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Implementing Tracking with the ATLAS Diamond Beam Monitor

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The Diamond Beam Monitor (DBM) recently installed in ATLAS is the largest diamond pixel tracking detector ever deployed in the realm of high-energy particle physics. The DBM is designed for three main purposes: making high-precision luminosity measurements that will be essential for obtaining precision cross-section results, providing spatial information about background sources to help characterize beam backgrounds, and providing bunch-by-bunch beam spot monitoring. The highly spatially-segmented structure of the DBM will ensure it never saturates, even when the upgraded LHC achieves more interactions per bunch crossing than ever before, and the material properties of the chemical vapour deposition diamond will allow it to perform in the demanding radiation environment near the interaction point. In order for the DBM to fulfill its full potential as a tracking device, distinguishing particle trajectories from beam halo and reliably monitoring backgrounds, specially-designed tracking algorithms are required. This DBM tracking will have to run "standalone", based only on DBM hits, separately from the standard track reconstructions performed in the rest of ATLAS. The architecture and positioning of the DBM – namely, four 3-module telescopes on each side of the interaction point, outside the η acceptance of the main ATLAS tracker – pose several particular challenges for tracking algorithms. The small magnetic field integral over each telescope, which entails poor pT resolution, argues for a "straight-line-based"tracking framework, rather than the usual paradigm for constructing helical tracks. I will present preliminary results, including impact parameter resolution and ability to resolve multiple tracks in a single event, from the DBM tracking endeavour.

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