



Contribution ID: 132

Type: poster

## A novel design approach and new Geant4 physics developments for microdosimetry simulation

*Wednesday, September 5, 2007 8:00 AM (20 minutes)*

Detailed knowledge of the microscopic pattern of energy deposition related to the particle track structure is required to study radiation effects in various domains, like electronics, gaseous detectors or biological systems.

The extension of Geant4 physics down to the electronvolt scale requires not only new physics models, but also adequate design technology. For this purpose a novel approach, based on a policy-based class design, has been explored: the usage of this design technique represents an innovative design within Geant4, and more in general for Monte Carlo simulation for particle physics.

A policy-based design assembles classes with complex functionality out of simpler ones responsible of a single behavioural or structural aspect. Policies define a class interface or a class template interface; they are more loosely defined than conventional abstract interfaces, as they are syntax oriented rather than signature oriented.

A policy-based design is highly customisable; this feature is relevant to cases where a variety of physics models is desirable. It also provides advantages in performance with respect to more conventional techniques for interchangeable algorithms, such as a Strategy pattern: in fact, policies are compile-time bound and are exempt from the drawbacks related to the virtual method table.

The novel design and a set of new physics models introduced in Geant4 are presented; this prototype demonstrates the feasibility of the new approach. The new design technique is suitable to be extended to other Geant4 physics domains to improve the flexibility of modelling configuration and the execution performance.

**Primary authors:** Dr PIA, Maria Grazia (INFN GENOVA); Dr NIEMINEN, Petteri (ESA); Dr INCERTI, Sebastien (CENBG-IN2P3)

**Presenter:** Dr INCERTI, Sebastien (CENBG-IN2P3)

**Session Classification:** Poster 2

**Track Classification:** Event Processing