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Search for massive, long-lived charged particles with large specific ionisation and low- β in 140 fb^{-1} of pp collisions at $\sqrt{s} = 13\text{ TeV}$ using the ATLAS experiment

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This paper presents a search for massive, charged, long-lived particles with the ATLAS detector at the Large Hadron Collider using an integrated luminosity of 140 fb^{-1} of proton-proton collisions at $\sqrt{s} = 13\text{ TeV}$. These particles are expected to move significantly slower than the speed of light. In this paper, two signal regions provide complementary sensitivity. In one region, events are selected with at least one charged-particle track with high transverse momentum, large specific ionisation measured in the pixel detector, and time of flight to the hadronic calorimeter inconsistent with the speed of light. In the other region, events are selected with at least two tracks of opposite charge which both have a high transverse momentum and an anomalously large specific ionisation. The search is sensitive to particles with lifetimes greater than about 3 ns with masses ranging from 200 GeV to 3 TeV. The results are interpreted to set constraints on the supersymmetric pair production of long-lived R-hadrons, charginos and staus, with mass limits extending beyond those from previous searches in broad ranges of lifetime.

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