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Reconstruction of long-lived particles with the ILD detector at the ILC

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In recent years, long-lived particles (LLPs) have been widely considered in a variety of Beyond the Standard Model (BSM) scenarios and in many different experimental searches for new particles. Future e^+e^- colliders, thanks to their clean environment and triggerless operation, offer a unique opportunity to search for such states at sub-TeV energies. Considered in this contribution are promising prospects for LLP searches offered by the International Large Detector (ILD) at the International Linear Collider (ILC), with a Time Projection Chamber (TPC) as the core of its tracking systems, providing almost continuous tracking.

Based on the full detector simulation, we study the possibility of reconstructing decays of heavy LLP at the ILD. We consider a challenging scenario with low mass splitting between LLP and the dark matter candidate, resulting in only a very soft displaced track pair in the final state, not pointing to the interaction point. We consider the soft beam-induced background (from measurable e^+e^- pairs and $\gamma\gamma \rightarrow$ hadrons processes), expected to give the dominant background contribution due to a very high cross section, and show the possible means of its reduction. We also present corresponding results for an alternative ILD design, where the TPC is replaced by a silicon tracker modified from the design presented for the Compact Linear Collider detector (CLICdet).

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