Geant4 Requests from NA61/SHINE

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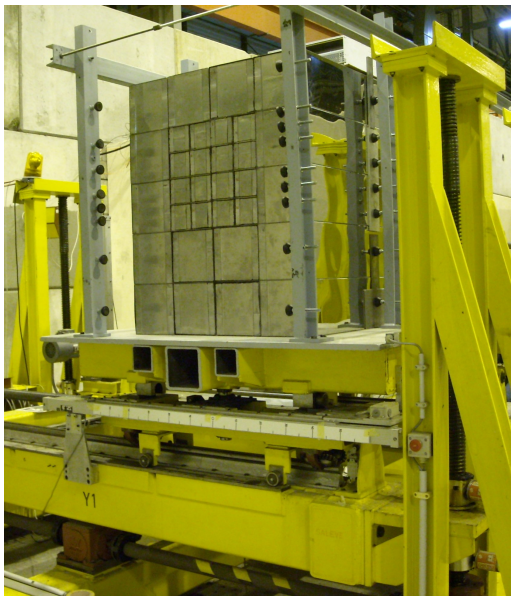
Geant4 in SHINE

- NA61/SHINE — fixed-target experiment at the SPS, studying p+p, p+A and A+A collisions at $p_{beam} = 10A$–$350A$ GeV/c
- Primary NA61 detector simulator: GEANT3-based
  - inherited from NA49
  - now considered inadequate, esp. for A+A collisions
- Efforts launched to upgrade to Geant4
  - . . . but to satisfy all needs, Geant updates are needed
- Existing side Geant4-based tools
  - beam-line simulator
  - *PSD set-up*
  - miscellaneous smaller projects

NA61/SHINE PSD

- Projectile Spectator Detector: a forward detector to measure fragments and spectator nucleons of projectile nuclei
- High-granularity, longitudinally-segmented compensated calorimeter
- Centrality, event-by-event fluctuation and reaction-plane measurement in $A+A$ collisions
- Construction in progress, expected to be ready by June 2011
- First SHINE ion-beam data in November 2011
  - full simulations including PSD *urgently* needed



PSD, early March 2011.

12 modules to go!

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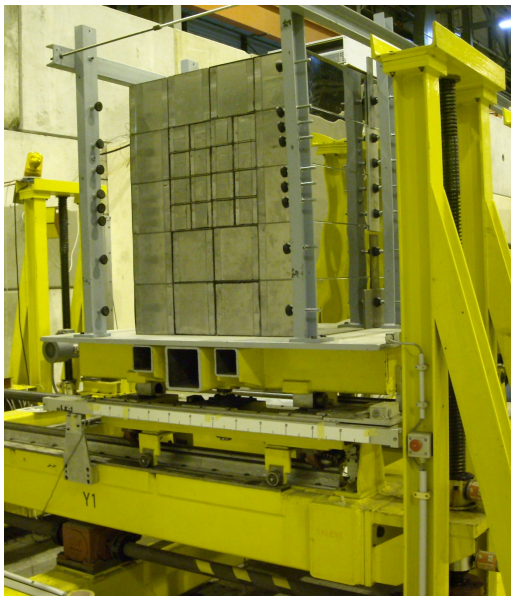

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PSD Simulator

- Virtual Monte Carlo + ROOT Geometry
- Geant4.9.3.p02 as back-end
  - QGSP_BIC_HP physics list
- Full NA61/SHINE geometry
- Likely basis for the new primary simulator

Issues

1. Problem: no low energies in the PSD E distribution
   - Cause: in Geant4, no ion–nucleus interactions above $20A$ GeV/c
   - Possible solutions recently discussed with Geant4 developers
   - Need to include nucleus–nucleus collisions, at up to $200A$ GeV/c, in standard Geant4 releases
2. Problem: hard to compare different simulators
   - Geant4, FLUKA, GEANT3 (for cross-checks)
   - VMC was to help here...
   - ...but FLUKA support dropped

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Our Requests

1. Include nucleus–nucleus collisions, at up to 200A GeV/c, in standard Geant4 releases
   - very important for *e.g.* CPoD search
   - MC models to be considered: FLUKA, SHIELD, DPMJET
   - SHINE offers help and experience
     - *e.g.* interfacing Fortran and C
   - our primary platform: x86 SLC5, gcc-3
2. FLUKA back in VMC
   - a "political" matter
   - CERN endorsement might play an important role

THANK YOU