HSF Detector Simulation Working Group
2022 Summary, 2023 plans

https://hepsoftwarefoundation.org/workinggroups/detsim.html

2022 Conveners:
Ben Morgan (ATLAS, Geant4, University of Warwick)
Kevin Pedro (CMS, Fermilab)
Krzysztof Genser (Mu2e, Geant4, Fermilab)

2023 Conveners:
John Chapman (ATLAS, University of Cambridge)
Krzysztof Genser (Mu2e, Geant4, Fermilab)
Sandro Wenzel (ALICE, Geant4, CERN)

19th of January 2023

Summary of 2022 Detector Simulation WG Sessions

- 2022 Sessions in reverse chronological order:
  - see https://indico.cern.ch/category/10916/
  - Studying Geant4 Hadronic Model Parameters
  - Differentiable Simulation
    - Overview of MODE; TomOpt: Differentiable Muon Tomography Optimization; Differentiable simulation for MAGIS
  - FLUKA.CERN Overview
  - Recent developments and experience with DD4hep
  - HSF Detector Simulation on GPU Community Meeting (co-organised together with Geant4 R&D Task Force & HSF Coordinators) https://indico.cern.ch/event/1123314/
  - Fast Calorimeter Simulation Challenge
  - MARS15 Code Overview
  - As in 2021, we tried not to overlap in talks and time with other closely related meetings, e.g., Geant4 meetings and Technical Fora , Compute Accelerator Fora, Software & Computing Round Tables and instead advertised those meetings
- 2021 Summary and 2022 plans from a year ago: https://indico.cern.ch/event/1096580/

Considered 2023 Detector Simulation WG Session Topics (1/2)

- Following up on developments of or in the area of
  - Opticks
  - FLUKA
  - Simulation on GPUs and co-processors in general
  - ML/AI related to simulation (including training on Geant4 samples)
  - Fast Simulation
  - Differentiable simulation
  - Simulation of future experiments (at EIC, FCC, and others)
- Techniques used to optimize geometry
- Optimization of Geant4 cuts and materials as done by experiments
- Simulation of effects like space charge

Considered 2023 Detector Simulation WG Session Topics (2/2)

- Topics overlapping with other working groups:
  - Integration of Geant4 and Event Generators
    - E.g., in the area physics models, processes
      - including exotic physics/particles
    - Sharing experiences of extending Geant4 by experiments
  - Integration of processing frameworks, Geant4 as well as Event Generators
    - Simulation aspects of ACTS (A Common Tracking Software)
  - Integration of Geant4 into Python based frameworks
    - More generally, Python/Julia bindings in simulation packages