Contribution ID: **2**   Type: **Talk**

Discovering matter-antimatter asymmetries with GPUs

Friday, 12 September 2014 10:00 (30 minutes)

The search for matter-antimatter asymmetries requires highest precision analyses and thus very large datasets and intensive computing. This contribution discusses two complementary approaches where GPU systems have been successfully exploited in this area. Both approaches make use of the CUDA Thrust library.

The first approach is a generic search for local asymmetries in phase-space distributions of matter and antimatter particle decays. This powerful analysis method has never been used to date due to its high demand in CPU time. The implementation details on a GPU system, which allowed this method to be used for the first time, as well as its performance including on GPUs on the grid will be discussed in detail.

The second approach uses the GooFit framework, which is a generic fitting framework that exploits massive parallelisation on GPUs. Its performance for the use case of a many-parameter fit to a large dataset is discussed as well as its interface from a user point-of-view.

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Session Classification: GPU in Offline, Montecarlo and Analysis (3/3)