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## Search for a heavy neutral lepton that mixes predominantly with the tau neutrino

*Wednesday, 13 December 2023 18:00 (20 minutes)*

We report a search for a heavy neutral lepton (HNL) that mixes predominantly with  $\nu_\tau$ . The search utilizes data collected with the Belle detector at the KEKB asymmetric energy  $e^+e^-$  collider. The data sample was collected at and just below the center-of-mass energies of the  $Y(4S)$  and  $Y(5S)$  resonances and has an integrated luminosity of  $915 \text{ fb}^{-1}$ , corresponding to  $(836 \pm 12) \times 10^6 e^+e^- \rightarrow \tau^+\tau^-$  events. We search for the production of the HNL (denoted  $N$ ) in the decay  $\tau^- \rightarrow \pi^- N$  followed by its decay via  $N \rightarrow \mu^+\mu^-\nu_\tau$ . The search focuses on the parameter-space region in which the HNL is long-lived so that the  $\mu^+\mu^-$  originate from a common vertex that is significantly displaced from the collision point of the KEKB beams. Consistent with the expected background yield, one event is observed in the data sample after the application of all the event-selection criteria. We report limits on the mixing parameter of the HNL with the  $\tau$  neutrino as a function of the HNL mass.

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