

Update on Requirements

43rd Geant4 Technical Forum
May 3rd 2016
HSF meeting @ LAL

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On behalf of the Geant4 Collaboration

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

Outline

- ⦿ What this presentation is about
- ⦿ Requirements:
 - > Classical presentation:
 - New requirements
 - Open requirements
 - Recently closed requirements
 - > Today : only “Open requirements”
 - As new and closed requirements are empty.

What this presentation is about ?

- Geant4 maintains communication with users through various channels :
 - > e-mails, hypernews, tutorials, etc.
 - > And technical forum meetings
 - Gather users and developers
 - All these channels are ways to clarify aspects, report bugs or collect “requirements”
 - > Requirements are functionalities desired or needed by users.
 - > The technical forum is the most efficient channel in terms of producing requirements
 - Users’ requirements expressed are:
 1. Analyzed
 - Sometimes reformulated (for more generality) , rarely appear invalid
 2. Considered from resources point of view
 - In most cases, requirements can be served simply
 - In some other cases, they require long term efforts
 - Some valid requirement may also not be served, because of lack of resources
 3. Served
 - With feedback requested
 - Captured requirements are documented in JIRA
 - > To provide information on the requirement and related development, status.
 - This presentation exposes the status of open requirements.
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JIRA requirements tracking page

Introduction
Geant4 Requirements Tracker

Welcome to the Geant4 Requirements Tracking System. With this system, you may follow the progress of development on each individual requirement.

Geant4 collaboration then evaluates the feasibility and required resource for each of these requirements and lists accepted requirements on this tracking system.

Filter Results: In Progress

Assignee	Created	Key	Labels	Summary	Status
Andrea Dotti	21/Jan/16	UR-30	4003	Validation of new versions of Geant4	IN PROGRESS
Makoto Asai	06/Dec/12	UR-12	3301	Multithreading processing driven by experiment framework	IN PROGRESS

Filter Results: Open

Assignee	Created	Key	Labels	Summary	Status
Alberto Ribon	21/Jan/16	UR-32	4005	Neutron production in muon showers at the %-level	OPEN
Dennis Herbert Wright	21/Jan/16	UR-31	4004	Treatment of gamma cascades after neutron capture (Gd, Xe)	OPEN
Makoto Asai	21/Jan/16	UR-29	4002	Reweightable uncertainties for systematic uncertainties estimation	OPEN
Alberto Ribon	09/Dec/15	UR-28	4001	Anti-proton production from proton beam (Mu2e request)	OPEN
Makoto Asai	02/Jun/15	UR-26	3901	Complete destruction at exit of Geant4 objects	OPEN
Pedro Arce Dubois	10/Oct/14	UR-21	3701	Use of Geant4e in track fitting	OPEN

Filter Results: Closed

Assignee	Created	Key	Labels	Summary	Status	Resolved
Gabriele	02/Jun/15	UR-27	3902	Fatal exception to Warning for C4MultiQuellCenter:EstimateIntersectionPoint()	CLOSED	03/Feb/16

Issue Statistics: User Requirements (Status)

Status	Count	Percentage
OPEN	6	21%
IN PROGRESS	2	7%
CLOSED	20	71%
Total	28	

Issue Statistics: User Requirements (Assignee)

Assignee	Count	Percentage
Alberto Ribon	2	25%
Andrea Dotti	1	13%
Dennis Herbert Wright	1	13%
Makoto Asai	3	38%
Pedro Arce Dubois	1	13%
Total	8	

Filter Results: Assign to Me (UR)
No matching issues found.

