



Contribution ID: 92

Type: **not specified**

## Distinguishing between Dirac and Majorana HNL's at FASER2

Heavy Neutral Leptons (HNLs) are promising extensions of the Standard Model that could explain neutrino masses, baryogenesis, and dark matter. A key question is whether HNLs are Dirac or Majorana particles, with the latter allowing lepton number violation. We investigate the potential of the proposed FASER2 detector, alone and in combination with ATLAS, to distinguish between Dirac and Majorana HNLs in the GeV mass range. Using simulations with FORESEE and HNLCalc, we assess sensitivity to HNL mass, mixing, and lifetime differences. We find that there are regions of un-probed HNL parameter space where FASER2 alone can discriminate between Dirac and Majorana scenarios based on their energy spectra. Furthermore, we demonstrate that FASER2 can act as a viable trigger for ATLAS within the allowed timing constraints. This coordination enables the use of charge information from prompt leptons observed in ATLAS, which significantly enhances model discrimination when combined with FASER2 data.

**Authors:** HEWITT, Alec; LA ROCCO, Daniel; FENG, Jonathan Lee (University of California Irvine (US))

**Presenter:** HEWITT, Alec

**Session Classification:** Non-SUSY extensions of the Standard Model

**Track Classification:** Non-SUSY extensions of the Standard Model