

# High Energy Physics Center for Computational Excellence: CCE Phase 2: FY24 SIM

DOE HEP CCE All-Hands

Dec 18-19 2023

## Two Focus Areas

- Event Generators
- Detector Simulation

We will set up monthly meetings of SIM leadership

- Interest spreadsheet to follow
- Slack channel is in place #sim-wg
- First meeting in January will figure out organization of task
  - Reporting of milestones
  - Dissemination and archiving of results

# Event Generators: FY24 Goals

- Preparation for NLO software portability:
  - Parallel implementation of transcendental functions ( $\text{Li}_n, \dots$ )
    - survey existing solutions if they exist
  - Identification of GPU-friendly alternatives to quadruple precision arithmetic
    - survey existing solutions if they exist
  - Note: Good targets for Summer Student Engagement
- Engaging with OpenLoops:
  - Creation of test cases (simple 2->2 or 2->3 process).
    - used as simple porting standalone examples.
    - Porting these become a proxy for what we need for the full code.
  - Combination with either Sherpa or Pepper framework to test physics performance.
- Continued LO MadGraph Support:
  - Wrapping up LO versions with final physics validation and patches, documentation, etc.

ANL: 0.1 staff FTE + 0.5 post-doc FTE (to be hired in Summer 2024)

FNAL: 0.1 staff FTE + post-doc FTE (TBD)

# Detector Simulation Milestones - FY24

## Optical Photons

1. Implement GPU optical physics models (Nvidia/AMD)
2. Integrate GPU optical photon event loop into Celeritas with verification and baseline performance on (simplified) LZ geometry models

## Geometry

1. Develop GPU-enabled surface-based shape models needed for ATLAS, CMS, and other experimental detector models