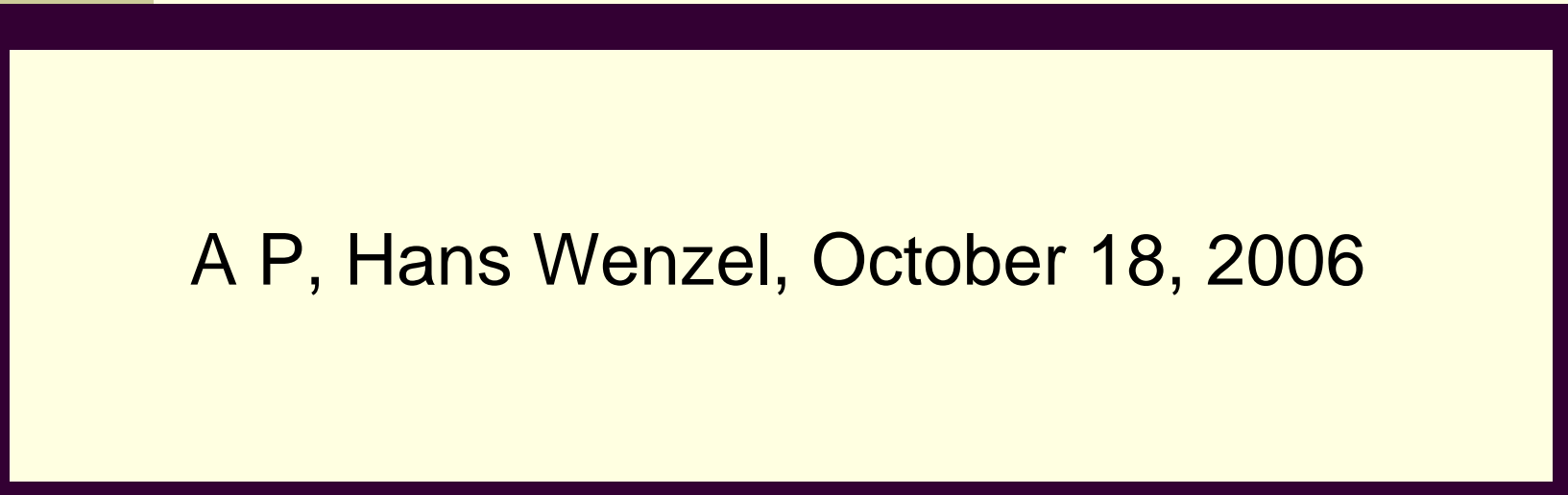# GEANT 4 Issues

A P, Hans Wenzel, October 18, 2006

Abnormal Energies

- Problem: (at least) for a sampling detector with scintillator as an active layer there is a tiny fraction of events where the total energy deposited in the Cherenkov radiator + active layer exceeds the initial particle energy by a big factor (like 2):
  - Bug in our code?
  - Bug in GEANT4?
- Debugging steps:
  - Verify that the step length and the energy deposited used are identical with those reported by GEANT (~few tens of steps)
  - Verify that our recording is once per step and only for steps of charged particles (~few tens of steps)
  - Verify that the total path length accumulated in our code compares with the total path length of all trajectories of charged particles in GEANT (at the level of 10%, abnormal events have very large upward fluctuation in GEANT too)
- Bug in GEANT, most likely. Will try to get attention of GEANT4 people

Simulation Strategy

- A thought: replace the part of the analysis (summation, spatial granularity, etc..) done at the simulation step by writing a file with a complete history of the energy depositions by charged particles. This would enable more detailed studies without a computer-intensive step of simulation.

- File format: Root file

File Content (Draft)

- Separate trees for absorber, Cherenkov radiator, active material energy depositions and for Cherenkov photons.
- Energy deposition (==step):
  - Position 1 (before the step)
  - Position 2 (after the step)
  - Energy deposition
  - Particle type
  - Parent particle type
  - Process responsible for the energy loss
  - Separate lists for different volume types

File Content II

- Cherenkov photons
  - Emission point
  - Energy/wavelength
  - Parent particle