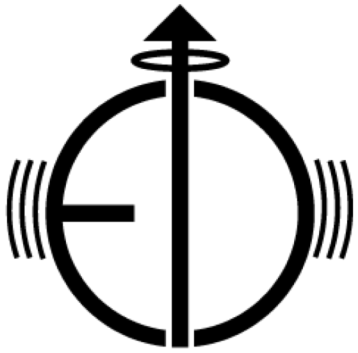


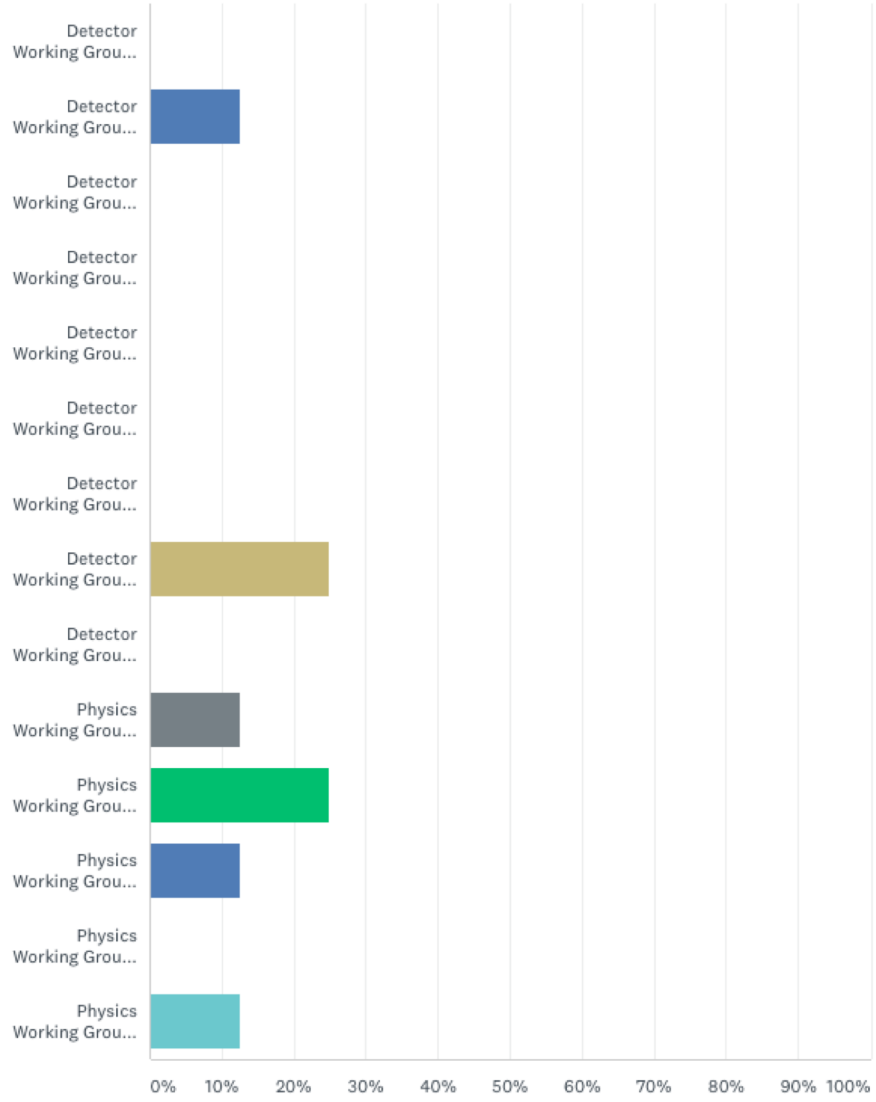
ELECTRON ION COLLIDER USER GROUP

SOFTWARE NEWS

Survey on Simulation Needs

EICUG Software Working Group

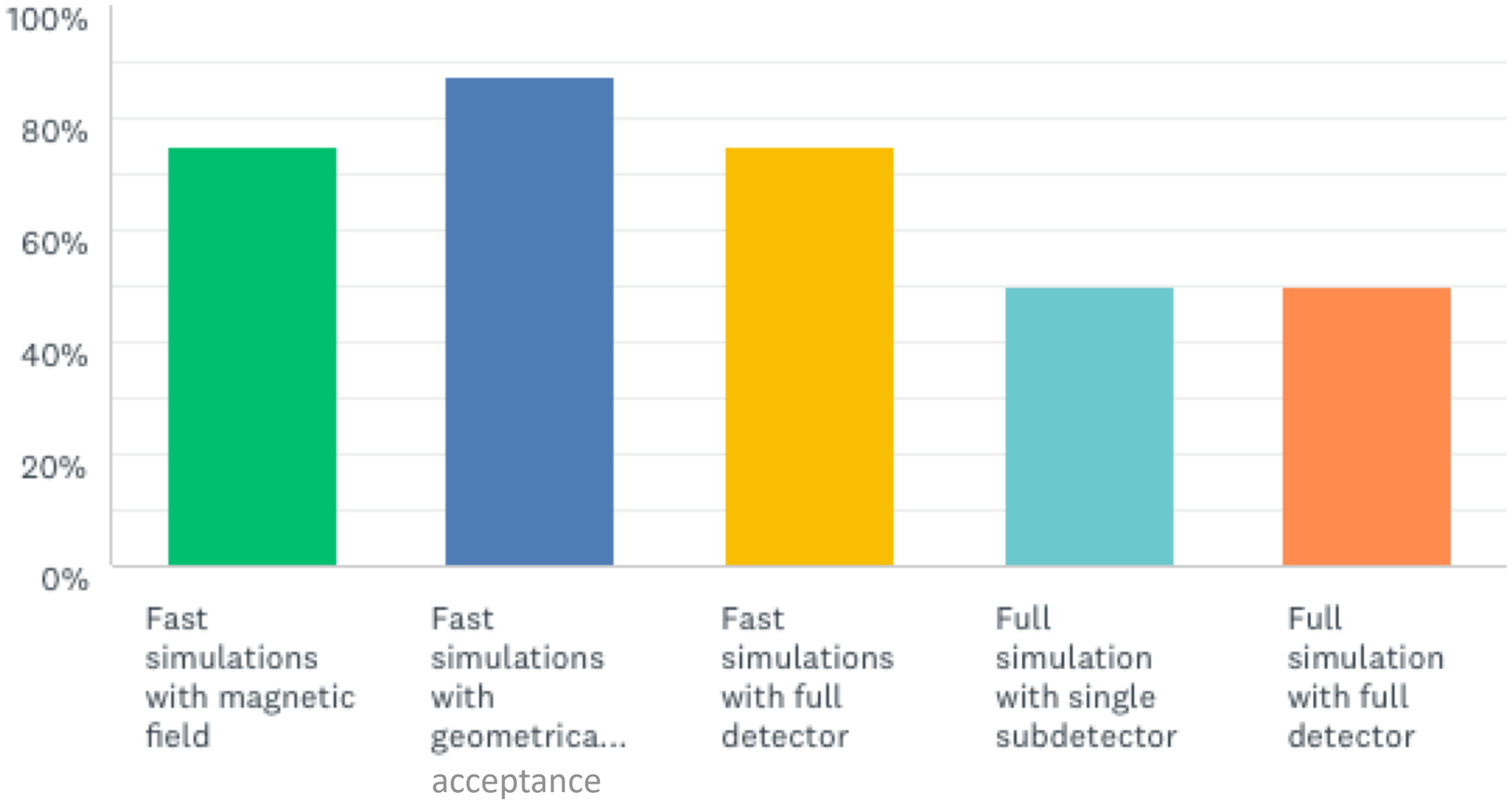
