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Advancements in ACTS: Speed and Adaptability for the Muon Collider

This poster presents two projects aimed at evaluating and adapting A Common Tracking Software (ACTS) for future collider experiments. In the first project, an evaluation of the latest version of ACTS (v32) has been conducted through various performance studies, both with and without Beam Induced Background events. The new ACTS version has demonstrated improvements over the previous version in both timing and efficiency.

The second project focused on transitioning ACTS processors from Marlin to Gaudi to address the need for scalable processing capabilities. This scalability is essential for the future high-luminosity Muon Collider. Unlike the current specialized ILC Software framework in which ACTS runs, Gaudi's design naturally supports parallelization. This parallelization will efficiently handle the abundance of Beam Induced Background (BIB) particles expected at the Muon Collider. Even amidst millions of BIB interactions per event, parallelization within Gaudi will allow for the accurate reconstruction of signal particles. With these changes, ACTS will be able to support future collider experiments at never before seen luminosity levels.

This work aims to address the need to adapt to evolving software frameworks. As Key4HEP continues to develop, transitioning older algorithms from ILCSoft becomes increasingly necessary. Key4HEP offers enhanced multithreading capabilities that optimize resource utilization and will allow advancements in speed and accuracy. By using these advancements, our work aims to facilitate reliable data analysis and pave the way for new discoveries in collider physics.

Primary authors: FERRARO, Samuel (Brown University); GARG, Rocky (Stanford University); PAGAN GRISO, Simone (Lawrence Berkeley National Laboratory); MELONI, Federico (Deutsches Elektronen-Synchrotron DESY); KRIZKA, Karol (Lawrence Berkeley National Laboratory); Mr ANDREETTO, Paolo (INFN PD); BURMASOV, Nazar

Presenters: FERRARO, Samuel (Brown University); GARG, Rocky (Stanford University)

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