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On the equilibrium of self-gravitating neutrons, protons and electrons in β-equilibrium

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(Submitted on 14 Jul 2011)

We have recently proved the impossibility of imposing the condition of local charge neutrality in a self-gravitating system of degenerate neutrons, protons and electrons in β-equilibrium. The coupled system of the general relativistic Thomas-Fermi equations and the Einstein-Maxwell equations have been shown to supersede the traditional Tolman-Oppenheimer-Volkoff equations. Here we present the Newtonian limit of the new equilibrium equations. We also extend the treatment to the case of finite temperatures and finally we give the explicit demonstration of the constancy of the Klein potentials in the case of finite temperatures generalizing the condition of constancy of the general relativistic Fermi energies in the case of zero temperatures.

Submission history

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[v1] Thu, 14 Jul 2011 10:28:51 GMT (88kb)

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