



Tracking Speed in MAUS Step IV



Chris Rogers,
ASTeC,
Rutherford Appleton Laboratory

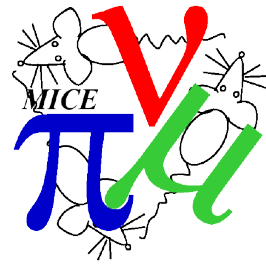


Overview



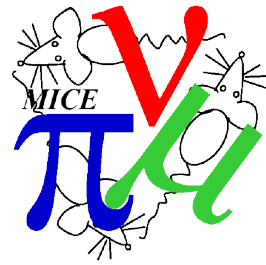
- Few complaints that tracking speed was slow
 - Want to MC > 1 “good muon” per second as a minimum
 - To keep up with nominal data taking of ~ 50 good muons per second we need ~ 50 cpus
 - As we move towards integration tests this becomes important
- What is taking the time?
 - Look at Stage 4 Monte Carlo
 - Not done with high statistics
 - Issue #1248
- Running 1000 muons initially on axis starting at $z=0$
 - Upstream of TOF0 in Stage4

Look at principle elements



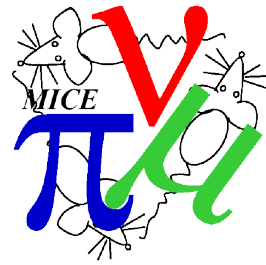
- configurations/CoilOnly.dat – SS coil pack only
 - real 0m15.190s
- configurations/Nothing.dat – empty geometry
 - real 0m8.247s
- configurations/TOFOnly.dat – TOF only
 - real 0m33.481s
- configurations/TrackerOnly.dat – tracker only
 - real 1m44.981s
- Stage4.dat – full stage 4
 - real 2m6.981s

Physics processes



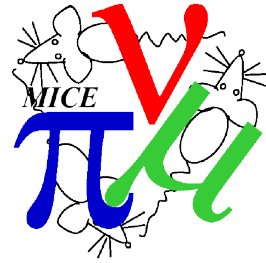
- “physics processes” = “none”
 - real 3m35.098s
 - Kill all physics processes
- “kinetic_energy_threshold” = 10 [MeV]
 - real 4m19.957s
 - Kill delta electrons
- configurations/Stage4.dat (1 mm step size)
 - real 6m17.091s
- Some benefit to not enforcing proper physics processes
 - but it means that the tracking will be non-physical

Json/processors



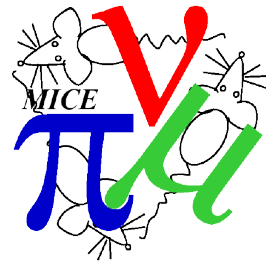
- Stage4.dat
 - Running only MapPyBeamMaker and MapCppSimulation
 - real 5m26.555s
- Compare with other results
 - Not much speed up

