

Bridging the Machine Detector Interface

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To make the best possible use of existing and proposed collider experiments, the precise measurement and understanding of machine induced backgrounds as well as forward collision products coupled back into the accelerator is crucial. Conventional detector simulations do not include the whole accelerator with thousands of magnets, nor does the numerical integration used to track through detector magnetic fields accurately represent the passage through an accelerator. We present the methodology for a truly combined detector and accelerator simulation with accurate accelerator tracking and a demonstration using the code BDSIM built on Geant4. Full multi-turn models of the Large Hadron Collider accelerator at CERN with particle matter interaction are presented. Comparison of simulation with measured forward physics debris reaching far throughout the accelerator is shown and the possible application to recently proposed far-forward detectors searching for long lived particles is discussed.

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