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Contribution ID: **4580** Type: **Poster not-in-competition (Graduate Student) / Affiche non-compétitive (Étudiant(e) du 2e ou 3e cycle)**

(G) (POS-75) Bouncing cosmology; a solution to the singularity problem and more.

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Finding a complete explanation for cosmological evolution in its very early stages (about 13 billion years ago) "can significantly advance our understanding of physics. Several models have been proposed, with the majority falling into a category called inflationary universes, where the universe experiences rapid exponential expansion. Despite numerous achievements of inflationary models in explaining the origin of the universe, it has been shown that inflationary models generically suffer from being geodesically past incomplete, which is a representation of singularity. Motivated by addressing the singularity problem, we study a recent model of the early universe, called Cuscuton bounce. This model utilizes a theory of modified gravity by the same name, i.e., Cuscuton, which was originally proposed as a dark-energy candidate, to produce a bouncing cosmology as opposed to inflationary ones. It has been shown that within the Cuscuton model, we can have a regular bounce without violation of the null energy condition in the matter sector, which is a common problem in most bouncing-cosmology models. In addition, the perturbations do not show any instabilities, and with the help of a spectator field, can generate a scale-invariant scalar power spectrum. We will then set out to investigate if this model has a strong coupling problem or any distinguishing and detectable signatures for non-Gaussianities. We expand the action to third order and obtain all the interaction terms that can generate non-Gaussianities or potentially lead to a strong coupling problem (breakdown of the perturbation theory). While we do not expect the breakdown of the theory, any distinct and detectable sign of non-Gaussianities would provide an exciting opportunity to test the model with upcoming cosmological observations over the next decade.

Keyword-1

Cosmology

Keyword-2

Early-universe

Keyword-3

Bouncing-cosmology

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