

ANISOTROPIC CHARGED STELLAR MODELS VIA BESSEL DIFFERENTIAL EQUATION

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Abstract

Several new families of exact solution to the Einstein-Maxwell system of differential equations for a spherically symmetric relativistic fluid sphere matched to the exterior Reissner–Nordström space–time are found for anisotropic charged matter. The spacetime geometry is that of Finch and Skea which satisfies all criteria for physical acceptability. For this purpose we construct a suitable form of one of the gravitational potentials, Electric field intensity and the anisotropic factor which are physically reasonable to obtain a closed form solution. This form of the remaining gravitational potential allows us to solve the second order ordinary differential equation and integrate the field equations. The resulting new anisotropic charged solution is well behaved which can be utilized to construct realistic static fluid spheres. The exact solutions can be expressed in terms of elementary functions and Bessel functions. When a parameter is restricted to be an integer then the special functions reduce to simple elementary functions. It is interesting to note that we regain earlier models with uncharged and charged matter distributions. The uncharged model of Finch and Skea (Class. Quantum Grav. 6 (1989), 467) and the charged model of Hansraj and Maharaj (Int. J. Mod. Phys. D 8 (2006), 1311) are regained as special cases.

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