Going to ArXiv: “Primer on ILC Physics and SiD Software Tools”

Chris Potter

University of Oregon

Primer on ILC Physics and SiD Software Tools

Chris Potter[1,2]

[1]Center for High Energy Physics, University of Oregon
[2]Institute for Fundamental Science, University of Oregon

January 29, 2020

Abstract

We first outline the Standard Model (SM) of particle physics, particle production and decay, and the expected signal and background at a Higgs factory like the International Linear Collider (ILC). We then introduce high energy colliders and collider detectors, and briefly detail the ILC and the Silicon Detector (SiD), one of the two detectors proposed for the ILC. Next we review the available software tools for ILC event generation, SiD detector simulation, and event reconstruction. Finally we suggest open avenues in research for detector optimization and physics analysis. The pedagogical level is suitable for advanced undergraduate and beginning graduate students.

Contents

Acknowledgements

Much of this primer began as lecture notes for the courses *Physics 610: Collider Physics* and *Physics 662: Elementary Particle Phenomenology*, taught at the University of Oregon in Winter and Spring terms in 2018. Thanks to Jim Brau, who generously allowed the author to fill in for him as instructor of record for 610 and 662 while he attended to ILC business, and Ray Frey, then Chair of the UO Physics Department. Brau first taught the author about measuring Higgs boson branching ratios at a future linear collider nearly two decades ago. Thanks also to Marty Breidenbach and Andy White for sharing their wisdom at the SiD Optimization meetings. Breidenbach, who maintains an incomprehensibly large store of experience, worked on deep inelastic scattering at Stanford, SPEAR and SLD and was an early architect of SiD. Thanks finally to Jan Strube and Dan Protopopescu, who have convened the SiD Optimization meetings over the past few years. Protopopescu cowrote and maintains the DD4hep SiD detector description.