

Geometry

Recent & ongoing developments



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Outline



- ❧ Developments in the last year
 - ❧ Introduced in release 9.5 and patches
- ❧ Planned for release 9.6 and ongoing ...
 - ❧ Currently under development and scheduled for inclusion in the November release

Fixes/updates on solids



- ↻ Improved random sampling of points on surface 9.6.beta
 - ↻ Using polar coordinate parameterizations, to generate more uniform distributions

- ↻ Refined protection for potential cases of infinite loop in *DistanceToIn(p,v)* of *G4SubtractionSolid* 9.6.beta
 - ↻ Return computed distance instead of zero and provide more descriptive information when issuing warning
 - ↻ Problem report [#1304](#)

- ↻ Fix in *G4EllipticalCone* in *DistanceToIn(p,v)* 9.4.p03 & 9.5.p01
 - ↻ To exclude imaginary solution (virtual cone) when distance is calculated

- ↻ Fixes for Coverity defects 9.5.p01
 - ↻ None of them critical...

More fixes/updates



- ❧ Fix all cases of variable shadowing
 - ❧ Part of a general cleanup for the Geant4 code
- ❧ Explicit inclusion of headers for system of units and physical constants
 - ❧ In provision to remove implicit inclusions of CLHEP headers from global
 - ❧ Part of a general cleanup for the Geant4 code for variable shadowing
- ❧ Fine tuning of parameters in *G4PropagatorInField*
 - ❧ Revised threshold for *decreaseFactor* from 100 to 30 times the zero-step threshold
- ❧ Added base materials in properties propagation for *G4Region*
 - ❧ Fixing computation of material-cuts couples for materials defined through base materials

9.6.beta

9.6.beta

9.5.p01

9.5.ref08

More developments included in release 9.5



- ❧ Parallel layered mass geometry
 - ❧ *Now possible to define volumes with material in parallel geometry layers*
 - ❧ *Enhancement of the existing functionality for parallel specialised geometries, which is also used for scoring, fast simulation, shower parameterisation and event biasing*
- ❧ Added capability for (uniform) gravity field
 - ❧ *Implemented with new classes `G4EqGravityField`, `G4UniformGravityField`*
- ❧ Fix long-standing issue in locator classes for tracks stuck on boundaries between volumes
 - ❧ *Improved the condition for accepting a candidate intersection with a boundary in all locator classes and added ability to compute global surface normal to `G4Navigator`*
 - ❧ *Addressing issue reported by ATLAS*
 - **See presentation by J.Apostolakis in parallel session 5b for issues on surface normal calculation**

Yet expected for release 9.6 ...



- ❧ Implementation of precise ComputeSafety() in navigation for EM use
 - ❧ *Refined implementation of alternative Computesafety() for use by physics processes (mainly EM) for measuring the exact safety value, not limited by voxels boundaries*
- ❧ Identification of first/last step in a volume for curved tracks
 - ❧ *Feature currently possible only for linear track*
 - ❧ *Requires to be extended also for curved tracks in magnetic field*
- ❧ Review of field classes and of design for field accuracy settings
 - ❧ *Revise design and implementation of the field classes, improving intersection, adding trajectory (and potentially interpolation)*
- ❧ Start adaptation of relevant classes for multi-threading
 - ❧ *Identify design choices to be applied for making relevant parts of the geometry modeler thread-safe and implement most obvious ones*

➤ **Review in parallel session 5b of affected classes & code**

Unified Solids library

on-going development



- ❧ Implementation of a common library for shapes (CSG and specific) with Root geometry
 - ❧ Work started in the context of the [AIDA EU Project](#)
 - ❧ Types and common interface defined
 - ❧ Bridge classes defined and implemented for both Geant4 and Root
 - ❧ Solids implemented so far: box, orb, simple trapezoid, new “Unions of Many” solid and improved tessellated solid
 - ❧ Planning to include new improved tessellated solid already in release 9.6 as *G4TessellatedSolid*
 - ❧ Currently tackling: tube, cons and polycone
 - ❧ Comprehensive testing suite defined, deployed and extended
- Detailed presentation by Marek Gayer in parallel session 5b



Thanks!