



# SciDAC Projects

Marc Paterno  
SCD Projects Meeting  
18 March 2021

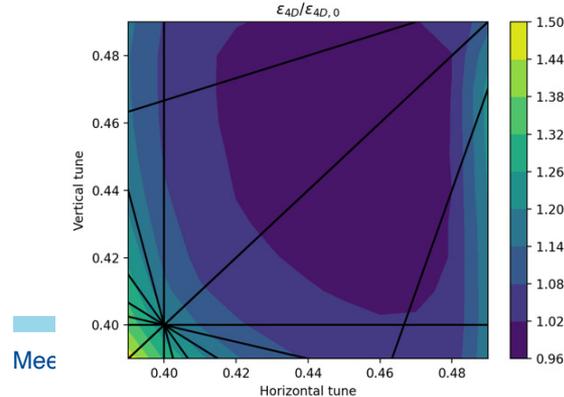
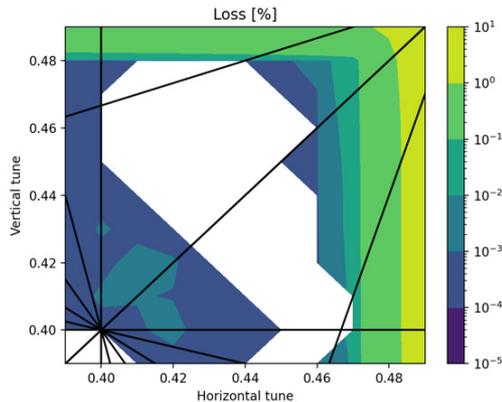
# Scientific Discovery Through Advanced Computing (SciDAC)

- Overall program: <https://www.scidac.gov/>
  - DOE Program managers are Lali Chatterjee and Randall Lavolette
  - Combines ASCR and domain science programs
- Five HEP projects
  - **ComPASS4: Accelerator Science and Simulation** (Jim Amundson)
    - Conventional Beam Dynamics, Plasma-based acceleration
  - Accelerating HEP Science - Inference and Machine Learning at Extreme Scales (Salman Habib)
    - Focus areas: Cosmology, Stats/ML at Scale, Accuracy
    - <https://press3.mcs.anl.gov/cpac/projects/scidac>
  - HEP Data Analytics on HPC (Jim Kowalkowski)
    - Accelerate HEP analysis on HPC platforms with help from ASCR FASTMath and RAPIDS
    - <https://computing.fnal.gov/hep-on-hpc/>
  - **HEP Event Reconstruction with Cutting Edge Computing Architectures** (Giuseppe Cerati)
    - Accelerate HEP event reconstruction using modern parallel architectures
  - Event Generation on HPC (Stefan Hoeche)
    - Short-distance cross section calculations on HPC



# Accelerator Modeling developments

- Joint SciDAC post-doc position shared between EGS and JBK posted: job #4365. Posting closes March 30.
- "E. Stern, Y. Alexahin, A. Burov, V. Shiltsev, Self-consistent PIC Simulations of Ultimate Space Charge Compensation with Electron Lenses" [PUB-21-047-AD-SCD] detailing Synergia simulations run on Cori at NERSC accepted for publication in JINST.
- **Achieving Maintainable Cross-Platform Performance in the Particle-in-Cell Accelerator Modeling Code Synergia using Kokkos** presented at SIAM CSE21 conference. [SLIDES-21-008-SCD]
- First science run of Synergia3 performed by Rob Ainsworth in MI department!



# HEPReco: CMS tracking

- Developments towards deploying mkFit for Run3 offline CMS reconstruction
  - work to enable support for multiple tracking iterations continues
  - ongoing tuning of configuration for first iteration, also starting for other iterations
  - investigating track selection performance: work to understand difference in BDT inputs with respect to default algorithm
- Portability studies
  - accepted for ALCF/NVIDIA hackathon. Plan is to boost implementation of p2r
  - ongoing work to fix some issues common to p2z and p2r and to make benchmark code more realistic

# HEPReco: LArTPC reconstruction

- Compiled spack build of LArSoft + icaruscode updated to use icc and custom compiler options for specific files, enabling vectorization in GausHitFinder algorithm.
- Paper on GausHitFinder in progress; granted approval from relevant collaborations to publish results based on their samples.
- Shared spack recipe with collaborators on icarus workflow project; ongoing developments.

# SciDAC HEP on HPC - ICARUS

- Spack build is working to a large extent thanks to Sophie
  - Build and install complete and executables running on ANL standalone machine (Orcun)
  - Test suite still having trouble because of missing ICARUS-specific configuration files
  - Still building on the new csresearch00 machine (Saba and Marc)
- Need to have a conversation with SCD about streaming data over to ALCF for testing. Is it Andrew and Burt that are working through data movement to ALCF?
- We are defining a workflow with the ANL group. We are working with Wes, Maya, and Giuseppe.