



Contribution ID: 49

Type: **Oral contribution**

Experiences on Grid production for Geant4

Wednesday, 1 March 2006 17:00 (30 minutes)

Geant4 is a general purpose toolkit for simulating the tracking and interaction of particles through matter. It is currently used in production in several particle physics experiments (BaBar, HARP, ATLAS, CMS, LHCb), and it has also applications in other areas, as space science, medical applications, and radiation studies. The complexity of the Geant4 code requires careful testing of all of its components, especially before major releases (which happens twice a year, in June and December).

In this talk, I will describe the recent development of an automatic suite for testing hadronic physics in high energy calorimetry applications. The idea is to use a simplified set of hadronic calorimeters, with different beam particle types, and various beam energies, and comparing relevant observables between a given reference version of Geant4 and the new candidate one. Only those distributions that are statistically incompatible are then printed out and finally inspected by a person to look for possible bugs. The suite is made of Python scripts, and utilizes the “Statistical Toolkit” for the statistical tests between pair of distributions, and runs on the Grid to cope with the large amount of CPU needed in a short period of time. In fact, the total CPU time required for each of these Geant4 release validation productions amounts to about 4 CPU-years, which have to be concentrated in a couple of weeks. Therefore, the Grid environment is the natural candidate to perform this validation production. We have already run three of them, starting in December 2004. In the last production, in December 2005, we run as Geant4 VO, for the first time, demonstrating the full involvement of Geant4 inside the EGEE communities. Several EGEE sites have provided us with the needed CPU, and this has guaranteed the success of the production, arriving to an overall efficiency rate of about 99%.

In the talk, emphasis will be given on our experiences in using the Grid, the results we got from it and possible future improvements. Technical aspects of the Grid framework that have been deployed for the production will only be mentioned; for more details see the talks of P.Mendez and J.Moscicki.

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Session Classification: 1b: Astrophysics/Astroparticle physics - Fusion - High-Energy physics

Track Classification: Astroparticle physics - Fusion - High-Energy physics