

# Università degli Studi di Trieste

Dipartimento di Fisica

Seminario

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April 22, 4.00 PM - Lecture room A, F building, Dip. di Fisica - via Valerio, 2 – Trieste

## CPT symmetry, entanglement, and the neutral kaon system



CPT symmetry, i.e. the symmetry under the combination of charge conjugation, parity, and time reversal transformations, experimentally appears to be the only discrete symmetry of Quantum Mechanics respected in Nature. Even though this result has a very solid theoretical foundation in the well-known CPT theorem, tiny CPT violation effects could be justified in the framework of a quantum theory of gravity with

non-trivial space-time topologies, in some cases implying a loss of coherence in single and entangled quantum states. Therefore the discovery of CPT violation would have dramatic consequences on our present theoretical picture and would definitely constitute an unambiguous signal of New Physics beyond the Standard Model, thus strongly motivating both experimental searches and theoretical studies on this subject.

Entangled neutral K mesons produced in phi meson decays constitute a very special quantum system, which demonstrate, in the most impressive manner, a number of spectacular quantum phenomena.

After an introduction to CPT symmetry and the neutral kaon system, the last and more refined experimental tests will be reviewed. So far no deviation from the expectations of CPT symmetry and Quantum Mechanics is observed, while the precision of the measurements, in some cases, reaches the interesting Planck scale region, where CPT violation effects driven by quantum gravity might show up. Finally, prospects for this kind of experimental studies will be presented.



Organizzazione a cura di: Prof. E. Milotti, Dr. E. Vesselli

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**Everyone interested in the topic is welcome to attend**

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