Simulation Setup

- Geant4 versions used:
  - Started with 3.0
  - Test several bug fixes
  - Finished with 3.2
- Processes used:
  - Transportation
  - Proton Inelastic: `G4ProtonInelasticProcess`
- Models:
  - GHEISHA: `G4L(H)EProtonInelastic`
  - Precompound: `G4PreCompoundModel`
- Geometry used:
  - Low cross sections:
    ⇨ Thin target is rarely “seen”
    ⇨ CPU time expensive
  - One very large material block
    ⇨ One interaction always takes place
    ⇨ Save CPU time
  - Stop every particle after the interaction
    ⇨ Store kinematic properties of secondaries

Summary

- Several bugs were found in GEANT4 during proton inelastic scattering test development
- Wrong azimuthal distributions were a surprise!
  - For GHEISHA it has been confirmed to be a bug in the low energy part of the code
  - For Precompound it will be fixed in next releases
- Incorrect pion production cross sections are important
- GHEISHA cannot satisfy the physics we require

Conclusion

- Hadronic shower in G4 not yet ready for calorimetry!
  - After 3 years from release
- Clearly there are problems in the quality control procedure
  - The simplest checks have not been performed on the generators
- Still a lot of work to be done by GEANT4 to provide a reliable predictive tool
  - We still have no alternative to GEANT3 for full detector simulation!
  - Can we help them?