

**REPORT ON
SOME ASPECTS OF SPHERICALLY SYMMETRIC
SPACE-TIME IN BIMETRIC RELATIVITY**

U.G.C.SPONCERED

MINOR RESEARCH PROJECT

IN

MATHEMATICS

BY

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“Some Aspects of Spherically Symmetric Space-Time in Bimetric Relativity”

SUMMARY-

This minor research project is devoted to the study of “Some Aspects of Spherically Symmetric Space-Time in Bimetric Relativity”. To remove some of the unsatisfactory physical features, namely, the aspects of singularities of Einstein’s theory of relativity, Rosen has proposed a new theory -Bimetric theory of relativity.

Bimetric Theory of Relativity –

In the frame work of general theory of relativity, Rosen N (1940)[27] has proposed a Bimetric theory of relativity. In this theory two metric tensors are used, a Riemannian metric tensor g_{ij} - describing gravitational field and a flat metric tensor γ_{ij} - describing the inertial forces. The background metric γ_{ij} enters into the field equations and interacts with g_{ij} but does not interact directly with matter.

Accordingly, at each space-time point, one has two line elements

$$ds^2 = g_{ij} dx^i dx^j \quad \text{and}$$

$$d\sigma^2 = \gamma_{ij} dx^i dx^j$$

Where ds is the interval between two neighboring events measured by means of a clock and measuring rod. The interval $d\sigma$ is an abstract or geometrical quantity not directly measurable. One can regard it as describing the geometry that would exist if no matter were present.

Spherical symmetry has its own importance in general relativity by virtue of its comparative simplicity.

A spherically symmetric space time is one whose isometric group contains a subgroup which is isomorphic to the rotation group SO (3) and the orbits of this group are 2-dimensional spheres (2-spheres). In general spherically symmetric metric can be written as

$$g_{\mu\nu} = \begin{pmatrix} \lambda(r) & & & \\ & \frac{1}{\lambda(r)} & & \\ & & -R^2(r) & \\ & & & -R^2(r) \sin^2 \theta \end{pmatrix}$$

And in this case the only non zero components of the Ricci tensor are R_{tt} , R_{rr} , $R_{\theta\theta}$ and $R_{\phi\phi} = R_{\theta\theta} \sin^2 \theta$.

Spherical symmetry is a characteristic feature of many solutions of Einstein's field equations of general relativity, especially the Schwarzschild solution.

As the mathematical problems associated with spherical symmetry are so far being exhausted, we have taken up a project to discuss some aspects of it with various matters in the context of bimetric relativity proposed by Rosen. (Four Research Papers Are Published)

CONCLUSION-

(1)Static Spherically Symmetric Cosmological Space- Time in Bimetric Relativity

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In this research paper -Spherically symmetric static Kantowski-Sachs space –time is studied in the context of Rosen's bimetric relativity with the source of matter perfect fluid and scalar massive meson field respectively. It is observed that Kantowski-Sachs cosmological model representing perfect fluid does not exist where as massive meson scalar field exists when the space time is Spherically symmetric static model and $M \neq 0$. Moreover ,when $M=0$,the scalar meson field reduces to zero mass scalar field.

(2)Spherically Symmetric Domain Wall with Massive Scalar Field in Bimetric Relativity, Archives of Applied Science Research, ISSN 0975-508X, vol. 6(4) 2014, 91-95.

In this research paper spherically symmetric domain wall coupled with massive scalar field in bimetric relativity does not survive and hence only vacuum model is obtained .Further we obtain vacuum solutions in this theory.

(3)Spherically Symmetric String Cloud with Strange Quark Matter in Bimetric Relativity, JIAM, vol.36 (2), 239-244, 2014. ISSN-0970-5120

Here, Spherically Symmetric space –time is studied with the matter string cloud and strange quark in bimetric relativity. And observed that non existence of nature of strange quark as well as string cloud in this theory.

(4)Spherically Symmetric Bulk Viscous Fluid in Bimetric Relativity, IOSR- J. Of Mathematics Vol.10 (3), 2014, 53-55.e-ISSN: 2278-5728, p-ISSN: 2319-765X.

In this paper, the study of spherically symmetric space-time, there is nil contribution of bulk viscous fluid in Bimetric theory of relativity. It is observed that bulk viscous fluid cannot be a source of gravitational field in the Rosen's bimetric theory but only vacuum model exists.