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Optimizing the ATLAS Geant4 detector simulation

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The ATLAS experiment at the LHC heavily depends on simulated event samples produced by a full Geant4 detector simulation. This Monte Carlo (MC) simulation based on Geant4 was a major consumer of computing resources during the 2018 data-taking year and is anticipated to remain one of the dominant resource users in the HL-LHC era. ATLAS has continuously been working to improve the computational performance of this simulation for the Run 3 Monte Carlo campaign. This report highlights the recent implementation of Woodcock tracking in the Electromagnetic Endcap Calorimeter and provides an overview of other implemented and upcoming optimizations. These improvements include enhancements to the core Geant4 software, strategic choices in simulation configuration, simplifications in geometry and magnetic field descriptions, and technical refinements in the interface between ATLAS simulation code and Geant4. Overall, these improvements have resulted in a more than 100% increase in throughput compared to the baseline simulation configuration utilized during Run 2.

Significance

References

Experiment context, if any

ATLAS

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