

## **New physics from oscillations: sensitivity for the DUNE near detector**

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We study the capabilities of the DUNE near detector to probe deviations from unitarity of the leptonic mixing matrix, the 3+1 sterile formalism and Non-Standard Interactions affecting neutrino production and detection. We clarify the relation and possible mappings among the three formalisms at short-baseline experiments, and we add to current analyses in the literature the study of the  $\nu_{\mu} \rightarrow \nu_{\tau}$  appearance channel. We study in detail the impact of spectral uncertainties on the sensitivity to new physics using the DUNE near detector, which has been widely overlooked in the literature. Our analysis show that this plays an important role on the results and, in particular, that it can lead to a strong reduction in the sensitivity to sterile neutrinos from  $\nu_{\mu} \rightarrow \nu_e$  transitions, by more than two orders of magnitude. This stresses the importance of a joint experimental and theoretical effort to improve our understanding of neutrino nucleus cross sections, as well as hadron production uncertainties and beam focusing effects. Nevertheless, even with our conservative and more realistic implementation of systematic uncertainties, we find that an improvement over current bounds in the new physics frameworks considered is generally expected.

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