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A Survey on Study of some Creation Field Cosmological Models

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Abstract: *The present paper introduces the work done on the study of creation field Bianchi type cosmological model and their physical and geometrical properties. We have observed that the theoretical cosmological models are constructed using Einstein field equation and different assumptions.*
Keywords: Cosmological Model, Einstein Field Equation, Bianchi type

I. Introduction

From the earliest known periods the Big Bang Model is the pre dominating cosmological model based on the Einstein theory of relativity assuming homogeneity and isotropy of space. Primordial singularity is itself sometimes called as "Big Bang''

Pillars of evidences for observational Big Bang theory are:

- Space itself is expanding which can be explained by cosmological principle.
- CMBR – Cosmic Microwave Background Radiation.
- The abundance of Deuterium and helium (primordial nucleosynthesis)
- Evidences of Evolution.

Earlier prediction of FRW model did not meet the expectation and CMBR model also didn't came out to be the outcome of Big Bang theory. There were some flaws related with the theory which are as follows:

Theory failed to explain the origin of galaxies, Magnetic Monopole problem, Horizon problem, Flatness problem.

The explanation and the result given by Big Bang model were in contrast with the result relating Red shifts from the extra galactic objects. Alternate to the Big Bang model evolution of the universe was Steady State Theory which was given by Hermann Bondi and Thomas Gold. According to this theory appearance of universe is same at any time as well as at any place (perfect cosmological principle).This theory is a view that although universe is expanding but maintaining a constant average density of matter at t=0.It believes that star and galaxies die and reform.

Steady State universe has no beginning and no end in time. This theory was discarded for not giving any physical justification to continuous creation of matter.

To conquer with the above difficulty a field theoretic approach was adopted by Hoyle and Narlikar[1].They introduced a scalar field 'C' in Einstein Hilbert action with zero mass and zero charge to represent the phenomenon of constant creation of matter due to the presence of an appropriate creation field with negative energy. In this theory there is no Big Bang type if singularity as in steady state theory.

Narlikar investigated that matter creation is accomplished at the expense of negative energy massless scalar creation which has solved the particle horizon and flatness problem faced by Big Bang model. The propose research based on the study of special case of C- field theory will be a key to understand the theoretical liveliness and viability of cosmological models.

II. Literature Review

Solutions of Einstein field equation admitting radiation with a negative energy massless scalar field C have been obtained by Narlikar andPadmanabhan [2]. Space time with higher dimensions was carried out by Chatterjee and Banerjee [3]. Bali and Tikekar [4] investigated C-field cosmological model for dust distribution with variable gravitational constant in framework of flat FRW space time. Seema Saraf [5] have investigated C-field cosmological model for dust distribution with bulk viscosity and time dependent cosmological term (Λ) in Bianchi type - I space - time. The C-field increases with time and the model admits the uniform expansion.

Bali and Saraf [6] have investigated c-field cosmological model for barotropic fluid distribution with variable bulk viscosity and vacuum energy (Λ) in FRW model space time. Adhav et.al. [7] have obtained kasner and axially symmetric universes in C- field theory of gravitation. Bali and Kumawat [8] studied C-field cosmological models with variable G in FRW space time. Bali and Kumawat [9] also investigated C-field cosmological model with variable G for barotropic perfect fluid distribution in flat FRW space time to get the

deterministic model of the universe. Singh & Chaubey [10] investigated Bianchi type cosmological models in the C-field theory of gravitation. LRS bianchi type V perfect fluid cosmological model in C-field with variable Λ have been studied by Tyagi and Singh [11].Ghate et.al.[12,13] has studied cosmological models in C-field theory of gravitation with different contexts. Adhav et.al. [14] have investigated LRs bianchi type V universe in C- field cosmology.

A cosmological model in creation field cosmology with varying Λ in the framework of FRW space time was investigated by Bali and Saraf [15]. Time dependent Λ in Bianchi type IX Cosmological model with barotropic perfect fluid in C- field theory have been studied by Parikh et.al. [16].

Ghate and Salve [17] have investigated some dust cosmological models with time dependent Λ in C-field cosmology. C-field cosmology for barotropic fluid distribution with variable bulk viscosity and vacuum energy (Λ) in FRW space-time has been studied by Bali and Saraf [18].

III. Material and Methods

It has been observed that the various cosmological models are constructed using Einstein field equation. Here we can highlight that Einstein field equation is the basic application by which we can frame detailed study of cosmological model. Einstein field equation is defined as:

$$R_{ij} - \frac{1}{2}Rg_{ij} + \Lambda\, g_{ij} = -\frac{8\pi G}{C^4}\left[T_{ij}(m) + T_{ij}(c)\right]$$

Where R_{ij} is the Ricci Tensor, R is the scalar curvature, g_{ij} is fundamental tensor, Λ is cosmological constant, G is Gravitational Constant and$T_{ij}(m)$ is Energy Momentum Tensor. Here$T_{ij}(c)$ is Energy Momentum Tensor of C-field given by

$$T_{ij}(c) = -f\left(C_i C_j - \frac{1}{2} g_{ij} C^k C_k\right) \text{With} f > 0 \text{ and } C_i = \frac{\partial C}{\partial x^i}$$

It will be used to construct various Cosmological Models

IV. Conclusion

We have investigated some cosmological models constructed using modified Einstein field equation and different assumption; we get deterministic solution i.e. we obtain new class of cosmological model for which physical and geometrical properties are studied. Also we observe whether the model approaches to isotropy or in general the model is expanding, shearing and non rotating.

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