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EXACT RELATIVISTIC STELLAR MODELS VIA HYPERGEOMETRIC DIFFERENTIAL EQUATION

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Abstract

We find new classes of exact solutions to the Einstein-Maxwell system of equations for a charged and anisotropic sphere with a particular choice of the electric field intensity, anisotropic factor and one of the gravitational potentials. The condition of pressure isotropy is reduced to a linear, second order differential equation in terms of the remaining gravitational potentials which can be solved in general. This is achieved by transforming the corresponding field equation to a hypergeometric equation with suitable transformations. Consequently we found exact solutions to the Einstein-Maxwell field equations to a static spherically symmetric gravitational potential in terms of hypergeometric functions. An interesting feature of the class of solutions is that one can easily switch off the electric and/or anisotropic effects in this formulation. We demonstrate that it is possible to express our class of solutions in a simple closed form so as to examine its physical viability for the studies of relativistic compact stars.

Keywords: *relativistic fluid sphere, exact solutions, Einstein-Maxwell system*