

# DPF-PHENO 2024

Contribution ID: 532

Type: **not specified**

## Search for displaced vertices of oppositely charged leptons from decays of long-lived particles in $p p$ collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector

*Thursday 16 May 2024 14:30 (15 minutes)*

A search for long-lived particles decaying into an oppositely charged lepton pair,  $mumu$ ,  $ee$ ,  $emu$ , is presented with a requirement that candidate leptons form a vertex within the inner tracking volume of ATLAS, displaced from the primary  $pp$  interaction region. The analysis uses the  $140 \text{ fb}^{-1}$  of Run II data collected at 13 TeV by the ATLAS Experiment in 2015-2018. The results of the analysis are interpreted in the context of two models, together producing generic detection efficiencies for resonances with decay lengths ( $c\tau$ ) of 10-1000 mm decaying into a dilepton pair with masses between 0.1-2.2 TeV. The first model is a generic pair-produced  $Z'$  from a new heavy scalar ( $S$ ) with the  $Z'$  decaying to lepton pairs or pairs of fermionic dark matter. The second is an R-parity violating supersymmetric model in which the lightest neutralino decays into  $\ell+\ell'-\nu$  ( $\ell, \ell' = e, \mu$ ) with a finite lifetime. The neutralinos can be produced via the decay of pairs of gluinos or a variety of electroweak modes with heavier neutralinos and/or charginos.

### Mini Symposia (Invited Talks Only)

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**Session Classification:** Physics Beyond the Standard Model

**Track Classification:** Other BSM