Participation in survey



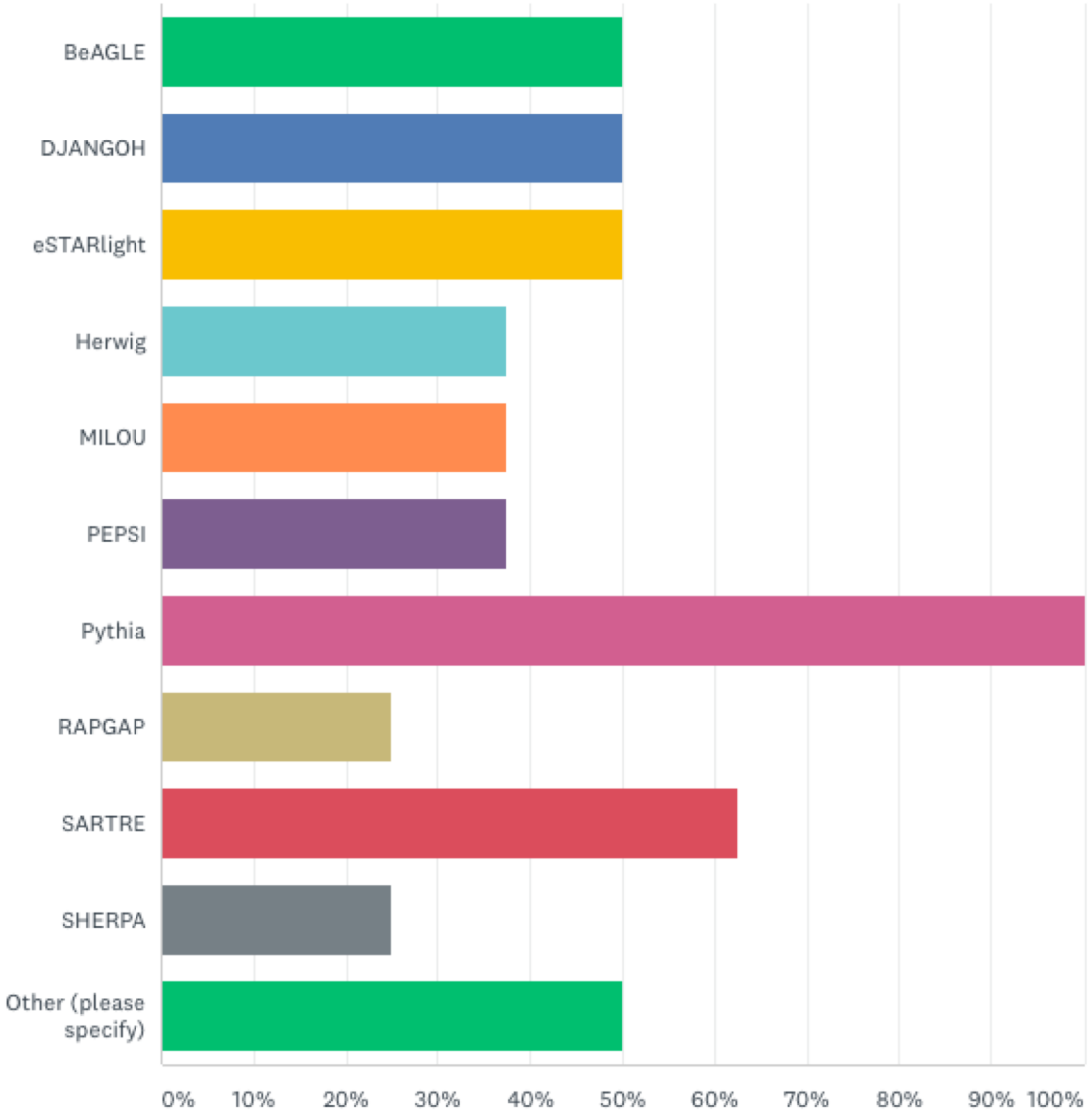
Thank you very much for your help!

Please let us complete the survey.

What type of simulations will you need for your studies?



