APR21-2021-020065

Abstract for an Invited Paper
for the APR21 Meeting of
the American Physical Society

Summary Basic Research Needs for High Energy Physics Detector Research Development

BONNIE FLEMING, Yale University

Transformative discovery in science is driven by innovation in technology. Our boldest undertakings in particle physics have at their foundation precision instrumentation. Investments in High Energy Physics (HEP) enabled by instrumentation have been richly rewarded with discoveries of the tiny masses of the neutrinos, the origin of mass itself: the enigmatic Higgs boson, and the surprising accelerating expansion of the Universe. What we have learned is remarkable, unexpected, exciting and mysterious; raising many new questions waiting to be answered. The program laid out in the 2014 Particle Physics Projects Prioritization Panel (P5) report Building for Discovery - A Strategic Plan for U.S. Particle Physics in a Global Context guides current and near future experiments to exploit these and other discoveries, and the instrumentation innovation they require, to push the frontiers of science into new territory. To explore this territory HEP will soon embark on planning the next generation of experiments. Realizing these experiments will require giant leaps in capabilities beyond the instrumentation of today. Accordingly, now is a pivotal moment to invest in the accelerated development of cost-effective instrumentation with greatly improved sensitivity and performance that will make measurable the unmeasurable, enabling a tool-driven revolution to open the door to future discoveries. A Basic Research Needs Study for High Energy Physics Detector Research and Instrumentation was held during 2019 and released in August 2020. Historic scientific opportunities await us, enabled by executing the instrumentation research plan that I will outline in this talk.