Contribution ID: **253** Contribution code: **S03-GC-107** Type: **Oral presentation**

On some analytical solutions of inflationary models with DBI tachyon field

Thursday, 1 September 2022 15:30 (10 minutes)

Cosmological inflation provides solutions to some problems in standard cosmology. Many different scenarios of inflation have been proposed. The generally accepted and the most commonly used approach is that the inflationary phase can be described by a single scalar field. One of the interesting possible mechanisms for inflation is based on the dynamics driven by the tachyon field θ [1, 2]. The dynamics in this model can be described by an effective Dirac-Born-Infeld (DBI) type Lagrangian. A specific property of different models is determined by choice of the potential associated to the tachyon field, motivated by the string theory.

The usual manner of analyzing inflationary dynamics (in both tachyon and canonical scalar field cases) is based on slow-roll regime/approximation. Although the slow-roll approximation can simplify the system of equations, the numerical procedure is still necessary for finding its solution [3]. Also, the properties and predictions of the model greatly depend on a type of potential.

In this work, we consider some specific criteria which can provide analytical solutions of the dynamical equations. Having in mind that the Hubble parameter (H) is a decreasing function of a tachyon field, we find the analytical solutions of the exact dynamical equations (without slow-roll approximation) for some specific cases ($H(\theta) \propto \theta^{-2}$, $H(\theta) \propto \sin^{-2}\theta$, etc.), which have not been considered so far. In addition, we calculate the Hubble hierarchy slow-roll parameters. In order to compare predictions of the model with observational data we calculate the values of the most important observational parameters for inflation, in the slow-roll regime, i.e. the scalar spectral index (n_{s}) and the tensor to scalar ratio (r). We compare the obtained results with the Planck 2018 data [4]. Parameterization of observational parameters, via the number of e-folds (N), is introduced [5] for some specific cases of $H(\theta)$.

Acknowledgement: The authors acknowledge the grant of the Ministry of Education, Science and Technological Development of Serbia 451-03-68/2022-14/200124 and 451-03-68/2022-14/200113, ICTP-SEENET-NT03 and CEEPUS CIII-RS-1514-02-2122 Gravitation and Cosmology project for carrying out this research.

References

1. D.A. Steer and F. Vernizzi, Phys. Rev.D 70, 043527 (2004).
2. N. Bilic, D. D. Dimitrijevic, G. S. Djordjevic, M. Milosevic and M. Stojanovic, JCAP 08, 034 (2019).
3. M. Milošević, N. Bilić, D.D. Dimitrijević, G.S. Djordjević and M. Stojanović, Numerical Calculation of Hubble Hierarchy Parameters and Observational Parameters of Inflation, AIP Conf. Proc, 2075, 090009 (2019); M. Milosevic, D.D. Dimitrijevic, G.S. Djordjevic and M. Stojanovic, Serbian Astronomical Journal 192, 1–8 (2016).
4. Planck 2018 results - X. Constraints on inflation, A&A 641, A10 (2020).
5. V. Mukhanov, Eur. Phys. J. C. 73 (2013).

Primary authors: STOJANOVIC, Marko (Faculty of Medicine, University of Nis, Serbia); Prof. DJORDJEVIĆ, Goran S. (Faculty of Sciences and Mathematics, University of Niš, Serbia); Dr MILOŠEVIĆ, Milan (Faculty of Sciences and Mathematics, University of Niš, Serbia); Prof. DIMITRIJEVIĆ, Dragoljub D. (Faculty of Sciences and Mathematics, University of Niš, Serbia)

Presenter: STOJANOVIC, Marko (Faculty of Medicine, University of Nis, Serbia)

Session Classification: S03 Gravitation and Cosmology

Track Classification: Scientific Sections: S03 Gravitation and Cosmology