LABORATORY FOR ELEMENTARY-PARTICLE PHYSICS (LEPP)

LEPP Joint Seminar

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LBNL

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401 Physical Sciences Bldg

11am: Preparing ATLAS pixels for the high rate and radiation environment of the HL-LHC

Silicon pixel detectors are at the core of the current and planned upgrade of the ATLAS detector at the Large Hadron Collider (LHC). As the closest detector component to the interaction point, these detectors will be subjected to a significant amount of radiation over their lifetime and must be able to cope with an enormous data rate. I'll pick a few stories to highlight new results on sensor and readout chip radiation damage measurements and simulations as well as studies for optimizing our usage of the limited readout bandwidth. We have an interesting opportunity now to use simulation studies, combined with validation in testbeam and collision data, to make design choices that best utilize our detector for the exciting dataset we will collect at the end of the LHC and at the high-luminosity upgrade. These choices have serious implications for the reach of new physics searches and the precision of future measurements.

2:30pm: Modeling final state radiation on a quantum computer

Particles produced in high energy collisions that are charged under one of the fundamental forces will radiate proportionally to their charge, such as photon radiation from electrons in quantum electrodynamics. Realistic simulations of such collisions in collider- or cosmic-based high energy physics require an accurate model of this final state radiation pattern. When the charge is large, the radiation pattern is a complex, many-body quantum system. Classical Markov Chain Monte Carlo approaches work well to capture many of the salient features of the shower of radiation, but cannot capture all quantum effects. This is particularly true when additionally the gauge group is non-Abelian, as is the case for quantum chromodynamics (QCD). In this talk, I will describe an effort to use inherently quantum algorithms to model generative processes with increasing sophistication (and resemblance to QCD). With future advances in quantum computing hardware, these algorithms may be able to improve precision calculations for high energy physics measurements.

LEPP and CHESS resources have merged and a new lab, (CLASSE), has formed. LEPP's primary source of support is the National Science Foundation. Visit us at www.lepp.cornell.edu