

GEANT4 10.4 highlights

kernel modules

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for the [Geant4 Collaboration](#)



Outline

- Features and fixes introduced in release 10.4
 - Kernel modules
 - EM Physics (see talk by V.Ivantchenko)
 - Hadronic physics (see talk by A.Ribon)

➤ *Detailed release notes:*

- <http://cern.ch/geant4/support/download.shtml>

➤ *List of planned features for 2017:*

- http://geant4.cern.ch/support/planned_features.shtml

Geometry

Geometrical primitives

- Updated VecGeom library
 - Optional replacement of original Geant4 solids
 - Selection made at configuration
 - External library VecGeom v00.05.00
 - <https://gitlab.cern.ch/VecGeom/VecGeom/tree/v00.05.00>
 - Deprecated & replaced USolids old interfaces and wrapping system
 - Available shapes for replacement:
 - Box, Trapezoid (Trap), Simple Trapezoid (Trd), Orb, Sphere (+ sphere section), Tube (+ cylindrical section) , Cone (+ conical section), Generic Trapezoid (Arb8), Polycone (PCon), Polyhedron (PGon), Parallelepiped (Para), Paraboloid, Torus (+ torus section)
- Added new construct, G4MultiUnion as native type, implementing a multiple-union of several volumes, displaced/rotated and same material

Geometry

Volumes, Field transport

- New revised algorithms for basic shapes (box, trap, trd, para,...)
 - Providing more compact implementation and CPU speedup
- Implemented specialized constructs for trap and extruded-solid
 - Trd-like structure and convex/non-convex right prism
- Fixed static memory leaks from geometry objects in MT mode
- New stepper, *G4DormandPrince457*, now set as the default stepper for magnetic fields, providing higher accuracy than *G4ClassicalRK4*, the old default
- Modified behaviour of *SetDetector()* in *G4FieldManager* to pass the Field to the Equation, as for natural user expectation. Introduced *G4VIntegrationDriver* base class for any driver algorithm.

Analysis & Persistency

- Analysis:
 - Added support for the input/output in HDF5 format
 - Geant4 libraries to be built with the `-DGEANT4_USE_HDF5=ON` CMake option
 - Added support for row-wise n-tuple in MT mode
- Persistency
 - New GDML schema version 3.1.6
 - Added possibility to specify material properties tables for optical surfaces
 - Added ability to export limited number of levels in geometry hierarchy
 - Added UI commands to enable/disable stripping of names for reading and for appending or not pointers to names for writing
 - Enabled import/export of *G4MultiUnion* as a native type

Materials, Particles, Solid State

- Materials:
 - Added DAVIS model for optical surfaces
 - Model used with reflection and for transmitting photons based on LUTs
 - Added possibility of defining custom density effect parameters
- Particles:
 - Updated properties according to PDG-2017
 - Introduced *G4GenericMuonicAtom* class, used only by *G4IonTable* and not for tracking; processes for *G4MuonicAtoms* should be registered with this class
- Solid State:
 - New module including channeling and phonon modeling

Global, Run, Digits-Hits

- Global:
 - New structure for *G4coutDestination* functionality with division between sink and filter
- Run:
 - Modified design of physics-lists for allowing cleanup of memory in MT mode
 - New class *G4PhysicsBuilderInterface* which all physics-lists builders inherit from
 - Prevent adding multiple times the same sensitive-detector to the same logical volume
- Digits-Hits:
 - Renamed *G4THitsMap* to *G4VTHitsMap*
 - Made *G4VTHitsMap* more generic in accepting the type of data stored (with more generic template overloads not specific to *G4double* and *G4StatDouble*)

Visualization, Environments & Data sets

- Visualization:
 - Added visualization support for General Particle Source
 - Can be used with new UI command `/vis/scene/add/gps`
 - Improved arrow drawing and magnetic field drawing
- Environments:
 - New experimental module ZMQ, including ZeroMQ interface
- Data sets:
 - New versions: `G4EMLOW-7.3`, `G4ENSDFSTATE-2.2`,
`G4RadioactiveDecay-5.2`, `G4PhotonEvaporation-5.2`, `G4ABLA-3.1`,
`G4RealSurface-2.1`
 - Updated optional data set `G4TENDL-1.3.2` for high-precision incident particles

Configuration & Externals

- Cmake:
 - Requiring CMake v3.3 or higher
 - Removed obsolete FindCLHEP.cmake and FindROOT.cmake modules
 - Set INSTALL_RPATH for MacOS systems
- CLHEP:
 - New version 2.4.0.0 required
 - Set MixMax random engine as the default engine, replacing HepJamesRandom

Platforms for 10.4

- Linux, gcc-4.8.5, 4.9.X, 5.3.X, 6.2.X, 7.2.X, 64 bits
- MacOSX 10.13, clang-4.0 (XCode 9.x), 64 bits
- Windows 10, Visual C++ 14.11 (Visual Studio 2017)
- Also tested:
 - Linux SLC6/CentOS7, icc-18, clang-3.9
 - Linux Ubuntu 14, gcc-4.8
 - Linux for Intel Xeon Phi with Intel-icc 16.0 (gcc-4.9 compatibility layer)
 - MacOSX 10.10/10.11/10.12, clang-3.6/3.7/3.8
 - Windows 7, VC++14.0 (no MT support on Windows yet)

Thanks!