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slic: A Geant4-based full detector response simulation program

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As the complexity and resolution of particle detectors increase, the need for detailed simulation of the experimental setup also increases. Designing experiments requires efficient tools to simulate detector response and optimize the cost-benefit ratio for design options. We have developed efficient and flexible tools for detailed physics and detector response simulation which builds on the power of the Geant4 toolkit but frees the end user from any C++ coding. The primary goal has been to develop a software toolkit and computing infrastructure to allow physicists from universities and labs to quickly and easily contribute to detector design without requiring either coding expertise or experience with Geant4.

Geant4 is the de facto high-energy physics standard for simulating

the interaction of particles with fields and materials. However, the end user is required to write their own C++ program, and the learning curve for setting up the detector geometry and defining sensitive elements and readout can be quite daunting. We have developed the Geant4-based detector simulation program, slic, which employs generic IO formats as well as a textual detector description. Extending the pure geometric capabilities of GDML, LCDD enables fields, regions, sensitive detector readout elements, etc. to be fully described at runtime using an xml file. We provide executable programs for Windows, Mac OSX and Linux, allowing physicists to design detectors and study their response within minutes.

We present the architecture as well as the implementation for several candidate ILC detector designs, demonstrating both the flexibility and the power of the system. We then present some examples of the potential of this tool to application domains outside of HEP.

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