Applications

High energy and nuclear physics detectors
- ATLAS, CMS, HARP and LHCb at CERN and BaBar at SLAC

Accelerator and shielding
- Linacs for medical use

Medicine
- Radiotherapy
  - photon, proton and light ion beams
  - brachytherapy
  - boron and gadolinium neutron capture therapy
- Simulation of scanners
  - PET & SPECT with GATE (Geant4 Application for Tomographic Emission)

Space
- Satellites
  - effect of space environment on components
    (especially electronics)
  - shielding of instruments
  - charging effects
- Space environment
  - cosmic ray cut-offs
- Astronauts
  - dose estimates

Concept

Geant4 simulates the passage of particles through matter. It provides a complete set of tools for all domains of radiation transport:
- Geometry and Tracking
- Physics processes and models
- Biasing and Scoring
- Graphics and User Interfaces
- Propagation in fields.

Geant4 physics processes describe electromagnetic and nuclear interactions of particles with matter, at energies from eV to TeV. A choice of physics models exists for many processes providing options for applications with different accuracy and time requirements.

The toolkit is developed, maintained and supported by Geant4, a world-wide collaboration of about 100 scientists from many institutions, contributing in their area of expertise. Developers interact constantly with users, and combine efforts to validate physics results for application in high energy physics experiments, space and medical studies.

Advantages

- Simulates the geometries of complex setups efficiently
- Provides configurations of physics processes for application areas
- Enables user to tailor simulation components and address accuracy needs
- Performant and adaptable
- Easy to embed into specific applications

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The European Organization for Nuclear Research (CERN), one of the world’s foremost particle physics laboratories, has introduced an active Technology Transfer policy to establish its competence in European industrial and scientific environments, and to demonstrate clear benefits of the results obtained from the considerable resources made available to particle physics research. Technology Transfer is an integral part of CERN’s principal mission of fundamental research.