

New Perspectives



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Heavy Neutral Lepton Search at MINERvA

Heavy Neutral Leptons (HNL) are hypothetical particles that, among other things, can explain the origin of the active neutrino masses via a seesaw mechanism. Depending on the seesaw details, they can have masses as low as $\mathcal{O}(100 \text{ MeV}/c^2)$, making them prime targets for searches at accelerator neutrino beams such as at DUNE. The MINERvA neutrino interaction experiment, placed on axis in the NuMI beam immediately upstream of the MINOS near detector, received an exposure of 1.2×10^{21} protons on target, producing an intense neutrino flux with $\langle E_\nu \rangle = 6 \text{ GeV}$. The high exposure and energy of the flux, as well as MINERvA's leading charged-current coherent interaction measurements, make MINERvA an excellent candidate to search for HNL in the region of parameter space currently unexplored by previous searches. The most promising discovery channel is the muon-pion channel at low invariant mass, but prospects remain open for other signatures with significantly less Standard Model background, such as $N \rightarrow \nu\mu\mu$.

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