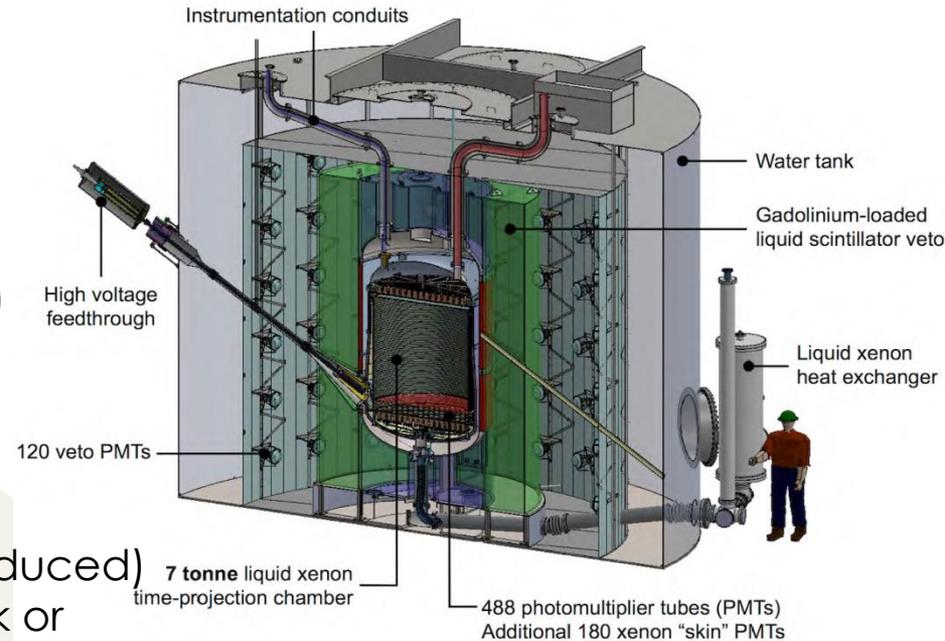
Recent Activity
February 08
Marc Verderi commented on UR-28 - Anti-proton production from proton beam (Mu2e request)

Annotations:
- Red box: TF # where requirement was expressed (points to 4003)
- Green box: Requirement # in that TF (points to 4003)

Open requirements

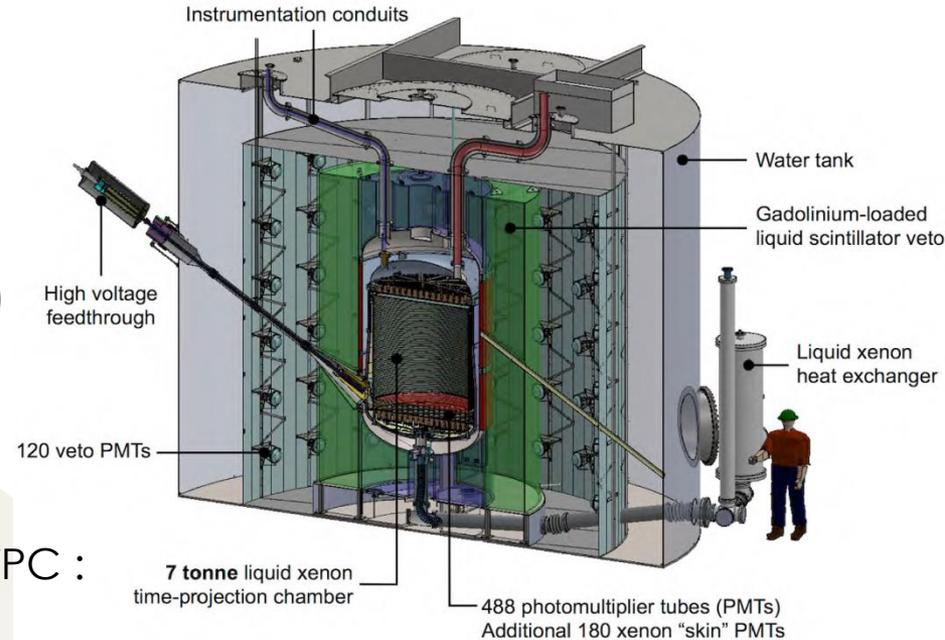
4005 : Neutron production in muon showers at the % -level

- Requester: LUX-ZEPLIN (LZ)
 - > 2nd-generation dark-matter detector
 - WIMPs detection from few GeV/c² to several 100 TeV/c².
 - > Request made at 40th TF @ FNAL ([link](#))
- Responsibles:
 - > Alberto Ribon, Vladimir Ivantchenko
- Scope:
 - > Control of the cosmogenic (muon-induced) neutron production (surrounding rock or detector material) as a background source
 - > Control in the detector calibration through Xe activation
- Status:
 - > Valid requirement, but difficult.
 - > Resources needed to address this problem.
 - > FNAL requested to seek for resources.
 - > **Open.**



4004 : Treatment of gamma cascades after neutron capture (Gd, Xe)

