Open requirements –
HEP Intensity and Cosmic Frontier experiments

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Geant4 Collaboration Meeting, Lund, Sweden

August 27-31, 2018

Outline

- Requirements currently in Jira
- Other requirements

Current or recently closed requirements in JIRA

- UR-29 Reweightable uncertainties for systematic uncertainties estimation
  - An ability to vary model parameters (and interaction cross sections), including the reweigthability aspect
  - In progress; Bertini, FTF models being looked at and the impact of parameter variation is being studied; an API is being worked on; See Julia and Robert's talks
- UR-30 Validation of new versions of Geant4
  - An ability to learn what changed between two given versions
  - Closed. The StatTest utility available at: https://github.com/andreadotti/StatTest; DoSSiER: http://g4validation.fnal.gov:8080/DoSSiER/ offers another way of comparing two versions for a given distribution
  - Still hard to get a definite list of changes between two versions though
- UR-31 Treatment of gamma cascades after neutron capture (Gd, Xe)
  - It was thought that the problem was fixed in 10.2.p02
  - Closed as no response from LZ was received, however it was recently noticed by SuperCDMS that the issue is still there, so the requirement should be reopended
- UR-33 Need of correct pion elastic model for T2K
  - The correction is needed for all neutrino oscillation experiments including e.g. DUNE, not only for T2K
  - Cross sections were fixed
  - Closed as currently there is not enough manpower to develop explicit quasi-elastic channel reactions
    - It is on the list of hadronic developments for the future

Other requirements: IF experiments

- NOvA: A need for a modern treatment of Bethe-Bloch density effect (energy loss calculations for materials)
  - see https://bugzilla-geant4.kek.jp/show_bug.cgi?id=1994
    - or https://sft.its.cern.ch/jira/browse/SIM-695
  - Addressed in 10.4

Other Requirements: Dark Matter Experiments

- Simulation of neutron self-shielding effect
  - Neutron flux through a material can be significantly modified when the neutron energy is in the resonance region
  - The capture process can reduce the flux at one position in a crystal creating a kind of shadow in which the downstream atoms see a different background flux (a ~10% effect)
  - No progress due to lack of manpower
- Simulation of gamma induced neutron background
  - Low energy gammas producing neutrons in various materials can be a significant background in dark matter experiments
    - Photo-nuclear process does not model this well below 30 MeV
      - An improved process using the G4LEND gamma models is required
  - No progress due to lack of manpower
- Both requirements should be entered into JIRA

Summary

- Several requirements being worked on, several addressed
- The number of requirements closed due to the lack of manpower is growing