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Majoron Dark Matter form exact proton stability

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In this talk, we will revisit a class of lepton-flavor non-universal $U(1)$ gauge extensions of the Standard Model that provide a robust mechanism to generate neutrino masses and mixing angles via a high-scale seesaw while ensuring exact proton stability to all orders in the effective field theory. This framework naturally realizes minimal thermal leptogenesis, offering a viable explanation for the observed matter-antimatter asymmetry. A key prediction of this construction is the existence of a light pseudo-Goldstone boson, the majoron. We will explore the potential role of this boson as dark matter and discuss its implications for cosmology and experimental searches.

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