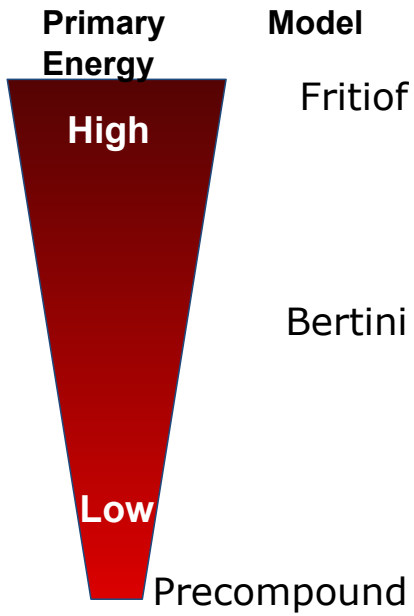
Detector simulations

EIC

- detector (and physics) simulations rely on Geant4
- energy range is different from LHC
- validation, tuning and extension including test beam studies required



- **collaboration with Geant4 Collaboration (liaison: M. Asai)**
  - Makoto Asai, Andrea Dotti, Dennis Wright
- **Geant4 for EIC**
  - Geant4 10.6 recommended (released Dec. 6, 2019)
  - maintain EIC physics list
  - coordinate input for Geant4 validation based on EIC physics list
- **Geant4 Technical Forum at JLAB**
  - knowledge transfer: Geant4 ↔ CLAS12, EIC, GlueX, sPHENIX
  - improved photo-nuclear and electro-nuclear reactions in Geant4
  - fast simulations

Comments on fast simulations by Andrea Dotti

Andrea Dotti on the topic of fast simulation, based on his ATLAS/CERN experience:

- Being able to produce data in the same format from full or fast, so one can reuse exactly the same reconstruction and analysis after simulation is a major benefit. I think this should be one of the top priorities.
- Should an experiment attempt to create a fast simulation simplifying G4 or build a stand-alone independent application? The answer here is less obvious and depends on how fast one wants to go. If you start from G4 and simplify (replacing some physics aspects), this has huge advantages: you can use everywhere the same geometry (very important to reduce debugging and development time); in addition Geant4 already provides sub-systems for fast simulations (targeting calorimeters, based on Gflash), so the development time of a fast simulator can be substantially reduced. Depending on the detector type and physics precision requirements I think it is possible to reach speedups up to x10, maybe even x100 with aggressive strategies. However if one needs more than this a very simple dedicated application with very simplified geometry is needed. This requires writing from scratch and duplication of codes (e.g. specific physics studies, SUSY parameter-space “scans”).