Contribution ID: **65**   Type: **Poster**

Search for long-lived heavy neutral leptons using a displaced jet tagger

Thursday 1 February 2024 15:35 (5 minutes)

A search for long-lived heavy neutral leptons (HNLs) is presented, which considers the hadronic final state and coupling scenarios involving all three lepton generations in the 2-20 GeV HNL mass range for the first time. A central feature of the analysis is a novel jet tagger, based on a deep neural network (DNN), that has been developed to identify displaced jets from an HNL decay using various features of the jet and its constituent particles without explicitly requiring the reconstruction of displaced vertices. The DNN uses a domain adaptation technique to ensure accurate performance of the resulting classifier in data. A broad range of HNL lifetimes are probed by parametrizing the DNN as a function of the HNL displacement in the laboratory frame. Contributions from background processes are determined from data. No excess of events in data over the expected background is observed. Upper limits on the HNL production cross section are derived as functions of the HNL mass and the three coupling strengths to each lepton generation and presented as exclusion limits in the coupling-mass plane, as lower limits on the HNL lifetime, and on the HNL mass.

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No

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Session Classification: Poster Session

Track Classification: 1 ML for object identification and reconstruction