Neutrinos, DUNE and the world best bound on CPT invariance

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CPT violating neutrinos

- A violation of CPT invariance could be manifested in different oscillation parameters for neutrinos and antineutrinos.

- We can use oscillation data to compute bounds.

- DUNE could improve some of these bounds by one order of magnitude.

\begin{align*}
|\Delta m_{21}^2 - \Delta \bar{m}_{21}^2| &< 4.7 \times 10^{-5}\text{eV}^2, \\
|\Delta m_{31}^2 - \Delta \bar{m}_{31}^2| &< 3.7 \times 10^{-4}\text{eV}^2, \\
|\sin^2 \theta_{12} - \sin^2 \bar{\theta}_{12}| &< 0.14, \\
|\sin^2 \theta_{13} - \sin^2 \bar{\theta}_{13}| &< 0.03, \\
|\sin^2 \theta_{23} - \sin^2 \bar{\theta}_{23}| &< 0.32.
\end{align*}

CPT violating neutrinos

- If CPT is violated in nature we commit errors in analyzing neutrino and antineutrino data together.
- If the T2K measurements were confirmed by DUNE, we could observe CPT violation with a high confidence level.
- These results could not be explained by NSIs.

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