Special Issue on
Perspectives on Decay and Time Evolution of Metastable States: From Particle Physics to Cosmology

CALL FOR PAPERS

Almost all elementary particles interacting by means of strong or weak interactions are unstable. Theoretical studies of survival probabilities of one and many component quantum unstable systems show that subtle effects such as early time or late time deviations from the canonical exponential form of the decay law or oscillatory modulated decay curves at canonical decay times can exist. The still unsolved problems are, for example, whether and how such effects can affect the interpretation of experimental results in which the entanglement of quantum unstable systems or CPT symmetries in such systems are studied or in which the decay law of moving quantum systems is investigated. It also turns out that a better understanding of cosmological processes requires knowledge of the quantum theory of metastable states: the discovery of the Higgs boson at 125 – 126 GeV suggests that electroweak vacuum is unstable. This means that a discussion of Higgs vacuum stability must be considered in a cosmological framework, especially when analyzing the false vacuum state and decaying dark energy, inflationary processes, or the process of tunneling among many vacuum states on a string landscape.

This special issue aims to focus on the main aspects, problems, and solutions of models of quantum unstable systems and model independent results in the widest sense. Particular attention is devoted to analysis of properties of time evolution of quantum unstable systems (at both late and early times including neutral mesons systems, moving quantum unstable systems, and models of decaying dark energy (or running cosmological constant)).

Potential topics are based on involving a large number of frameworks which are able to face the various problems of time evolution of quantum unstable systems at rest and in motion, problems of testing discrete symmetries in neutral meson systems, and especially the problem of decaying dark energy without making use of any ad hoc assumptions. We accept original research results as well as review articles.

Potential topics include but are not limited to the following:

- ▶ Theoretical studies of quantum unstable systems
- ▶ Early and late time properties of unstable systems
- ▶ Quantum unstable systems in motion
- ▶ Quantum unstable systems and entanglement
- ▶ Tunneling as a quantum decay process
- ▶ Parametrization of decaying dark energy models
- ▶ Cosmologies with decaying dark energy

Authors are expected to deposit their manuscript in the arXiv pre-print server prior to submission, under the relevant high energy physics subject area: Experiment (hep-ex), Lattice (hep-lat), Phenomenology (hep-ph), or Theory (hep-th). Articles that are rejected by arXiv for these categories are unlikely to be suitable for the journal.

Authors can submit their manuscripts through the Manuscript Tracking System at https://mts.hindawi.com/submit/journals/ahep/pdte/.

Papers are published upon acceptance, regardless of the Special Issue publication date.

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