



Update on Geant4 User Requirements

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Outline

- Introduction: Streamlining of the processing the user requirements
- Requirements resolved recently
- Newly added requirements
- Open requirements lacking people who could work on them
- Summary/Comments

Introduction

- To streamline the processing of Geant4 User Requirements a new subgroup/activity was created

Krzysztof Genser was appointed the leader of this activity. He is helped by experts from specific domains

Domain experts who agreed to help with the validation of the requirements:

Makoto Asai - nuclear physics, space applications

Krzysztof Genser - HEP Intensity Frontier

Susanna Guatelli - Medical Physics

Mike Kelsey - Material Science/Cosmic/Dark Matter Physics

Alberto Ribon - HEP Energy Frontier

Giovanni Santin - Space Physics

A comment on the notation

- In the following pages the following notation is used:

UR-NN sometimes followed by a 4-digit number, e.g., **UR-52 5008**

- The above numbers can be used to lookup the requirements in the Geant4 User Requirements tracker, with the former being the database key e.g.,

<https://jira-geant4.kek.jp/browse/UR-52>

The 4-digit number is a **label**, which can also be used in queries, e.g.,

<https://jira-geant4.kek.jp/browse/UR-52?jql=labels%20%3D%20%225008%22>

Requirements resolved and closed recently

Issue	Labels	Summary	Geant4 release
UR-52	5008	Make EPICS2017 models available in Geant4 (electrons, photons) as an alternative to Livermore	11.1
UR-58	5202	Precision versus speed optimized EM physics simulation configuration for ATLAS; <i>Closed as a requirement but considered a regular support task being actively worked on</i>	~11.0+
UR-70	5503	Improve pbar annihilation process	11.2
UR-73	5701	Ability to define thresholds in energy	11.2
UR-75	5704	Verify HP physics lists wrt Total Ionizing Dose (TID); <i>Done using an extended, hadronic example ParticleFluence</i>	11.1/2
UR-77	5706	Multiscale combination. Mixing condensed-history and Geant4-DNA, e.g. for radioprotection in space	11.2
UR-84	5713	UI to allow user to specify the GDML schema location	11.2

Requirements added recently, including closed ones (1/3)

Issue	Labels	Summary	Status
UR-72	5702	Centralized repository for BSM particles	Open
UR-73	5701	<i>Ability to define thresholds in energy</i>	Closed
UR-74	5703	Support varying of detector geometry in detailed and/or fast simulations in a fast enough way to be used in production jobs	Open
UR-75	5704	<i>Verify HP physics lists wrt Total Ionizing Dose (TID)</i>	Closed
UR-76	5705	Provide (external) files to describe geometries of biomolecules (e.g. plasmids, bacterium & cell genome)	Open
UR-77	5706	<i>Multiscale combination. Mixing condensed-history and Geant4-DNA, e.g. for radioprotection in space</i>	Closed
UR-78	5707	<i>em + hadronic. Provide an example of physics list activating both Geant4-DNA and hadronic physics, including radioactive decay</i>	In Progress
UR-79	5708	Mesoscopic approach development (high dose rates, longer times), including extended example	Open

Requirements added recently, including closed ones (2/3)

Issue	Labels	Summary	Status
UR-80	5709	Isotope production from protons using IAEA medical cross-section	Lack of Resources
UR-81	5710	Add AtRest in Geant4 Generic Biasing framework	Open
UR-82	5711	Geant4-DNA physics processes for positrons	Lack of Resources
UR-83	5712	Webpage, with information about Geant4 for medical applications	Open
<i>UR-84</i>	<i>5713</i>	<i>UI to allow user to specify the GDML schema location</i>	<i>Closed</i>
UR-85	5714	Making MENATE_R package available as an alternative model	Lack of Resources
UR-86	5715	Consider refactoring of G4MTRunManager to allow override some of the functions in the base class	Waiting for a Response
UR-87	5716	Include (currently customised for SuperCDMS) databases for PhotonEvaporation and RadioactiveDecay in the official releases	Lack of Resources

Requirements added recently, including closed ones (3/3)

Issue	Summary	Status
UR-89	Improve Quasi-stable particle Simulation	In Progress
UR-92	Add a way to turn on/off Cherenkov effect per logical volume	Open
UR-93	Add a way to handle particles unknown to Geant4 modeled on G4GenericIon	Open
UR-94	Couple Bearden energy lines with ANSTO fluorescence data libraries	Lack of Resources
UR-95	Provide documentation on how to include and run tests via geant-val	Open
UR-96	Incorporate NuDEX generator into Geant4	Open
UR-97	Remove early/obsolete G4CMP code	In Progress

