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An Auxiliary ATLAS Detector to Enhance the Detection of Long Lived Particles

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Several models that provide solutions to the Standard Model's open problems allow for the possibility of long lived particles (LLPs) with lifetimes, in some cases, in excess of 10^3 seconds. It is proposed that charged LLPs produced at the Large Hadron Collider could interact with the ATLAS detector, eventually coming to rest and decaying. Other LLPs, such as neutral particles, may also exit ATLAS and decay in flight just outside the detector. We propose a low cost scintillating detector to be placed above the ATLAS detector to measure LLP signals as they decay within ATLAS during technical stops and other "beam off"times, thus minimizing Standard Model background. The same detector would provide a decay volume outside of ATLAS to detect LLP decays in flight during normal operation. To illustrate the efficacy of the proposed detector we simulate the production, interaction, and decay of long lived particles within select models.

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