What Monte Carlo event generators will you need for your studies?

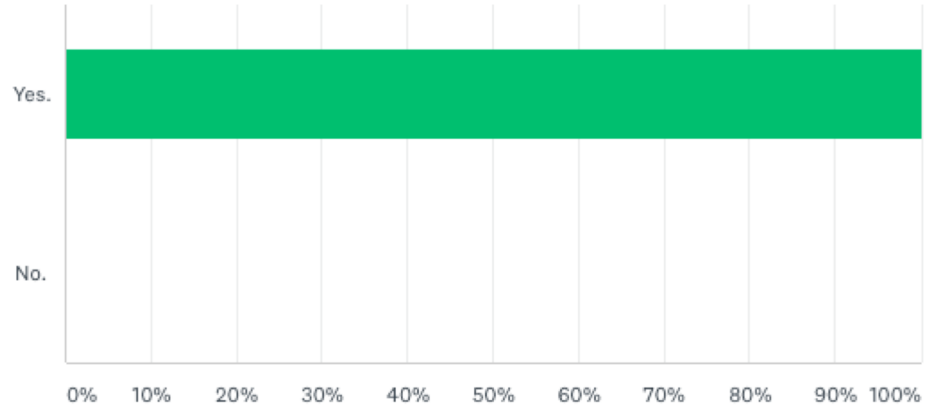


DPMJet

Pythia-6, Pythia-8, POWHEG+Pythia, DPMJet

LightIonEIC, GMPJet, Signal MC generators for spectroscopy processes, Meson structure

