Documentation

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Overview

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  - Geant4 HyperNews
  - Code documentation
  - Physics Lists
  - Working group and Geant4 related pages
  - Training courses material
- Examples
- Mailing List
- Papers, reports, publications

Geant4 general papers

- *Geant4—a simulation toolkit*
  - *Nuclear Instruments and Methods in Physics Research* A 506 (2003) 250-303
- *Geant4 developments and applications*
  - *IEEE Transactions on Nuclear Science* 53 No. 1 (2006) 270-278.

Search Geant4

Geant 4

User Support

1. Getting started
2. Training courses and materials
3. Source code
   a. Download page
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4. Frequently Asked Questions (FAQ)
5. Bug reports and fixes
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8. Documentation
   a. Introduction to Geant4
   b. Installation Guide
   c. Application Developers Guide
   d. Toolkit Developers Guide
   e. Physics Reference Manual
   f. Software Reference Manual
9. Physics lists
   a. Electromagnetic
   b. Hadronic
10. User Aids
    a. Process/model catalog
    b. General particle source manual
11. Contact Coordinators & Contact Persons

Related Links

- Object Oriented Analysis & Design
- Archive
- Mailing list subscription
- User requirements document (pdf)
- Technical Forum

Geant4 home page
http://cern.ch/geant4
-or-
http://geant4.org

Applications | User Support | Results & Publications | Collaboration | Site Map

Contact Webmaster

Last updated: 17 Dec 2007

User Documentation

○ Documentation   ← link to page with PDF
                                    versions for manuals below

- Introduction to Geant4
- Installation Guide
- Application Developers Guide
- Toolkit Developers Guide
- Physics Reference Manual
- Software Reference Manual

Installation manual

URL: (html/pdf)

http://cern.ch/geant4/UserDocumentation/UsersGuides/InstallationGuide/html/index.html
http://geant4.web.cern.ch/geant4/UserDocumentation/UsersGuides/InstallationGuide/fo/BookInstalGuide.pdf

- Step by step instruction how to install Geant4 from source code
- Requirements/dependencies on other software
  - Compiler, CLHEP, etc.
- Installation choices
- Details on environment variables

Application developers guide

URL: (html/pdf)

http://cern.ch/geant4/UserDocumentation/UsersGuides/ForApplicationDeveloper/html/index.html
http://.cern.ch/geant4/UserDocumentation/UsersGuides/ForApplicationDeveloper/fo/BookForAppliDev.pdf

- Guide for users developing an application based on Geant4 toolkit
  - Does not cover design or details of Geant4 classes
  - No description of physics models
- Introduces users to Geant4 toolkit
- How to set up and run simulation

- Contents
  - Getting started
  - Toolkit fundamentals
  - Detector Definition and Response
  - Tracking and Physics
  - User Actions
  - Communication and Control
  - Visualization
  - Examples

Toolkit developers guide

URL: (html/pdf)

http://cern.ch/geant4/UserDocumentation/UsersGuides/ForToolkitDeveloper/html/index.html
http://cern.ch/geant4/UserDocumentation/UsersGuides/ForToolkitDeveloper/fo/BookForToolDev.pdf

- More details on Geant4 classes
  - Object oriented design
  - Explaining design choices
  - Algorithms
- How to extend Geant4 functionality

- Contents
  - Introduction
  - Design and Function of Geant4 Categories
    - …
  - Extending Toolkit Functionality
    - …

Physics Reference Manual

URL (html/pdf)

http://cern.ch/geant4/UserDocumentation/UsersGuides/PhysicsReferenceManual/html/index.html
http://cern.ch/geant4/UserDocumentation/UsersGuides/PhysicsReferenceManual/fo/PhysicsReferenceManual.pdf

- detailed explanations of the physics implemented in the Geant4 toolkit
- theoretical formulation, model, parameterization, or data underlying the physics interactions included in Geant4
- probability of the occurrence of an interaction
  - and the sampling mechanisms required to simulate it
- reference for toolkit users and developers who wish to consult the underlying physics

Getting help

- FAQ
- Geant4 HyperNews
- Code documentation
- Physics Lists
- Working group and Geant4 related pages
- Training courses material

Getting Help - FAQ

○ Frequently asked questions (FAQ)
http://geant4.cern.ch/support/faq.shtml

○ First place to look for help

○ Solutions to several problems or questions
  • Installation
  • Run time
  • Geometry
  • …

Getting help - Hypernews

- Geant4 hypernews at

  http://hypernews.slac.stanford.edu/HyperNews/geant4/cindex

- 24 forums grouped into 6 categories
- Open for all to read postings
- Only members may create postings
  - To join, click on "new Member" and fill form
- Members can also subscribe to forum(s)
  - receive posting in forum by e-mail

Getting help - Hypernews

Geant 4

Forums by Category	Recent Postings	Member Info	Overview
Forums by Time Order	Search in Forums	Members List	Contact Admin
Request a New Forum	Subscribe to Forums	New Member	

Page Help

Category: Applications

Educational Applications	Industrial instruments	Medical Applications
Space Applications		

Category: Control of runs, events, tracks, particles

Event and Track Management	Particles	Run Management

Category: Experimental Setup

Fields: Magnetic and Otherwise	Geometry	Hits, Digitization and Pileup

Category: General matters

Documentation and Examples	HyperNews System Announcements	Hypernews Testing
Installation and Configuration	User Requirements	

