

Update on Requirements

35th Geant4 Technical Forum
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Requirements Tracking System Page:
<http://jirageant4.kek.jp/secure/Dashboard.jspa>

NEW REQUIREMENTS

FROM LAST TF (DECEMBER)

3401 : Allow for use of alternate set of mathematical libraries

- Requester: CMS
 - Description: CMS profiling shows that 10-15% is spent in math functions: possibility to speed up simulation by using fast math libraries.
- Responsible: Ben Morgan
- Proposed solution:
 - Investigate if it is feasible to produce a built in option allowing to enable/disable fast mathematical libraries.
 - Evaluate effects of usage of fast mathematical libraries on accuracy of Geant4 tracking and physics
- Status:
 - Plan to address requirement with cmake configuration.
 - Communication ongoing about which libraries required and how they should be substituted.
 - **Open**

3402 : Allow for suppression of the NeutronHP package warning messages on user's request

- Request:
 - Allow for suppression of the NeutronHP package warning messages of the type:
 - “/Elastic/ file for Z = ..., A = ... is not found and NeutronHP will use ...”
- Responsible: Tatsumi Koi
- Proposed approach:
 - Agreed that the print should be by default, and could be switched off **on user's purpose only**.
- Status:
 - Requirement acknowledged
 - But work on re-structuration of Neutron HP package on going, requirement will be addressed after this work will have been completed.
 - **Open**

3403 : Indicate when Geant4 does or does not take ownership of pointers

- Requester: MU2e
 - Description: The MU2e experiment is driving the Geant4 loop in its framework and needs to have clarifications on when Geant4 takes or not ownership on pointers.
- Responsible: Michael Kelsey
- Status:
 - The philosophy of ownership will be documented for the most user-exposed classes, as part of the 10.0 release.
 - Given the number of classes, users are encouraged to communicate with developers in the mean time, and for more technical classes.
 - Open

3404 : Change of AtRest logic for allowing stopped tracks to be accelerated and further tracked

- Requester: Tom Roberts, Muon Inc.
 - Description: Tracks that come at rest are always killed
 - either after a physics interaction or because Geant4 abandons their tracking considering the tracking is finished.
 - But in presence of an electric field, for example, a stopped charged track maybe accelerated.
- Responsible: Takashi Sasaki
- Requirement:
 - Allow for AtRest track with fStopButAlive status to be put back as fAlive status.
- Use-cases (so far):
 - Inverse cyclotron: frictional cooling to stop muons before acceleration by electric field.
 - Collective tracking: mutually interacting tracks tracked in small time steps. Some may stop at some point and be restarted: not possible with current AtRest logic.
- Status:
 - Large change of logic in the stepping manager that can only go into a major release
 - Noted as a Collaboration-wide development item for 2013
 - **Open**

3405 : Extensible physics list factory

- Requester: Robert W. Hatcher, for FNAL neutrino experiments
 - If a user defines a physics list, there is no way to make it known by the physics list factory
 - If a user defines a physics module (eg monopole), there is no way to combine such module with existing physics lists
- Responsible: Gunter Folger
- Requirements:
 - Allow the physics list factory to be extensible with user-made physics list
 - Allow for user physics module / extension (eg monopole) to be combined with existing physics lists
- Status:
 - Communication ongoing
 - Open

OPEN REQUIREMENTS

2902: Displacement in thin volumes

- Originator: S. Miglioranzi (LHCb)
- Issue
 - Displacement lost for steps in thin vol. (Si layers)
 - Need to recover displacement for all charged particles (not just e-, as in EM opt 3)
 - Need to avoid extra CPU cost.
- Status November 2011
 - Customized physics List based on EM Option-0, limiting all charged particles' steps was provided.
 - Since simulation workshop in Oct. 2011: is complicated shape of the RF-foil, in front of the VELO, related to the problem (requires detailed implementation) ?
- Status from March 2012:
 - In 9.5 EM option2 includes WentzelVI MSC model, providing an alternative approach for scattering of hadrons.
 - Suspect discrepancy may be due to imperfect geometry modeling of complicated RF foil.
 - More complete geometry investigated via CAD/STL -> GDML -> G4 geometry
 - LHCb will report when studies conclude
- Status from December 2012:
 - Default multiple scattering for all particles (including e+- above 100 MeV) changed from Urban model to WentzelVI
- Status from today:
 - Significant invest in LHCb geometry for better description on-going. Awaiting for feed-back.
 - **Open.**

3301 : Multithreading processing driven by experiment framework

- Requester: CMS
 - Original request at 33th TF ([link](#))
 - Further information at G4 Collaboration meeting ([link](#))
- Responsibles: Andrea Dotti, Makoto Asai, John Apostolakis.
- Scope:
 - To process multiple events simultaneously \otimes process multiple modules (gen., sim./G4, trg., reco., ana.) for same event simultaneously
 - Geant4 = one of the modules
 - Framework controls modules execution
 - Geant4 to be controlled with proper messages
 - “Threading Building Blocks” (Intel[®] TBB) task model adopted and used as:
 - Single threaded initialization, for modules to setup
 - among-event shared data structures (e.g. physics, geometry)
 - one dedicated data structure / event
 - Process N events simultaneously \leq M threads, N and M told to the application
 - Processing one event:
 - Module called from a `tbb::task`
 - Module to access : the event, the shared data structure, the dedicated data structure of this event
 - Module is also allowed to create its own TBB tasks
 - » Module must wait for all of its TBB tasks to complete before returning
- Status:
 - Proper functioning of MT prototype within a TBB-based application has been verified.
 - Communication kept ongoing.
 - **Open.**

RECENTLY CLOSED REQUIREMENTS

2901: Lateral displacement in large volume

- Originator: G. Corti (LHCb)
- Issue
 - Bad correlation between displacement and angular deviation when delta rays are turned off (in large volume)
 - Due to displacement lost on steps ending on boundary
 - Proposal to use EM-Opt3 incurs too large CPU cost
- Status (Nov 2011)
 - Limitation for MSC in “default” EM-Opt0 with default value = $20 X_0$
 - Seemed to fix the issue for muons (G4 team).
 - Other particles less affected as higher probability to interact.
- Status from March 2012:
 - In 9.5 default muon MSC is WentzelVI model, with intrinsic step limitation $20 * X_0$.
 - LHCb: solution looks general, but applied to muon only ?
- Status from today:
 - **Closed.**

3201: Uniform Signature of Physics Builders

- Originators: (LHCb, Gloria Corti) – Nov. 2011
- Responsible(s) : W. Pokorski
 - In LHCb physics lists built at run time via a templated factory mechanism instantiating the Physics Builders
 - But also wish to configure them at construction time without duplicating instantiation code.
- Request
 - Uniform fixed signature for all physics constructors,
 - As far as the argument types are concerned.
 - e.g. Builder(string, string, int, float, double)
- Status from march 2012:
 - A solution has been proposed (using the constructor with a single string as argument)
 - Solution looks satisfactory to LHCb
- Status from today:
 - closed.