Contribution ID: **372** Type: **talk**

Prototyping a coherent framework for full, fast and parameteric detector simulation for the FCC project

Saturday 25 July 2015 10:45 (15 minutes)

The outstanding success of the physics program of the LHC including the discovery of the Higgs boson shifted the focus of part of the high energy physics community onto the planning phase for future collider projects. Hadron based and electron-positron based collider technologies are considered as potential LHC successors. Common to both branches is the need for a coherent software framework in order to carry out simulation studies to establish the potential physics reach or to test different technology approaches.

Detector simulation is a particularly necessary tool needed both for design studies of different detector concepts and to establish the relevant performance parameters. In addition, it allows to provide input for the development of reconstruction algorithms needed to cope with the expected future environments.

We present a coherent framework that combines full, fast and parameteric detector simulation embedded in the Gaudi framework and based on the FCC event data model. The detector description is based on DD4Hep and the different simulation approaches are centrally steered through the Geant4 simulation. A prototype example of a simple tracking detector will be demonstrated for the different simulation approaches and a potential workflow to use full simulation based on Geant4 and fast simulation techniques alongside will be presented.

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Session Classification: Detector R&D and Data Handling

Track Classification: Detector R&D and Data Handling