- Requester: LUX-ZEPLIN (LZ)
 - > 2nd-generation dark-matter detector
 - WIMPs detection from few GeV/c² to several 100 TeV/c².
 - > Request made at 40th TF @ FNAL ([link](#))
- Responsibles:
 - > Dennis Wright, Makoto Asai
- Scope:
 - > Gd-loaded liquid scintillator around TPC :
 - Used in veto of background events from PMT themselves
 - that could scatter into detector volume
 - Will be used for detailed understanding of background coming from detector as well
- Status:
 - > Patch 10.2.p01 released on March 2nd should correct.
 - Feed-back from LZ expected.
 - > **Open.**



4003 : Validation of new versions of Geant4

- Requester: Intensity Frontier FNAL experiments

- > Request made at 40th TF @ FNAL ([link](#)) , collecting items from:
 - Muon : g-2, Mu2e
 - Neutrino : DUNE, MicroBooNE, MINERvA, MiniBooNE, NOvA
 - Fixed Target : SeaQuest
 - Test Beam : LArIAT

- Responsible:

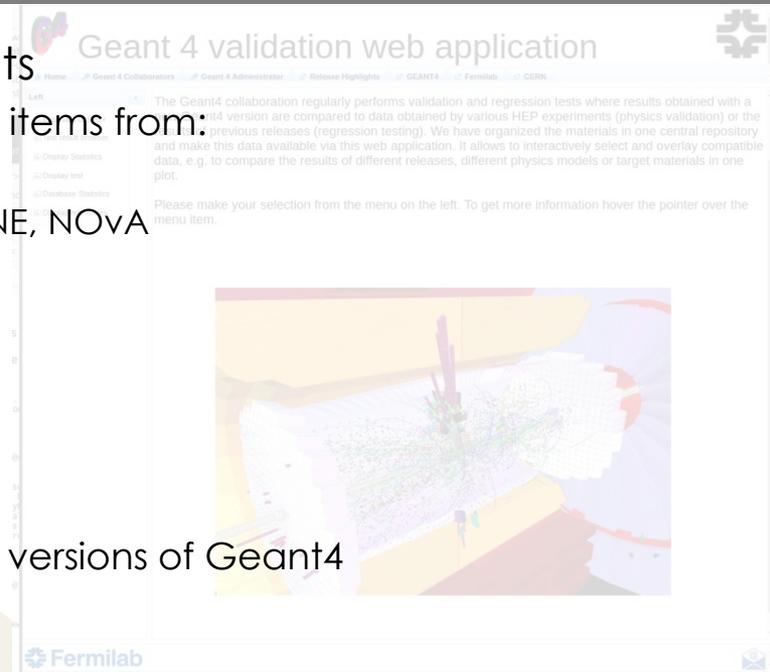
- > Andrea Dotti

- Scope:

- > Tool to understand differences between any two versions of Geant4
 - not just incremental changes of each release

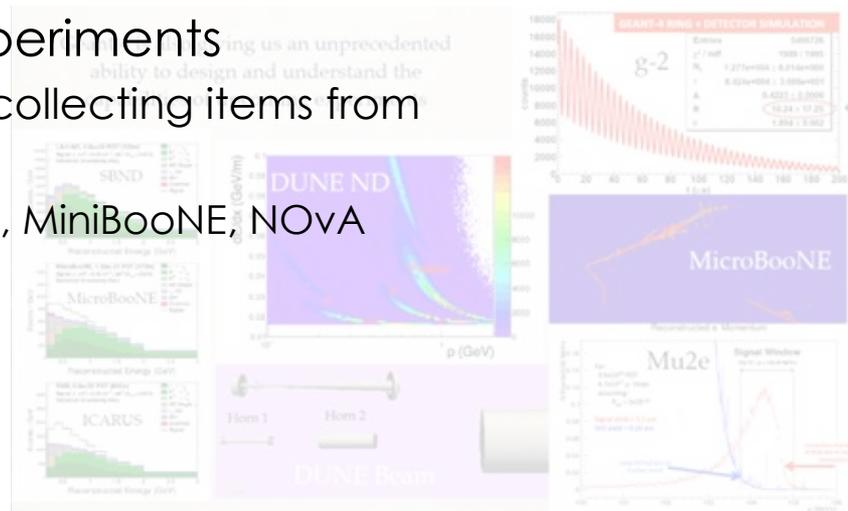
- Status:

