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Revealing violations of macrorealism in flavor oscillations: Leggett-Garg inequalities and no-signaling-in-time conditions

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We consider two necessary and sufficient conditions for macrorealism recently appeared in the literature, known as no-signaling-in-time and arrow-of-time conditions, respectively, and study them in the context of flavor transitions, within both the plane wave description and the wave packet approach. We then compare the outcome of the above investigation with the implication of various formulations of Leggett-Garg inequalities. In particular, we show that the fulfillment of the addressed conditions for macrorealism in flavor oscillations implies the fulfillment of Leggett-Garg inequalities, whereas the converse is not true. Finally, in the framework of wave packet approach, we also prove that, for distances longer than the coherence length, the no-signaling-in-time condition is always violated whilst Leggett-Garg inequalities are not.

Collaboration

Primary authors: ILLUMINATI, Fabrizio (University of Salerno); SIMONOV, Kyrylo (University of Vienna); SMALDONE, Luca (University of Warsaw); PETRUZZIELLO, Luciano (University of Salerno); BLASONE, Massimo (University of Salerno)

Presenter: SIMONOV, Kyrylo (University of Vienna)

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