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Evaluation of the Leggett-Garg inequality by means of the neutrino oscillations observed in reactor and accelerator experiments

The study of neutrino oscillation and its quantumness was studied by means of the Leggett-Garg inequality, which is based on the concept of macrorealism. This research considered the results from the Daya Bay and RENO reactor experiments, as well as the MINOS and NOvA accelerator experiments. It was found that Daya Bay and MINOS exhibit a strong violation of the Leggett-Garg inequality, while the indications from RENO and NOvA data are weaker.

The phenomenon of neutrino oscillation is significant in this context as it allows for the study of quantum phenomena, such as the survival probability of a neutrino flavor, at macroscopic distances. These studies are made possible by the aforementioned experiments.

The results demonstrate that the violation of the Leggett-Garg inequality is more pronounced for a smaller baseline-to-energy ratio in all the data sets considered. This is an important factor to consider when searching for evidence of quantum mechanical decoherence in neutrino oscillations. The findings imply that there is a characteristic value for each neutrino flavor beyond which the inequality is not satisfied.

Primary authors: ZAMORA, Ricardo (Universidad del atlántico); Mr ACERO, Mario A. (Universidad del Atlántico)

Presenter: ZAMORA, Ricardo (Universidad del atlántico)

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