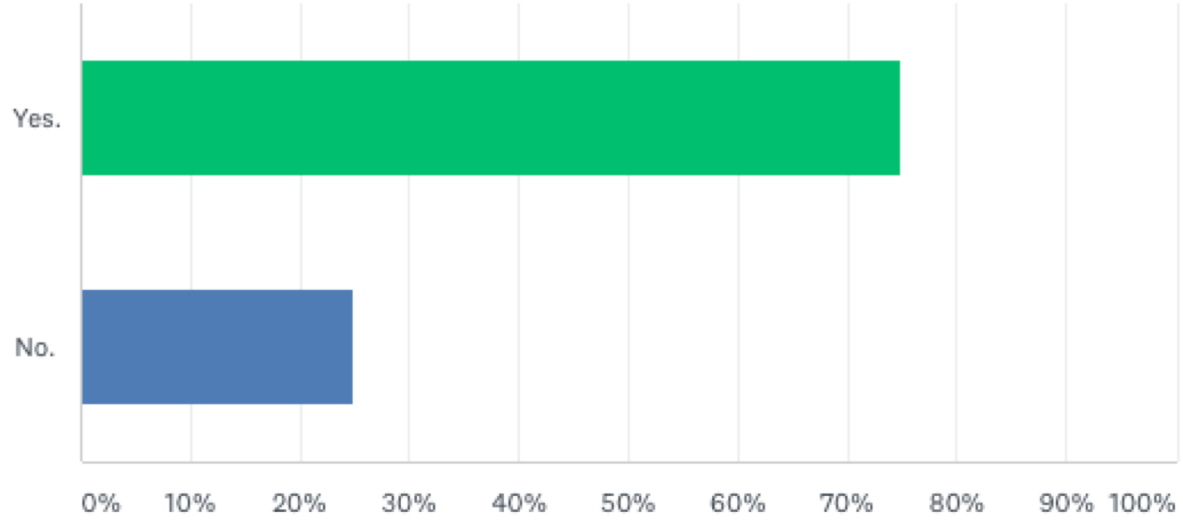
Do you have any special requirements for physics simulations?



Selected answers

- beam gas backgrounds, beam machine backgrounds
- forward kinematics
- need resolutions that depend on eta and momentum
- tracking
- cuts or filtering, e.g. to select high-pT particles/jets.
- e+A
- heavy quark simulations: close(r) integration between tracking and PID
- jet simulations: integration with calorimetry. homogeneous tracking/calorimetry over a wide range for large-radius jets need
- integration needs including supports and services.
- **Benchmark processes** We need to have baseline processes collected into normalized yield as a function of momentum vs eta ranges in a set of kinematic bins so that we can overlay detector performance against requirements.

Do you have any special requirements for detector simulations?



Selected answers

- We need realistic baseline performance implemented in eic-smear for each detector concept, as well as some relevant variations that we should test (e.g. B-field, PID performance, and vertex detector performance).
- lots of various silicon sensors. Silicon detectors.
- Roman pots, ZDC
- low-Q^2 tagger
- The Cherenkov detectors rely heavily on momentum resolution which relies heavily on material budget. This performance can only be known in detail by a full simulation. TOF detectors, by contrast give reasonable estimates of performance even from analytical calculations.

Precision you are aiming for in your studies?

- 100k events per process seems to be enough to set basic requirements for acceptance and resolution. More events really helps populate tails, like the high-t portion of the DVCS cross section for example.
- It is too early for a complete listing of event sample needs, however, needs were identified to simulate e+N and e+A at c.m. energies of 41, 85, and 141 GeV with high-Q2 (5 GeV^2, 10 GeV^2) with a full detector, initially in fast simulations.
- To map out the detector requirements, 1-10 million events will in general be more then sufficient, but this again depends on the details of the reaction being studied.
- We could expect on the order of 100 M Pythia events
- 100k events
- Since the central barrel is assumed +/-4 in eta, and we need to have precision in the tail to determine the 99% acceptance criterion. This turns into a complex request: We need 100,000 hadrons into the eta range of 3.8 to 4.0 in each kinematic bin. This may require different number of events for different processes.

Do you have any specific requests for the Software Working Group?

Common tools

- Jupyter notebook to allow sub-selection of the processes and kinematic limits and reduce the physics inputs into a "most demanding profile”
- use them

MC

- benchmark processes for detector studies
- data repository for MC samples

Fast simulations validate and document smearing parameters and parametrizations

Detector full simulations

- suitable general purpose detector simulation that is reasonably complete, including the latest beam-pipe (IR) and realistic magnetic field map
- likely help be needed with the implementation of silicon-detector concepts

Workflow

- how to agree on smearing parameters and parametrization used in simulations
- how to keep each other posted on simulation work in PWG and DWG
- **version numbers** state which version used in presentations, track changes

Support one-on-one help to get started in addition to extremely nice tutorials