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Can Neutrinos Decay?

Before the establishment of the LMA-MSW solution, Neutrino Decay was studied - both by itself and together with standard flavor oscillations - to explain the difference between the expected Solar Neutrino flux from nuclear fusion processes in the Sun and the detected flux on Earth - the so-called Solar Neutrino Problem (SNP).

In this work, we studied Neutrino Decay as a sub-leading effect in the propagation of Solar Neutrinos and, combining the data from Solar Neutrino experiments with the data from Kamland and Daya Bay experiments, we set a new lower bound to the ν_2 neutrino eigenstate lifetime at $\tau_2 / m_2 \geq 7.7 \times 10^{-4} \text{ s} \cdot \text{eV}^{-1}$, at 99% C.L..

Also, we calculate how seasonal variations in the Solar Neutrino data, which can be enhanced through decay, can give additional information about Neutrino's lifetime. Including in our analysis current data for the seasonal variation of Solar Neutrino flux, it results in a slightly lower value at 99% C.L. for $\tau_2 / m_2 \geq 7.2 \times 10^{-4} \text{ s} \cdot \text{eV}^{-1}$ due to the fact that the current eccentricity measurements and errors will favor lower, already excluded, lifetimes, for which the enhancement in the seasonal variation (and hence measured eccentricity) is higher.

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