

Geant 4

Highlights of latest developments



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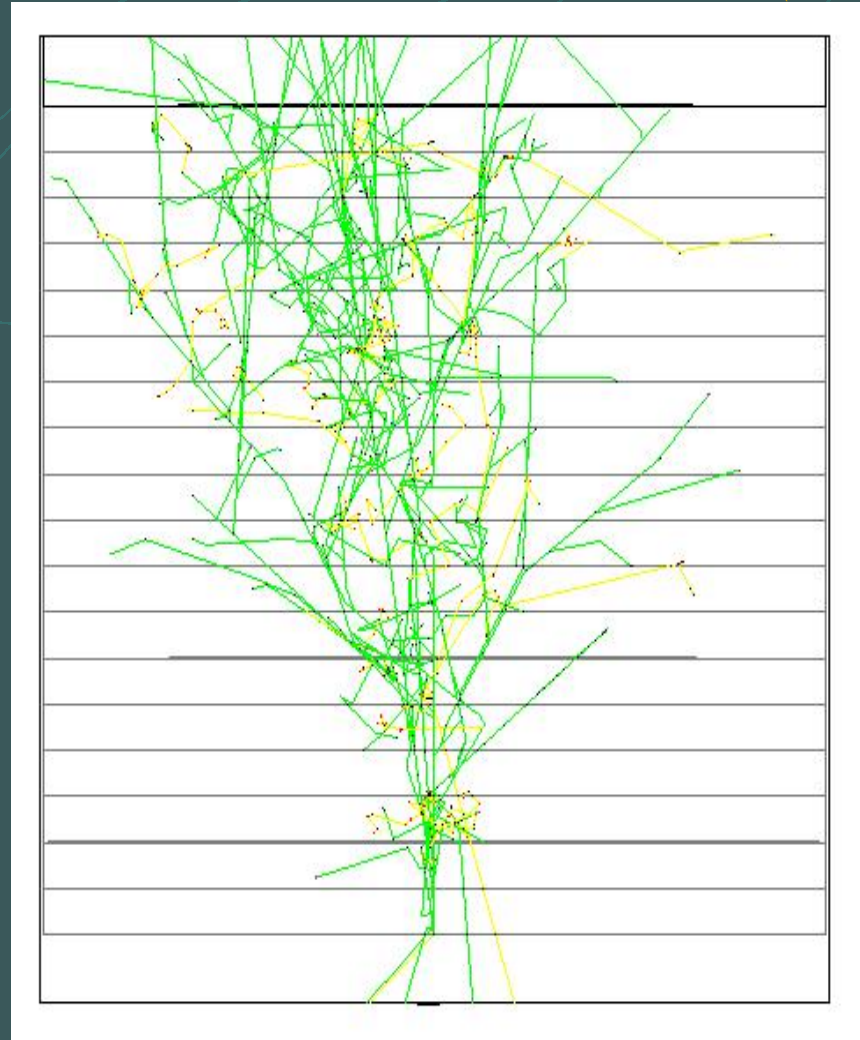
Introduction

- We currently provide two public releases and four beta releases every year.
 - Most recent public release is Geant4 version 5.0 released on December 13th, 2002.
 - Target date of next beta release is February 28th.
 - Target date of next public release is under discussion.
- I will try to summarize the highlights of new features released at version 5.0, and also highlights of developments which are ongoing and expected to be included in near future releases.
 - For new physics models, refer to presentations of Giovanni, Hans-Peter and Peter.
 - For the complete list of features of 5.0 including improvements and fixes, refer to the release note.

Event biasing and scoring

New
5.0

- Geometrical biasing (importance biasing) mechanism
 - Duplicate a track with half weight if it goes toward more important region.
 - Russian-roulette in another direction.
- Scoring particle flux with weights



Run and event managements

New
5.0

- Introducing “soft abortion”
 - Event loop is aborted after the completion of currently processing event.
 - “Hard abortion” is supported as well.
- First implementation of interface to HepMC.
- Introducing G4VExceptionHandler abstract class
 - Enable the user’s more flexible handling of program abortion when G4Exception occurs.
 - Enrichment of comments with G4Exception is underway.

Tracking management

New
5.0

- Introducing “Strongly Forced” condition in handling process invocations at each step.
 - “Strongly Forced” process is invoked even if the track becomes to “Stop and kill” status.
 - E.g. Scintillation process is now invoked for the final step.
- Introducing “smoothly curved” trajectory, which keeps auxiliary points used by G4Navigator / G4ChordFinder for drawing smoother trajectory.
 - Meaningful with magnetic field
 - Requires additional amount of memory

Electromagnetic processes

New
5.0

- Introducing new prototype implementation on “model approach” for standard EM processes.
 - This new approach allows flexible integration of more than one models into a process.
 - It is the same approach as taken by hadronic and Low-E EM processes.
 - E.g. combining standard and Low-E EM models enables us good performance at high energy range and precise simulation at low energy range within a single process.
- New implementations in multiple scattering and scintillation processes

Hadronic processes

New
5.0

- First release of the cascade part of the HETC re-write
- First release of the generic scattering term, currently used by binary cascade model
- Leading particle model has extended neutron spectrum to reach below 1 MeV
- De-excitation and radioactive decay models now support internal conversion
- Added Coulomb barrier to nucleus' public interface
- “Educated guess” physics lists applicable to many use-cases in various domains

Graphic_reps, GUI and visualization

New
5.0

- Introduced classes G4AttDef, G4AttDefStore and G4AttValue for uniform treatment over several GUI and visualization drivers of picking capability
- New implementation of HepRep driver (version 2)
- Precision control of g4_XX.prim files are now generated by the DAWNFILE/DAWN-Network drivers, by use of a new variable for tuning precision G4DAWNFILE_PRECISION. Default precision is now set to 9 digits.

Examples

New
5.0

● Advanced examples

- Migration of most examples to use AIDA 3.X for histogramming.
- Added "composite_calorimeter" example based on CMS test-beam setup.
- Added "IAr_calorimeter" example based on ATLAS IAr-calorimeter test-beam setup.

● Extended examples

● Analysis examples

- "A01" example for usage of analysis and HepRep.

● Biasing examples

- Restructured for demonstrating new importance biasing

Cuts per Region



- This new capability allows the user to define regions in his/her geometry and define set of production thresholds in range for each individual region.
- For example, sensitive tracking region has very small threshold, while a region of bulk of structural support has reasonably large threshold.
- Better overall performance is expected with this new capability.
- The user should be aware that having different thresholds in one geometrical setup may break the uniform consistency of the simulation result.
- Expected to be release publicly in the first half of this year.

Event biasing



- New functionalities of biasing options on physics process and cross-section is under development.
- Importance biasing will be available for virtual (artificial) geometry in addition to real geometry which is currently supported.
- Rewriting latest MARS code with biasing options is under study.
- Another biasing options are under study.
- Other scoring options rather than surface flux counting which is currently supported are under study.

Other ongoing developments



- For new developments of physics processes and models, refer to the presentations of Giovanni, Hans-Peter and Peter.
- Native GUI / Visualization for Windows OS is under study.
- Plan of developments and releases of this year is now under discussion, and will be posted on the Geant4 Web page before long.
 - In addition to the foreseen developments identified by the developers, user's requirements will be taken into account for planning.