- > Reminder : Geant4 validation database and website available at:
 - <http://g4validation.fnal.gov:8080/G4WebAppNG/>
 - Note that a re-design with extension to new data and features is being carried on.
- > First proposal : tool used for regression testing (StatTest) can be provided in a public form
 - Will allow to compare a same plot from an application, using two different versions of G4.
- > Andrea Dotti (SLAC) and Hans Wenzel (FNAL) working on it.
- > **Open.**



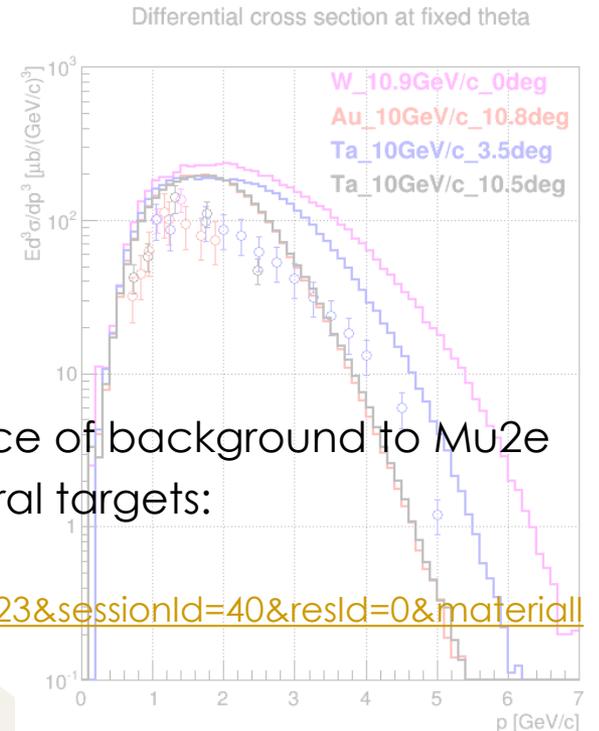
4002 : Reweightable uncertainties for systematic uncertainties estimation

- Requester: Intensity Frontier FNAL experiments
 - Request made at 40th TF @ FNAL ([link](#)) , collecting items from
 - Muon : g-2, Mu2e
 - Neutrino : DUNE, MicroBooNE, MINERvA, MiniBooNE, NOvA
 - Fixed Target : SeaQuest
 - Test Beam : LArIAT
- Responsible:
 - Makoto Asai
- Scope:
 - The technique allows to estimate the effect of model uncertainties on observables with a single MC sample
 - Model uncertainties provided under guidance of experts
 - Suggested from usability of GENIE Neutrino MC Generator
- Status:
 - Very big item, need further discussions.
 - Open.



4001 : Anti-proton production from proton beam

- Requester :
 - > Mu2e
 - > Request made at 40th TF @ FNAL ([link](#))
- Responsible:
 - > Alberto Ribon
- Scope:
 - > Anti-proton production is the third dominant source of background to Mu2e
 - > Discrepancy observed for 10 GeV beam on several targets:
 - see page 18 of:
 - <https://indico.fnal.gov/getFile.py/access?contribId=123&sessionId=40&resId=0&materialId=slides&confId=9717>
 - and validation plots:
 - http://g4validation.fnal.gov:8080/G4WebAppNG/DisplayTest_1.xhtml?selectedTestDescription=47
- Status:
 - > Requested Mu2e to try version 10 (preferably 10.2) to see the improvements.
 - > **Open.**



3901 : Complete destruction of Geant4 objects at exit

- ◉ Originator:
 - > CMS
 - > 39th Technical Forum ([link](#))
- ◉ Scope:
 - > Geant4 utilized in framework
 - But Geant4 leaves undeleted objects after completion.
 - > Clean destruction of G4 objects needed
- ◉ Responsible:
 - > Makoto Asai
- ◉ Status:
 - > Progress made on the strategy to destroy physics objects in MT
 - > **Open.**

3701 : Use of Geant4e in track fitting

- ◉ Originator: CMS (but now general).
- ◉ 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:
 - > Need confirmation for completion.
 - > But CMS has now a working setup.
 - > **Open.**

3602 : Optimize structure of Geant4 libraries

- ◉ Originator: CMS (but now general)
- ◉ 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:
 - > Test implementation started.
 - > **Open.**

3301 : Multithreading processing driven by experiment framework

- ◉ Requester: CMS (but now general)
 - > 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:
 - > Progress expected for 10.3
 - > On CMS side, issues are now resolved.
 - > **Open.**