

Update on Requirements

39th Geant4 Technical Forum
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Requirements Tracking System Page:
<https://jira-geant4.kek.jp/secure/Dashboard.jspa?selectPageId=10000>

NEW REQUIREMENTS
FROM LAST TF (JANUARY 2015)

3801 : Physics List option for accurate spin tracking

- Requester : Muon g-2 @ Fermilab
 - Requested at 38th TF
 - Presentation [link](#)
- Responsible:
 - Peter Gumplinger
- Scope:
 - Make spin treatment:
 - radiative muon decays with spin
 - tracking with spin
 - As a physics list option, or equivalent.
- Status:
 - Spin tracking already possible, but is not a matter of physics list, but of field setup in detector construction.
 - Requesters have been informed
 - Radiative muon decays with spin exist
 - Method of activation to be confirmed
 - Verification of test coverage ongoing.
 - **Open**

OPEN REQUIREMENTS

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 and process multiple modules in same event (gen., sim./G4, trg., reco., ana.) 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
- Status:
 - New features of TBB (task_arena and task_observer) will be illustrated in a new example.
 - **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
 - But in presence of an electric field, for example, a stopped charged track maybe accelerated.
- Responsible:
 - Marc Verderi (was 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.~~ Invalid.
 - 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.
- Investigations:
 - Changes to be made in the stepping manager to avoid AtRest track to be always killed identified.
- Status:
 - But important use case of frictional cooling is invalid :
 - frictional cooling does not bring muons at rest -they are absorbed otherwise- !
 - Any stopping of charged particles in matter involves many complications, making reacceleration “tricky”
 - Only the case in vacuum looks doable
 - **Worth to pursue ?**

3502 : Correct Kaon asymmetry in cross-sections

- Requester: LHCb
 - LHCb observes a kaon asymmetry which is too low, specially at high energy.
- Responsible:
 - Witold Pokorski
- Proposed solution:
 - LHCb will measure and provide the correct cross-section asymmetry.
- Last TF:
 - Progress advertised at 2nd LPCC workshop :
 - measurement on-going, to appear in arXiv.
- Status:
 - Feedback from LHCb took some time.
 - And requirement was closed at to some point.
 - Re-open.

3602 : Optimize structure of Geant4 libraries

- Originator: CMS
- Issue:
 - Current Geant4 consists of 23 shared libraries of different sizes
 - Process library is 10 times larger than any other library
- Request:
 - To consider alternatives and evaluate their performances:
 - Split process library in several pieces
- Responsible :
 - Physics groups (for specifying meaningful granularity) and Ben Morgan
- Status:
 - Quite a big task, still on going.
 - Open.

3701 : Use of Geant4e in track fitting

- Originator: CMS
- Issue:
 - Geant4e is being used by CMS for track fitting:
 - With a forward propagation phase, called “fitter”
 - Followed by a backward propagation, called “smoother”
 - Backward tracking requires the momentum to be flipped, changing the error matrix accordingly
- Request:
 - Improve documentation addressing the case of Kalman fitter scenario (forward & backward) propagation.
 - An automated mode to perform backward propagations in Geant4e:
 - Flip momentum
 - Take care of the error matrix transformation
 - Take care of the error handling
- Responsible:
 - Pedro Arce
- Status:
 - Some related fixes have been provided.
 - Pedro started to work on the functionality itself, in communication with CMS.
 - **Open.**

RECENTLY CLOSED REQUIREMENTS

Opening hadronic parameters to users

- Request by MINERvA to have some hadronic parameters to be accessible to users for systematic uncertainty studies.
- Presented by Alberto Ribon at last TF:
 - <https://indico.cern.ch/event/355250/session/1/contribution/9/material/slides/0.pdf>

REQUIREMENT SOURCES

Requirements collected at TFs

Requirement Sources (in JIRA system)

