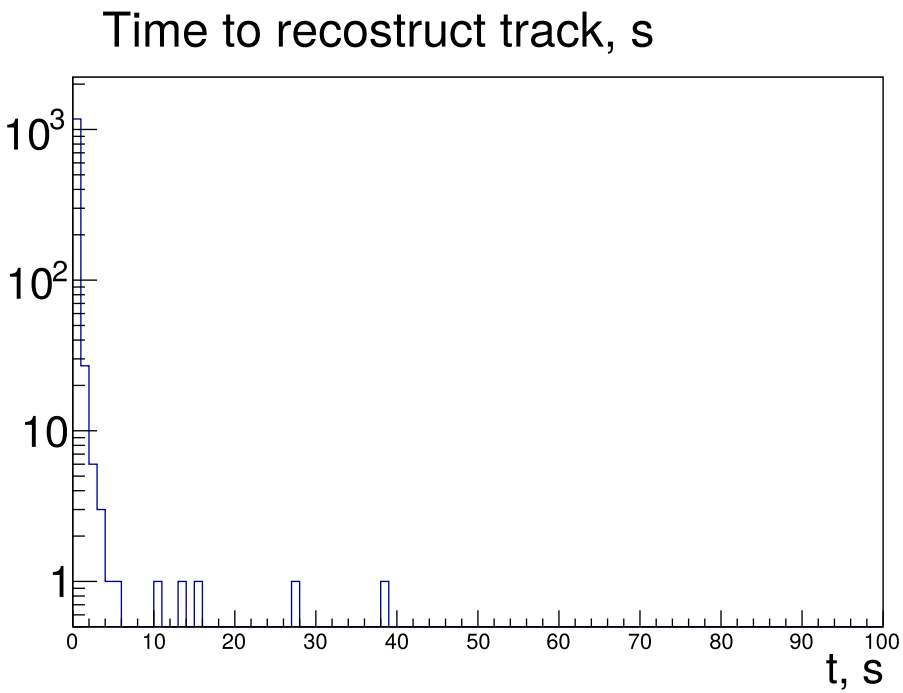
SPD track reconstruction (speed)

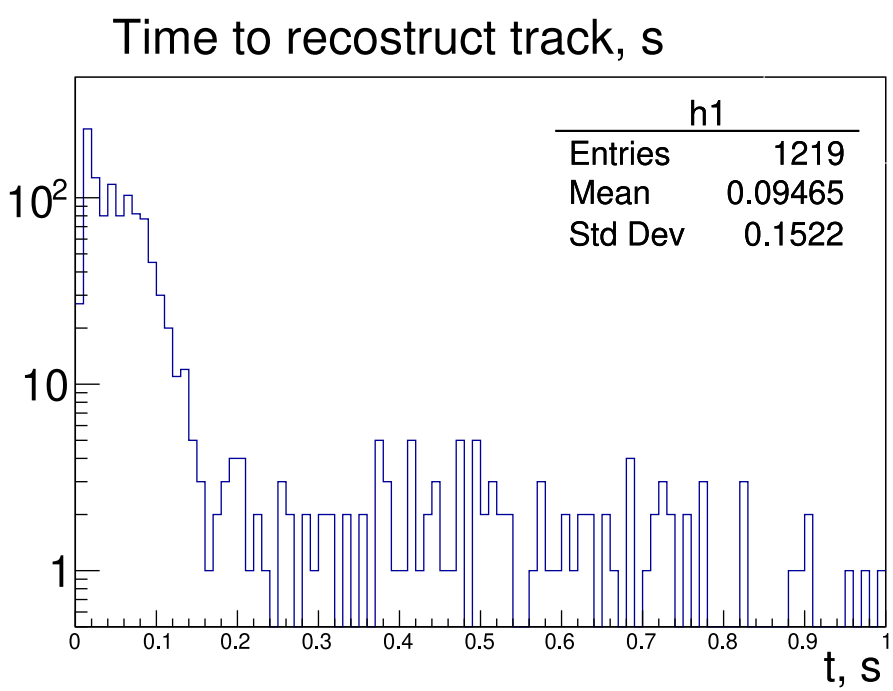
- standalone executable
- google-pprof profiler
- $>$ 80% of CPU is in Runge-Kutta algorithm within GenFit reconstruction

