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Interior solution and structure equations for the y-metric

Compact stars possess some of the strongest magnetic fields in nature. Such magnetic fields affect their shape, driving them apart from the spherical symmetry. Modelling magnetized stars is an open problem due to the difficulties in finding interior solutions to Einstein's field equations in axial symmetry. Here we present a new set of structure equations for uniformly magnetized stars based on the γ -metric, an exact vacuum solution in axial symmetry. This metric has been used before to find structure equations for compact objects but only in the case of stars that slightly depart from the spherical shape (low magnetic field). Nevertheless, our equations can deal with any deformation. An analysis of the magnetic field influence in the observables of Bose-Einstein condensate stars is done using this new framework.

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