Journal of Space Exploration
ISSN: 2319-9822

Current Opinion| Vol11 Iss11

Impact of Electric Field and Anisotropy on a Particular Kind of Tiny Stars' Mass-Radius Relationship

Andrea Jacobsen*

Managing Editor, Journal of Space Exploration, Australia

***Corresponding author:** Andrea Jacobsen, Managing Editor, Journal of Space Exploration, Australia, E-mail: spaceexploration@scholarres.org

Received: November 7, 2022**,** Manuscript No. tsse-22-83450; **Editor assigned:** November 9, 2022, PreQC No. tsse-22-83450 (PQ); **Reviewed:** November 16, 2022, QC No. tsse-22-83450 (Q); **Revised:** November 23, 2022, Manuscript No. tsse-22-83450 (R); **Published date:** November 30, 2022**.** Doi: 10.37532/2319-9822.2022.11 (11).245

Abstract

We describe a novel class of exact solutions to the Einstein-Maxwell system for a static, spherically symmetric, anisotropic, and charged distribution of matter. We convert the Einstein-Maxwell system's master equation into Bessel and modified Bessel differential equations by assuming particular configurations of the electric field and anisotropy. The ensuing solutions turn out to be generalizations of the anisotropic and charged stellar model. We study the impact of charge and anisotropy on the mass-radius relationship of compact stars and evaluate the physical viability of the solutions using one particular class of solutions.

Keywords: Compact star, Exact solution, Mass-radius relationship, Einstein-maxwell system

Introduction

The compact object where GR finds use is the pulsar. Since pulsars were initially discovered, precision in observational data has greatly increased thanks to technological breakthroughs. Therefore, pulsars continue to spark intense research interest among theoretical astronomers. By resolving the pertinent Einstein-Maxwell field equations, it is possible to study incredibly dense compact stars like pulsars when there is an electromagnetic field present. Two of the present authors have used various strategies to publish a new class of exact solutions to the Einstein-Maxwell system in a number of papers, addressing the physical relevance of these solutions in the setting of superdense stars. The motivation for considering electromagnetic fields with or without anisotropic stress has been covered in detail. In an Einstein-Maxwell system, the Coulomb repulsion balances the gravitational attraction, preventing the system from collapsing into a point singularity. Ivanov compiled a variety of solutions to the Einstein-Maxwell system. On the other hand, Bowers and Liang explored anisotropy's impact on compact stars for the first time, which later led numerous researchers to create and examine anisotropic stellar models. Some of the main goals of such investigations included stability analysis and setting limitations on the mass to radius ratio M/R. To examine the impact of charge and anisotropy on the mass-radius relationship of relativistic compact stars, we provide a novel set of exact solutions to the Einstein-Maxwell system. We then use these solutions to conduct our analysis. We select a physically plausible form for the electr-

Citation: Jacobsen A. Impact of Electric Field and Anisotropy on a Particular Kind of Tiny Stars' Mass-Radius Relationship. J Space Explor.2022; 11(11).245

-ic field strength, the measure of anisotropy, and the gravitational potential grr, and we create a master equation that becomes integrable for specific model parameter selections. Our research supports past findings that the mass-radius relationship of compact stars can be finely tuned by altering the electric field and/or anisotropy. Charged compact objects become less compact when anisotropy is present. The effects intensify with substantially higher electric field and anisotropic stress values. One hopes to gain a better understanding of the Equation of State (EOS) of such compositions and other factors that can affect the compactness of such stars as observational data on pulsar masses and radii continue to provide more accurate measurements. We apply a specific solution found in this research and employ numerical approaches to produce the mass-radius relationship in an effort to investigate the effects of electric field and anisotropy on compactness.

Conclusion

We were able to create a significantly larger class of solutions to the Einstein-Maxwell system by incorporating a more general form of the electric field and the anisotropic factor than previously thought of. The advantage of the new class of solutions is that the general form of the closed-form solutions can be used to examine all possible compositions (isotropic and uncharged, isotropic and charged, anisotropic and uncharged and anisotropic and charged) (isotropic and uncharged, isotropic and charged, anisotropic and uncharged and anisotropic and charged). This makes it easier to examine the effects of anisotropy and the electric field on the mass-radius relationship of compact stars.