

## **Dottorato di Ricerca in Fisica dell'Università degli Studi di Messina**

7 Febbraio 2011, ore 15.00, Aula E. Majorana, Dip.to di Fisica

V.le F. Stagno d'Alcontres 31, Messina

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Titolo del Seminario

### **The Geant4 Monte Carlo package from Cern and its applications to nuclear, particle, astroparticle and medical radiation physics**

#### **Abstract**

Geant4 (Geometry and Tracking 4) is a Monte Carlo toolkit developed by Cern in object-oriented C++ programming paradigm, for the simulation of nuclear and particle interaction.

It offers a wide set of complementary physics models, based either on theory or on experimental data and parametrizations, for electromagnetic and hadronic interactions in energy ranges spanning from some tens of eV to TeV, together with models for nuclear excitation, fission and decay. Extensions to low energy interactions and also to optical photon propagation are available.

Complex geometries can be defined and managed, made from elements or compounds whose properties can be obtained from databases or user defined. Volumes can be made "sensitive" to simulate detectors, through the use of hits and digitisation classes.

Primary particles propagate through the defined geometry according to the tracking and stepping rules, obeying to the physics models adopted and to the selected cuts.

Interaction tracks and cascades can be visualized either online or offline, and relevant quantities are scored in 1-2-3D histograms and n-tuples. Several ancillary softwares from Cern and from application developer teams aid the user in the I/O phases.

After a general introduction to the Geant4 concept, architecture and physical models, I will comment on the different fields of application, spanning from the high energy physics and astrophysics experiments, to the application of radiation physics for dosimetry and radioprotection from sources of photons, leptons and hadrons.