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CPT violation, entanglement and gravity in particle mixing

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We show that the gravitational interaction among the elements of a mixed particle system leads to the violation of the time-reversal (T) symmetry while the CP symmetry is preserved hence inducing a CPT symmetry violation. This violation is directly associated to the rising of the entanglement among the elements of the system. This many-body effect, which scales with the number of the elements in the system, could have played a relevant role in the generation of the asymmetry between matter and antimatter in the first stages of the Universe. Experiments, based on Rydberg atoms confined in microtraps can simulate the mixing and the mutual interaction, and could allow to test the presented mechanism.

Primary authors: CAPOLUPO, Antonio (University of Salerno); GIAMPAOLO, Salvatore Marco (Institut Ruder Boskovic); SIMONOV, Kyrilo

Presenter: SIMONOV, Kyrilo

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