Open requirements (1/2)

Issue	Labels	Summary	Status
UR-46	5002	Support for "sub-event" parallelism across G4 threads	In Progress
UR-50	5006	Improve simulation of gamma induced neutron background	In Progress
UR-51	5007	Improve electro-nuclear models	In Progress
UR-53	5009	Extend energy and material coverage of G4-DNA beyond DNA and liquid water	In Progress
UR-54	5010	Physics models for ions below 1 MeV/u for Boron Neutron Capture	In Progress
UR-57	5201	To extend "force collision" biasing to charged particles	In Progress
UR-59	5203	Improve the inelastic cross sections of anti_deuteron and anti_He3 at low energies (< 1-2 GeV/c).	Waiting for a Response/Data
UR-64	5303	GIDI - LEND Models : install new GIDI when ready and validate with updated LEND	In Progress
UR-68	5501	Propagation of polarized muons and taus in dense media	Open
UR-72	5702	Centralized repository for BSM particles	Open
UR-74	5703	Support varying of detector geometry in detailed and/or fast simulations in a fast enough way to be used in production jobs	Open
UR-76	5705	Provide (external) files to describe geometries of biomolecules (e.g. plasmids bacterium & cell genome)	Open

Open requirements (2/2)

Issue	Labels	Summary	Status
UR-78	5707	em + hadronic. Provide an example of physics list activating both Geant4-DNA and hadronic physics including radioactive decay	In Progress
UR-79	5708	Mesosopic approach development (high dose rates longer times) including extended example	Open
UR-81	5710	Add AtRest in Geant4 Generic Biasing framework	Open
UR-83	5712	Webpage with information about Geant4 for medical applications	Open
UR-86	5715	Consider refactoring of G4MTRunManager to allow override some of the functions in the base class	Waiting for a Response
UR-89		Improve Quasi-stable particle Simulation	In Progress
UR-92		Add a way to turn on/off Cherenkov effect per logical volume	Open
UR-93		Add a way to handle particles unknown to Geant4 modeled on G4GenericIon	Open
UR-95		Provide documentation on how to include and run tests via geant-val	Open
UR-96		Incorporate NuDEX generator into Geant4	Open
UR-97		Remove early/obsolete G4CMP code	In Progress

Requirements lacking people who could work on them

Issue	Labels	Summary
UR-28	4001	Anti-proton production from proton beam
UR-32	4005	Neutron production in muon showers at the %-level
UR-49	5005	Neutron self-shielding effect
UR-62	5301	Model for positronium creation and annihilation
UR-63	5302	To have an extended example to retrieve directly from the simulation Auger electron energy and associated atomic transition
UR-65	5304	Beta-delayed Neutrons : develop understanding of highly excited level densities in nucleus and model neutron decay from this region
UR-66	5305	Fix overproduction of n and p near endpoints of reactions at 4.5 GeV
UR-69	5502	Ability to turn off intranuclear scattering
UR-71	5504	Excess ratio of pi-/pi+ in p W reaction with Bertini
UR-80	5709	Isotope production from protons using IAEA medical cross-section
UR-82	5711	Geant4-DNA physics processes for positrons
UR-85	5714	Making MENATE_R package available as an alternative model
UR-87	5716	Include (currently customised for SuperCDMS) databases for PhotonEvaporation and RadioactiveDecay in the official releases
UR-94		Couple Bearden energy lines with ANSTO fluorescence data libraries

Summary/Comments

- We have reorganized the user requirement processing
 - Many (23) new requirements were entered into the tracking system since the last TF; We are still processing some requirements voiced in previous years; Thank you for your patience
- Several (7) requirements were resolved over the last year
- Many (23) requirements are open/being worked on
- There are many (14+) [requirements lacking people to work on them](#)

If possible, please consider joining the Geant4 Collaboration either as a contributor or a member to help with the work

Please contact Geant4 Working Group coordinators if you would like to join
https://geant4.web.cern.ch/collaboration/working_groups/

- For the list of all requirements in the tracking system and more details please see the following page:

<https://jira-geant4.kek.jp/projects/UR>