

Adam, D.

Models of magnetic white dwarfs. (English) Zbl 0592.76191
Astron. Astrophys. 160, 95-106 (1986).

Summary: This paper is devoted to the effects brought by the presence of a strong internal magnetic field on the structure of white dwarfs. The spherical equations of hydrostatic equilibrium are solved by using the following approximation: the actual magnetic pressure is replaced by its radial component averaged over a spherical shell. Physically, this represents the case in which the field lines within the star are severely twisted. Using adequate hypothesis about the behaviour of the field strength, the net force due to the field is then approximately radial. Comparisons with the model of *J. P. Ostriker* and *F. D. A. Hartwick* [*Astrophys. J.* 153, 797 ff. (1968)] are made and show an excellent agreement.

The effects of electrostatic corrections to cold electron pressure, of β -inverse decays and of pycno-nuclear reactions have also been considered. Mass-radius relationships are given for various values of the ratio of the magnetic energy to the gravitational energy of the white dwarf, and for various values of the highest excited Landau level. With the help of these results, it may become possible to estimate the mean central magnetic field of white dwarfs.

MSC:

76X05 Ionized gas flow in electromagnetic fields; plasmic flow
85A05 Galactic and stellar dynamics
76M99 Basic methods in fluid mechanics

Cited in **1** Review
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Keywords:

magnetized plasmas; dense matter; strong internal magnetic field; structure of white dwarfs; spherical equations of hydrostatic equilibrium; effects of electrostatic corrections; cold electron pressure; pycno-nuclear reactions