Category: Interfaces

(Graphical) User Interfaces	Analysis	Persistency
Visualization		

Category: Physics

Electromagnetic Processes	Fast Simulation, Transportation & Others	Hadronic Processes
Physics List	Processes Involving Optical Photons	

This site runs SLAC HyperNews version 1.11-slac-98, derived from the original HyperNews

Getting help – Code Documentation

○ LXR source code browser

http://www-geant4.kek.jp/LXR

- **Source-tree** browsing and filename search
- **Full-text** indexing
  - ○ fast retrieval of source files containing a given word or pattern.
- **Identifier cross-reference**
  - ○ fully hyperlinked source code
  - ○ names of classes, methods, and data can be clicked on to find the source files where they are defined and used.
- implemented using Glimpse, so all the capabilities of Glimpse are available, including regular expression searches.

Getting help – Code Documentation

- ○ Software reference manual

  http://geant4.cern.ch/bin/SRM/G4GenDoc.csh?flag=1

  - Details on the interface of important Geant4 classes
  - All classes and methods needed by or available to users documented
  - Internal classes are not documented here

- ○ Doxygen documentation (beta)
  - http://www-geant4.kek.jp/Reference
- ○ LXR source code browser

Getting help – Physics Lists

(Note: web pages for this are under revision)

- Documentation for complete physics lists under User Support, mostly HEP oriented
  - 9. Physics Lists
    - Description of electromagnetic builders
    - Description of reference physics lists
  - 10. User Aid
    - Process/model catalog describes
      - all hadronic processes/models and their applicability in energy and particle
      - Available Cross section
- Physics lists for medical and space applications
  - Low energy working group pages
  - Advanced examples working group
- Examples
  - extended/electromagnetic show details of EM physics lists
  - Optical examples in extended/optical demonstrate use of optical processes
  - Advanced examples have several physics lists including several for medical applications
  - …

Getting help – Working group pages Geant4 related pages

- Working group web pages
  - Within Geant4 collaboration page
  - details on current work and plans
  - Additional information
  - Validation
  - Papers

- Geant4 related web pages
  http://cern.ch/geant4/collaboration/other_g4_webs.shtml
  - Pages of collaborating Labs / Institutions
  - Pages of tools based on Geant4
    - Space users
    - Gate

Getting help – Training courses

- Training material used in courses URL:
  http://cern.ch/geant4/support/training.shtml

- Scope and depth on individual topics varies

Geant4 Examples

- Novice examples
  - Basic Geant4 features
  - seven examples
  - Each showing several aspects
- Extended examples
  - 20 groups of examples
  - demonstrate use of specific features
- Advanced examples
  - Complete applications
  - May depend on additional external software

Novice Examples

N01 Simple, basic example to demonstrate how the GEANT4 basic framework works.
- No physics involved, only tracking geantino in a simple geometry.

N02 simplified fixed target experiment.
- Use of parameterized volumes, uniform magnetic field.
- standard EM physics
- Includes visualization and detector response.

N03 sampling calorimeter setup.
- Demonstrates use of replicated volumes. Uniform field
- detector response and statistics on relevant quantities.
- tutorial for visualization, exercising different visualization drivers.

N04 simplified collider detector setup.
- interfaced to the PYTHIA primary generator.
- use of a readout geometry.
- Uses reference physics list
- event filtering using the stacking mechanism.

N05 fast-parameterization

N06 optical photons generation and transport.
- optical surfaces and exercises optical physics processes (Cerenkov, Scintillation, Absorption, Rayleigh, …).

N07 simplified sandwich calorimeters.
- how to modify part of the geometry setup at run-time.
- Use of scorer and filter classes
- Use of parallel scoring geometry and parallel world scoring process
- Use of user defined run class
- Use of regions to adapt production cuts

README files in examples have details

Extended examples

- Grouped into topics, ~following G4 categories, plus several specialized topics
  - Analysis
  - Biasing
  - Electromagnetic
  - … exotic physics … biasing …
  - Run and event
  - Visualisation
- README files in extended, for each topic, and for each example

Advanced examples

- Realistic applications of Geant4 in typical experimental environments for several application domains
  - Often created by experts in these domain
  - Particle physics
    - Air_shower, composite_calorimeter, lAr_Calorimeter, raredecay_calorimetry, radiation_monitor, Rich, Tiara, underground_physics
  - Medical
    - brachytherapy, hadrontherapy, human_phantom, medical_linac microbeam, nanobeam, purging_magnet, radioprotection
  - Space applications
    - cosmicray_charging, gammaray_telescope, radiation_monitor, radioprotection
- Maintained by advanced examples working group
  - http://cern.ch/geant4/collaboration/working_groups/advanced_examples/

Geant4 'announce' mailing list

- Announcements of general interest to users
  - new releases or patches
  - Workshops
  - Tutorials
- To subscribe, follow link in user support page, right side panel, or
  http://geant4.cern.ch/support/subscribe.shtml

Summary

- Geant4 offers wide set of documentation
  - Book style manuals
  - Additional information in Geant4 web
    - Much linked from "user support"
    - Additional pages under "collaboration"
  - Examples show how to use Geant4 for wide range of applications
- Direct questions can be put to hypernews
  - Developers watch topics