

GEANT4 9.4 release

and patch 9.4.p01

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Outline

- Major features included in release 9.4
 - Geometry
 - Physics
 - Kernel & Interfaces
 - <http://cern.ch/geant4/support/ReleaseNotes4.9.4.html>
- Last released patch 9.4.p01
 - <http://geant4.cern.ch/support/Patch4.9.4-1.txt>

Geometry

- Review of navigation **check-mode** verbosity
- First implementation of optional precise **ComputeSafety** in navigation
- Extension of divisions to allow for gaps in replicated daughters
- Possibility to define envelopes of different types other than box for regular voxel structures
- New recursive algorithm for improving visualization of Boolean combinations of shapes
- New **G4GenericTrap** specific shape (with GDML support)
 - Arbitrary trapezoid with up to 8 vertices standing on two parallel planes perpendicular to the Z axis (**Arb8** in Root)
- Optimisation in memory management
 - Dynamic allocation and memory fragmentation

Materials & Particles

Materials

- Addition of extra data for ion stopping powers
- Reviewed atomic shell energies

Particles

- Updated properties of particles to PDG 2010
- Reviewed implementation of static tables and treatment of ions for thread-safety

Electromagnetic physics

Standard EM

- Extended capability of helper classes
- More effective sampling of displacement in Urban multiple-scattering
- Updated Bremsstrahlung model for e[±] for energies $E < 1$ GeV
- New ionisation models **G4BraggIonGasModel**, **G4BetheBlochIonGasModel** for simulation of ion transport in low density media
- New model, **G4ICRU73QOModel**, for low-energy ionisation of negatively charged hadrons applicable from 5 keV to 15 MeV for anti-proton
- Improved modeling of fluctuations in energy deposition
 - Relevant for deposit in gasses and silicon
- New model of single scattering and NIEL for ions **G4IonCoulombScatteringModel**
 - Applicable from 50 keV to 100 TeV.
- First version of transportation code for magnetic monopole
 - Provided in extended example

Low Energy EM

- Penelope 2008 e[±] ionisation processes
- New photon Livermore models for pair production in the electron electric field
- Reimplementation of anti-proton model of ionisation
- New processes and models for Geant4-DNA in liquid water:
 - electron attachment, vibrational excitation, electronic excitation, excitation for neutral hydrogen, ionization

Hadronic physics

Hadronic Physics

- Deep review of Bertini cascade
 - Improved memory management
 - optimised fixes for energy/momentum conservation
 - additional interface to pre-compound model
- Implementation of fast neutron capture model
- Improved break-up method in de-excitation
- Completed migration to integer Z and A interface
- Interface of INCL to pre-compound & carbon ions in INCL/ABLA
- Integral elastic cross sections for coherent elastic model
- Extension of FTF model to nucleus-nucleus collisions
- Anti-baryon-nucleon elastic scattering in CHIPS model
- Development of ion-ion model for elastic scattering
- Development of integral nucleus-nucleus cross-sections

More Features

Scoring

- Full revision of scorers to accept user-defined unit
- Cylindrical meshes for command-based scoring

UI & Environments

- Support for Python 3.0 in G4Py

Visualization

- Production release for Qt4 visualization driver and UI
- General speedup for GL graphics

Configuration

- New optional configuration & installation system
 - Based on Cmake

Detailed notes: <http://cern.ch/geant4/support/ReleaseNotes4.9.4.html>

Supported platforms for 9.4 series

- Linux SLC5, gcc-4.1.2, gcc-4.3.X, 32/64 bits
- MacOSX 10.6, gcc-4.2.1, 64 bits
- Windows/XP and CygWin Tools
 - Compiler Visual C++ 9.0 (Visual Studio 2008)
- Also tested: gcc-4.5.1, icc-11.1

- *CLHEP version: 2.1.0.1*

9.4.p01

- Released last February
 - <http://geant4.cern.ch/support/Patch4.9.4-1.txt>
- Some problem reports addressed and closed:
 - [#1153](#), [#1159](#), [#1160](#), [#1166](#), [#1169](#)
- Added registration of BetaDecay for anti_neutron to fix run-time warnings as reported by CMS
- Fixes in CHIPS hadronic model for rare crashes reported by both ATLAS and CMS
- Fix for 'EMV' lists in definition of polar angle limit, responsible for significant CPU penalty in single scattering of muons
- Fixed inefficiency in computation of ionisation cross-sections for low-energy EM processes
- Fixed bug in `G4PhysicsTable` affecting data persistency
- Several Q/A fixes, following Coverity static analysis reports

Thanks!