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Neutrino Masses and Sterile Neutrino Dark Matter from the PeV Scale

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The Higgs boson mass of 125 GeV is suggestive of superpartners at the PeV scale. We show that new physics at this scale can also explain the observed active neutrino masses via a modified, low energy seesaw mechanism and provide a sterile neutrino dark matter candidate with keV-GeV scale mass. These emerge in a straightforward manner if the right-handed neutrinos are charged under a new symmetry broken by a scalar field vacuum expectation value at the PeV scale. The dark matter relic abundance can be obtained through active-sterile oscillation, freeze-in through the decay of the heavy scalar, or freeze-in via non-renormalizable interactions at high temperatures.

Primary authors: SHAKYA, Bibhushan (urn:Google); WELLS, James Daniel (University of Michigan (US)); ROLAND, Samuel (University of Michigan)

Presenter: ROLAND, Samuel (University of Michigan)

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