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Visible in the lab and invisible in cosmology: decaying sterile neutrinos

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We explore possible mechanisms of suppressing the production of keV scale sterile neutrinos, which is the target parameter space of several current/upcoming laboratory experiments such as KATRIN, HUNTER or MAGNETO-nu. These alternative scenarios include universes with a nontrivial cosmic lepton number, new neutrino interactions with light bosons, late-time neutrino mass generation, low reheating temperature universes, or phase transitions in the early universe. We analyze which theoretical models could explain the first detected remnant from the untested pre-BBN era in the Universe. Particularly within a low reheating Universe, a dark decay through a Z? or a new scalar, can lead to 3-body or 2-body decay to relativistic particles which doesn't violate any existing cosmological constraints and moreover provides a solution to the Hubble tension.

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