Ways to speed-up:

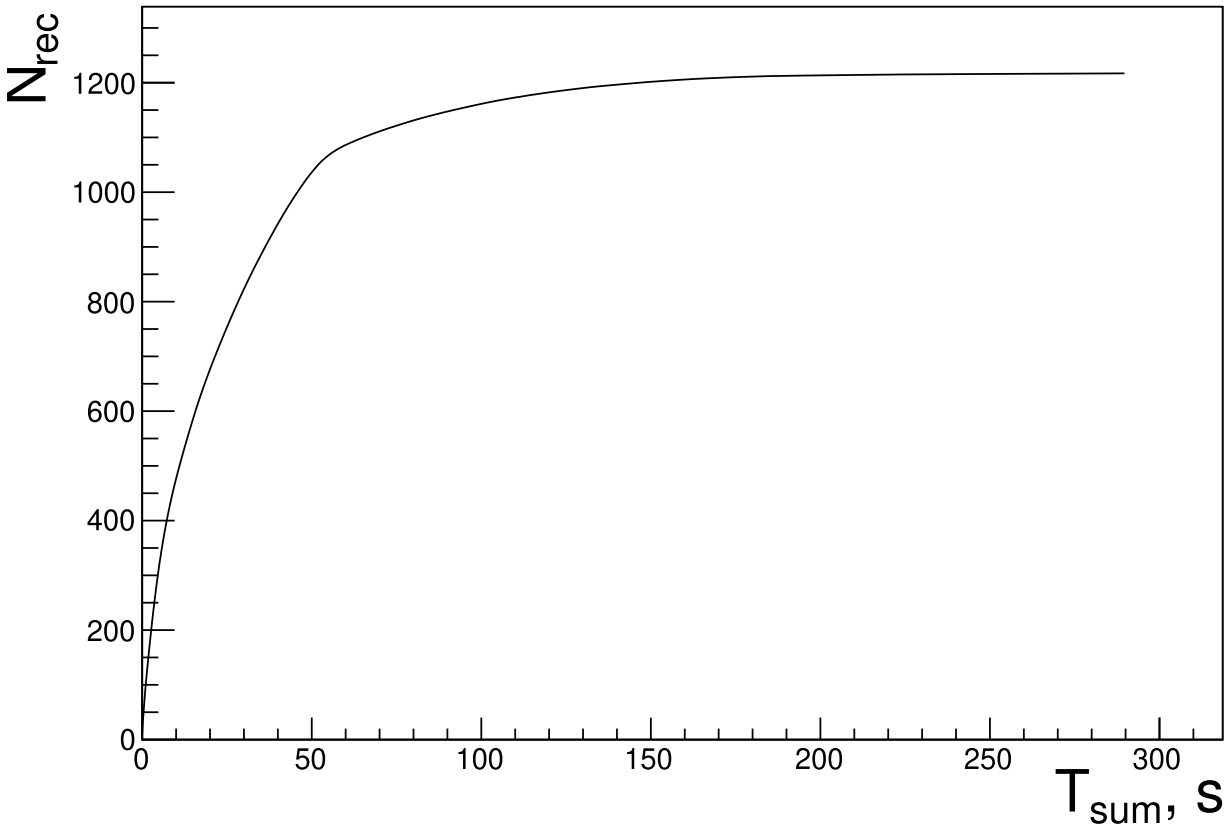
1. Coarse stepping in Runge-Kutta
2. Specific treatment of slowly reconstructed tracks

