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Search for sterile neutrino with light gauge interactions: recasting collider, beam-dump, and neutrino telescope searches

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We investigate features of the sterile neutrinos in the presence of a light gauge boson X that couples to the neutrino sector. The novel bounds on the active-sterile neutrino mixings $|U_{\ell 4}|^2$, especially for muon and tau flavors ($l = \mu, \tau$), from various collider and fixed target experiments in intensity frontiers are explored. Also, taking into account the additional decay channel of the sterile neutrino into a light gauge boson ($\nu_4 \to \nu_\ell e^+ e^-$), we explore and constrain a parameter space for low energy excess in neutrino oscillation experiments.

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