Step Size



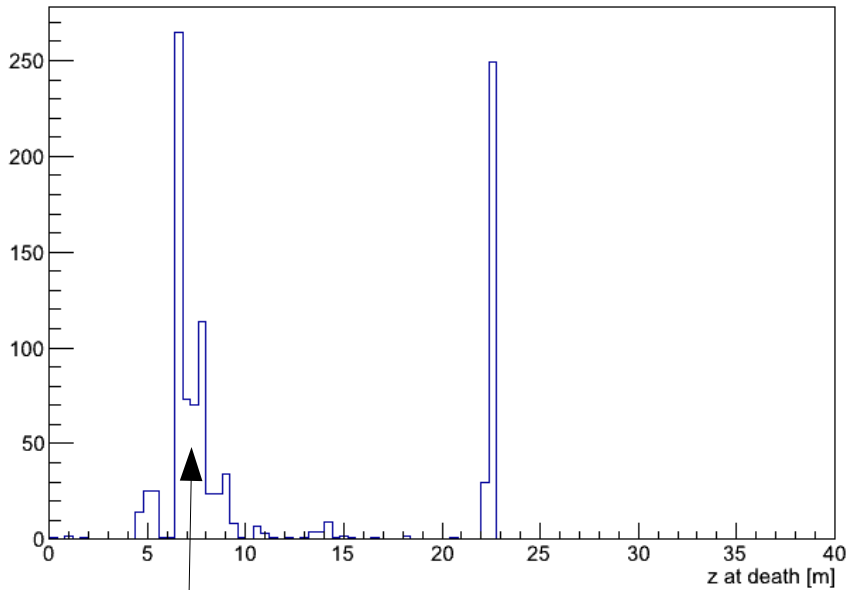
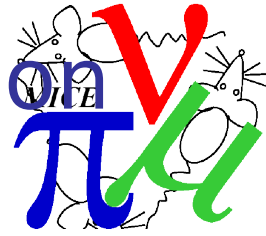
- configurations/Stage4_100_mm_step.dat
 - real 4m46.632s
- configurations/Stage4_10_mm_step.dat
 - real 5m8.047s
- configurations/Stage4_1_mm_step.dat
 - real 6m17.091s
- I did a study many years ago which indicated that 100 mm step size is sufficient for MICE
 - So change now step size to 100 mm
 - Note that this is a change in the global configuration and the beamline module (which also specified 1 mm step)
 - Revision 927

Look again at principle elements

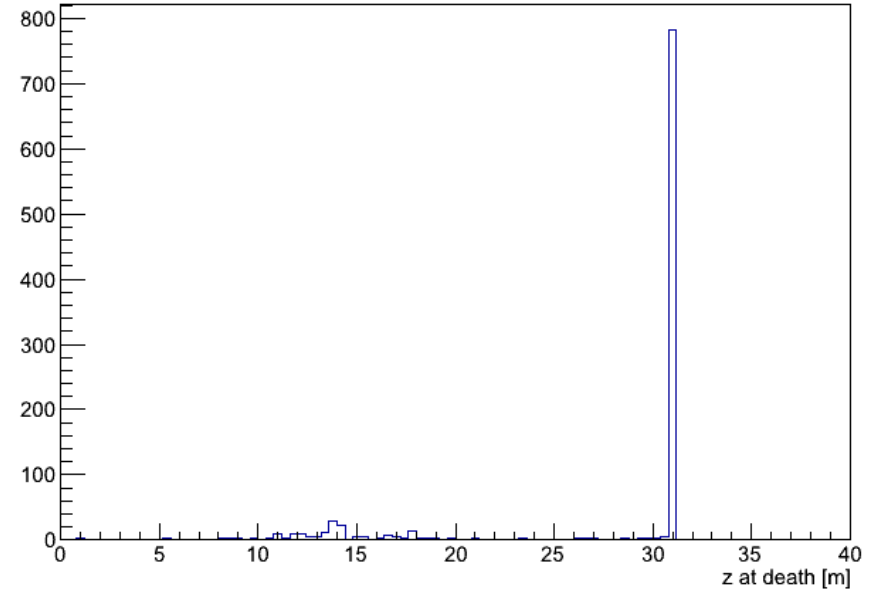


- Try removing selected elements and see if we can get some speed up
- Stage4.dat
 - real 7m28.072s
- Stage4NoBeamline.dat
 - **real 17m27.704s**
- Stage4NoBeamlineNoTracker.dat
 - real 1m58.248s
- Stage4NoTracker.dat
 - **real 2m10.582s**
- Stage4BeamlineOnly.dat
 - real 1m21.157s

No Beamline - Higher Transmission



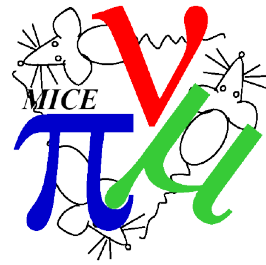
Losses vs z (step 4)



Losses vs z (step 4 – no beamline)

2/3 beam is lost

Conclusions



- Tracker looks like it is taking 2/3 of processing time
- Recommend
 - Tracker group reproduces the result to their satisfaction
 - Investigate ways to improve tracker MC time