

Search for long-lived particles in events with a displaced vertex using the ATLAS detector with the full Run2 dataset



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1. Abstract

A large number of physics models that extend the Standard Model predict the existence of new, massive, long-lived particles. Searches for these processes may target its decay products at a significant distance from the collision point. This signature provides interesting technical challenges due to their special reconstruction requirements as well as their unusual backgrounds. This poster will present recent results in long-lived SUSY searches using a displaced vertex in the Inner Detector in association to jets with the ATLAS full Run 2 data.

2. Analysis target	3. Special reconstruction	large recover reconstruction
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	Large radius tracking Standard Large radius R [mm] tracking tracking Silicon strip detector	$ \begin{array}{c} 1.2\\ 1.2\\ ATLAS Simulation Preliminary\\ Strong RPV \tilde{\chi}_{1}^{0}: m(\tilde{g}) = 1800 GeV, m(\tilde{\chi}_{1}^{0}) = 850 GeV, τ = 1 ns$



Both of Signal Regions (SRs) require at least 1DV passing the DV selection

Final DV selection: $m_{\rm DV} > 10 {\rm ~GeV}, N_{\rm trk} \geq 5$

Baseline DV selection:



Accidental

crossings

Estimate all backgrounds inclusively assuming:

correlated

6. Results No significant excess → Set limits at 95% CL 7. Summary

Hadronic

interactions



Merged

vertices

Search for long-lived electrowikinos with DV in the multijets events using new special reconstruction algorithms and background estimation method. The results are interpreted in RPV SUSY model. At 95% CL, $m(\tilde{\chi}_1^0)$ values up to 1.58 TeV for $\tau = 0.1$ ns are excluded, and the limit surpasses 1.5 TeV for all lifetimes in the range from 0.03 ns to 1 ns.

 $m_{DV} > 3 \text{ GeV}, N_{HL} > 2$

f e⁄

actio

0.2

correlated

0.4 More track jets

^{0.3} More SR-like DV

References:

"Search for long-lived, massive particles in events with displaced vertices and multiple jets in $\sqrt{s}=13$ TeV pp collisions with the ATLAS detector", ATLAS-CONF-2022-054, The **ATLAS** Collaboration



≥ 8

Number of track jets in event