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Performance results of the GeantV prototype with complete EM physics

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Improving the computing performance of particle transport simulation is an important goal to address the challenges of HEP experiments in the coming decades (i.e. HL-LHC), as well as the needs of other fields (i.e. medical imaging and radiotherapy).
The GeantV prototype includes a new transport engine, based on track level parallelization by grouping a large number of tracks in flight into "baskets", with improved use of caches and vectorisation. The main goal is to investigate what performance increase this new approach can deliver compared to the performance of the Geant4 toolkit.
We have implemented a prototype of the transport engine and auxiliary components, including a work scheduler, vectorized code for geometry, transport and magnetic field handling, as well as a complete set of vectorized electromagnetic physics models compatible with a recent Geant4 version. Based on this prototype, computing performance benchmarking and software optimization will allow us to determine the performance gains achievable in realistic conditions.
An analysis of the current performance results will be presented, both for a complete LHC detector and a simplified sampling calorimeter setup. The individual sources of the observed performance gain will be discussed together with the experienced limitations, and an estimate of the final performance will be given.

Author: GHEATA, Andrei (CERN)

Presenter: GHEATA, Andrei (CERN)

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