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MeV gauge boson and secret interaction of sterile neutrinos

Recent results from the neutrino experiments show evidence for light sterile neutrinos which do not have any SM interactions. These light sterile states are disfavored by cosmology due to the constraints from the Big Bang nucleosynthesis and the Large Scale Structure Formation. This tension could be solved if the sterile neutrino states could have interaction with a light gauge boson X with mass M_X (the secret interaction model) with a field strength at least 100-1000 times weaker than the Fermi constant. We show in this paper that such large interaction strength is disfavored from MINOS experiment and we can constrain the mass of the light gauge boson. A tiny region was found compatible with anomalous $g-2$ results, constrains from cosmology and MINOS data with $M_X \sim 10-100$ MeV and $g_x \sim 10^{-3} - 10^{-4}$.

Summary

We work the implications of secret interactions of sterile neutrinos with light gauge boson in neutrino phenomenology and we have found a curious common region for constraints from cosmology, MINOS data and $g-2$ anomalous results.

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