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Search for long-lived charged particles using large specific ionisation and time-of-flight in 140 fb-1 of pp collisions at sqrt(s) = 13 TeV with the ATLAS detector

Particles with lifetimes exceeding a few ns arise in a broad spectrum of beyond-Standard Model scenarios. This poster presents a search for massive, charged, long-lived particles exploiting 140 fb−1 of pp collision data collected by the ATLAS experiment between the years 2015-2018. Since these particles are expected to move significantly slower than the speed of light, they leave anomalously large ionisation losses in the pixel detector. The measured ionisation is used to reconstruct the particle's mass. A complementary mass determination is provided by a time-of-flight measurement with the hadronic calorimeter. Two search strategies are employed. One targets single long-lived charged particles with large transverse momentum, large specific ionisation loss in the pixel detector and the time of flight measured with the hadronic calorimeter inconsistent with the speed of light. The second strategy is optimized for pair-produced, charged long-lived particles with large transverse momenta and large specific ionisation losses in the pixel detector. This analysis is sensitive to particle masses ranging from 200 GeV to 3 TeV and lifetimes greater than about 3 ns. The results are interpreted in the context of slepton, chargino and gluino models, and the resulting production cross-section limits are the most stringent to date for detector-unstable charged long-lived particles with lifetimes exceeding 3 ns.

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