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## Reconstruction of displaced vertices at ATLAS

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Most searches for physics beyond the Standard Model at ATLAS study prompt signatures where particle tracks are associated to the primary interaction vertex. Since these searches have not found any evidence of new physics yet, it becomes more and more important to consider long-lived signatures that are much harder to probe. The reconstruction algorithms commonly used at ATLAS are highly optimized for prompt signatures and have low efficiencies for long-lived particles. To retain high efficiencies for tracks with large impact parameters, an additional tracking was developed which runs on detector hits not used by the standard tracking. This allows the reconstruction of secondary vertices inside the silicon trackers of ATLAS originating from decays of particles with a lifetime of the order picoseconds to nanoseconds. Hadronic decays with a high track multiplicity are especially challenging since they are often reconstructed as multiple displaced vertices separated in space, each with a low track multiplicity and mass, leading to degraded signal efficiencies. The reconstruction of such decays has been significantly improved recently by introducing a new procedure to merge close-by vertices. Further improvements have been implemented that increase the reconstruction efficiency of displaced vertices near disabled detector modules.

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