Time to reconstruct a track



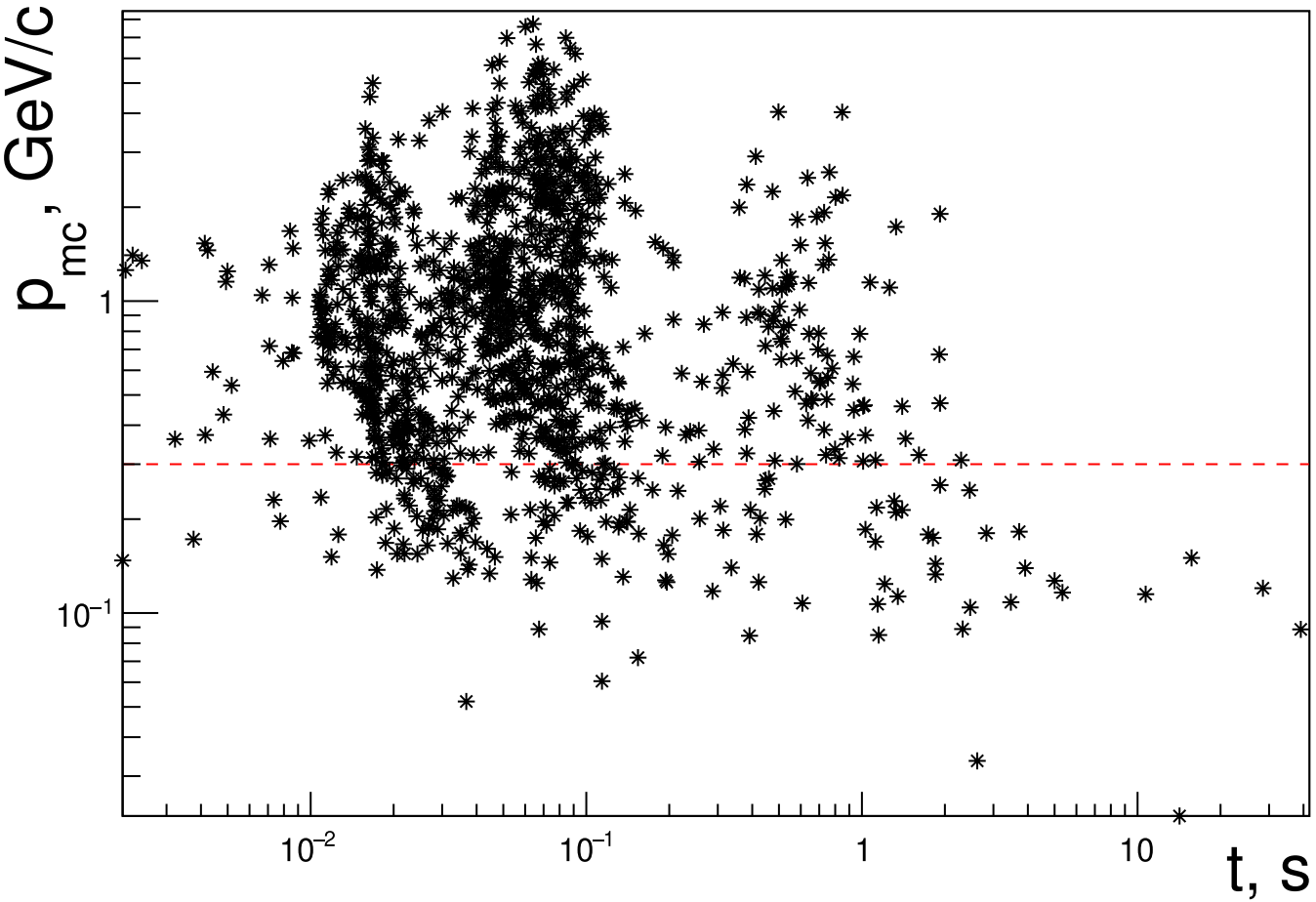


Speed-up opportunity



$$\langle t \rangle \sim \frac{300 \text{ s}}{1200 \text{ tracks}}$$

Slow tracks = slow reconstruction



Ways to speed-up slowly reconstructed tracks

- Natural cut on $p_\perp < 0.3$ GeV$/c$ due to magnetic field and the steel plate in the barrel
- Early cut-off in reconstruction

  (stop excessive track following):

  Either geometric cut on curved tracks

  e.g. $\angle(\vec{r}_\perp, \vec{p}_\perp) \geqslant \alpha_{\text{critical}}$ $(\alpha_{\text{critical}} \sim \pi/2)$

  Or Accumulated track uncertainty greater than the expected resolution on momentum $\sigma(p)$

  but dE/dX, multiple scattering, bremsstrahlung depends on unavailable PID

Conclusions

- Specific treatment of slow (=curved) tracks

  In progress: implement geometric cut within GenFit to stop excessive track reconstruction

  Factor $(3 \div 5)$ speed-up is expected

- Coarse stepping in Runge-Kutta (gain?)