On the stability of regular charged black holes with a de Sitter core

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In the present work we study black holes and other electrically charged compact objects in the context of the Einstein-Maxwell theory. The main objective is the construction of regular black hole solutions and the study of their stability. We consider the Einstein field equations coupled to an electrically charged anisotropic fluid satisfying a de Sitter type equation of state, where the radial pressure is equal to the negative of energy density. The fluid distributions possesses spherical symmetry and is bounded by a spherical surface. The external spacetime region, outside the matter, corresponds to the Reissner-Nordström (RN) solution. The interior solution is matched to the RN solution by a timelike spherical thin shell satisfying the Darmois-Israel junction conditions. It is assumed that the thin shell may contain matter in the form of a perfect fluid obeying the barotropic equation of state of the form P=wS, with constant w. The equations of motion for the shell are derived from the junction conditions. We show that there are static electrically charged regular black holes solutions and other compact objects for specific choices of the w parameter. The other free parameters are the mass m, the charge q and the radius a of the matching surface (thin shell). We also find the stability and instability regions of the solutions considering different matter contents for the shell and different parameters for the resulting solutions.