Advances in High Energy Physics

Special Issue on

Model-Independent Techniques of Dark Energy Scenarios in Homogeneous and Inhomogeneous Cosmologies

CALL FOR PAPERS

At the end of 90s, observations showed that the universe expands under a phase of positive acceleration. The cosmological concordance model, based on introducing a cosmological constant Λ, is jeopardized by several issues, which do not allow cosmologists to conclude that it represents the final paradigm to explain the observed cosmic speedup. After about 20 years the issues associated with Λ still remain unsolved. As a consequence, several models have been introduced adding a new ingredient, dubbed dark energy, which enters Einstein's equations. Since dark energy's origin has not been yet clarified, reconstructing the universe dynamics by means of model-independent techniques, that is, the ones which do not need to postulate the cosmological model a priori, has reached great consensus. In particular, once framing the universe dynamics in a model-independent way, one infers the corresponding cosmological model with a sort of *back scattering procedure*, in which dark energy's evolution is recovered in terms of either cosmic time or the redshift. Among all, every model-independent approach might be able to compare theoretical expectations directly with cosmic and/or astronomical data. Although appealing, all these schemes are often unable to distinguish with arbitrary accuracy different cosmological models, leading to a severe degeneracy problem, and are therefore still open challenges for present-time cosmology.

This special issue aims to focus on the main aspects, problems, applications, and solutions of model-independent scenarios in the widest sense. Particular attention is devoted to new kinematic aspects of dark energy's equation of state and to model-independent reconstructions of its evolution as the universe expands, that is, at both late and early times. Potential topics are based on involving a large number of frameworks which are able to face the problem of dark energy without making use of any *ad hoc* assumptions. Particularly welcome for the special issue are the investigations of galaxy lensing, cosmography, non-Gaussian methods, statefinder diagnostics, polynomial reconstructions, and so forth. In general, all topics related to theoretical and experimental treatments which face the problem of dark energy by means of model-independent assumptions. Particularly, eventual new approaches based on distinguishing models with different Hubble rate today, that is, H_0, and/or working on the problems of thermodynamics in the framework of homogeneous and inhomogeneous cosmologies are warmly considered, as well as possible solutions to the cosmic degeneracy useful to alleviate the problems afflicting current state of the art of cosmology.

Potential topics include but are not limited to the following:

- Theoretical and observational parameterizations of dark energy models
- Effective dark energy models from extended theories of gravity
- The degeneracy problem of cosmological models
- Unified dark energy and dark matter models
- Cosmography on background and early-cosmologies
- Universe kinematics from space-time symmetries
- Challenges and alternatives to the cosmological concordance paradigm
- Particle cosmology and early time constraints on the CMB measurements
- Thermodynamics and reconstructions of dark energy's equation of state
- Alternative methods of dark energy diagnostics

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