

# T2023

Contribution ID: 22

Type: **Plenary Presentation**

## Searching for Heavy Neutral Leptons using tau decays at BABAR

*Monday, 4 December 2023 14:30 (20 minutes)*

In the past few years there have been new results on the existence of Heavy Neutral Leptons (HNL) in the  $\mathcal{O}(\text{MeV}/c^2\text{-GeV}/c^2)$  mass range, these results are characterised by new and improved limits on the extended Pontecorvo-Maki-Nakagawa-Sakata (PMNS) matrix element,  $|U_{\tau,4}|^2$ , which describes the mixing of some hypothetical HNL and the Standard Model (SM)  $\nu_\tau$  state. This talk presents a model independent search at BABAR for a mostly sterile HNL, capable of mixing with the SM  $\nu_\tau$  neutrino. A total of  $424 \text{ fb}^{-1}$  of BABAR data has been analyzed. No significant signal is seen and 95 % confidence level upper limits are set:  $2.31 \times 10^{-2} < |U_{\tau,4}|^2 < 5.04 \times 10^{-6}$ , with all uncertainties considered, across the mass range  $100 < m_4 < 1300 \text{ MeV}/c^2$ . More stringent limits are placed at higher masses. The novel technique employed uses only kinematic information and makes no assumptions on the model behind the origins of the HNL, its lifetime or decay modes.

### Name of collaboration or list of co-authors

BABAR Collaboration

**Primary author:** MIDDLETON, Sophie (Caltech)

**Presenter:** MIDDLETON, Sophie (Caltech)

**Session Classification:** Monday after lunch