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GPU Enhancement of the High Level Trigger to extend the Physics Reach at the LHC

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Significant new challenges are continuously confronting the High Energy Physics (HEP) experiments in particular the Large Hadron Collider (LHC) at CERN who does not only drive forward theoretical, experimental and detector physics but also pushes to limits computing. LHC delivers proton-proton collisions to the detectors at a rate of 40 MHz. This rate must be significantly reduced to comply with the performance limitations of the mass storage hardware, and the capabilities of the computing resources to process the collected data in a timely fashion for physics analysis. At the same time, the physics signals of interest must be retained with high efficiency.

The quest for rare new physics phenomena at the LHC and the flexibility of the HLT allows us to propose a GPU enhancement of the conventional computer farm that provides faster and more efficient events selection at the trigger level.The proposed enhancement is made possible due to rising hybrid systems consisting of processors with multiple cores integrated with Graphics processing units (GPU) as a modified form of stream processor

A new tracking algorithm will be executed on the hybrid computer farm that will permit optimal use of the tracker information to reconstruct not only all the prompt tracks but also tracks not originating from the interaction point. One of its benefit, It will allow for the first time to reconstruct tracks originating from very long lived particles in the tracker system in the trigger system, hence extending the search for new physics at the LHC. Preliminary results will be presented comparing the algorithm performance between Nvidia K20 and Intel xeon-phi chip.

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