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Tracking for the Mu3e experiment

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The Mu3e experiment is designed to search for the lepton flavour violating decay $\mu^+ \rightarrow e^+e^-e^+$. The first phase of the experiment will Scherrer Institute providing 10^8 muons per second, allowing to reach the sensitivity of 10^{-15}. The muons are stopped and decay at rest on a target that is placed inside two double layers of $\SI{50}{\micro\m}$ thin pixel sensors. Timing information is provided by three layers of scintillating fibres, placed just before the outer double layers, and a scintillating tile detector. The detector geometry allows to record additional hits when particles bend back in the magnetic field which allows to improve momentum resolution. To cope with the high event rate and occupancy it is necessary to have a fast and efficient track reconstruction. The track reconstruction uses a novel fit algorithm that only takes into account the multiple scattering allowing fast online reconstruction on a graphics processor (GPU) based filter farm. The details of the multiple scattering fit and the algorithms for online and offline reconstruction are discussed. The performance of the tracking and time reconstruction, using the fibre and tile detectors, is presented.

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