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Accelerated Expansion of the Universe in Terms of the Jordan-Brans-Dicke Theory

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The origin and formation of the Universe is always one of the most discussed and researched topics of all time. It is relevant and several theories have been developed to explain the evolution of the Universe, such as the standard, De Sitter , Alven-Klein and other models. The Big Bang was immediately followed by an inflationary phase lasting 10-34 second, as confirmed by experimentally polarized relict radiation studies, after which the highly accelerated expansion began. Accelerated expansion implies the presence of a "repulsive force", which we call Dark Energy, and it makes up about 70% of the Universe.
Considering this fact, the work considers the scalar field dominating the model of the Universe with the presence of vacuum energy in the "Einsteinian" conception of the Jordan-Brans-Dickey theory. Two problems are studied in the work.
In the first problem, the case with the existence of a non-minimally connected scalar field and a gravitational constant was considered within the framework of the theory of the JBD, which, as a result of conformal transformations, becomes a constant in Einstein's image, which results in acceleration. In the second problem, the theory of JBD was considered in Einstein's framework. The case described by the equation of state of matter P=αE with the presence of a scalar field and a cosmological constant is discussed. whose existence when q=-1/2 leads to Einstein's theory.
The analysis of the reveal that when the contribution of scalar field and its impact of parameter Λ coincide under the condition q =-1/2. They effectively cancel each other, resulting in a theoretical framework consistent with Einstein's theory of gravity. To substantiate these findings, the study conducts numerical computations across an interval of dimensionless coupling constants, enriching our understanding of the behaviors of the models.

1 R. Avagyan, G. Harutyunyan, A. Kotanjyan, N. Saharyan, Dynamics of the Quasi-de Sitter Model of the Early Universe, 2018 Physics of Atomic Nuclei 81(6):894-898, DOI:10.1134/S1063778818060236

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