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Allen optimozation

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This thesis presents a set of optimization efforts within the Allen framework at CERN's LHCb experiment, with a specific focus on increasing throughput and obtaining deterministic behaviour on both the CPU and GPU executions. The key area of development are the algorithms working with events containing luminosity data, and their tests. These algorithms were detected to be a bottleneck during the March 2024 run of LHC. These optimizations led to speedups between 8.3x and 29.2x, obtaining a full-sequence throughput gain of up to 14% on GPU, using the same set-up (sequence and data) with which the issue was first found. Other areas of investigation include the study of the reduction of monitoring overhead and the stability of the CI/CD pipeline tests

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