HAYWARD-TYPE BLACK HOLE WITH NONLINEAR ELECTRODYNAMICS IN *F(R) THEORY*

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Since the beginning of General Relativity, solutions of black holes have gained a lot of attention. A black hole has the following basic characteristics: It is a solution of Einstein equations and there is a region that separates the causal structure of space-time, called the event horizon. In 1968, Bardeen presented a solution of Einstein equations that described a black hole with horizons but without singularities, known as Bardeen regular black hole. This new structure is regular in all space-time, not presenting singularity in the curvature invariants. The Bardeen solution can also be interpreted as a nonlinear electromagnetic source. Beyond General Relativity, there are plenty of alternative theories of gravity. One of these theories is the *f(R)* gravity which replaces the curvature scalar by a general function of the scalar, in the Einstein-Hilbert action. When coupled to *f(R)* gravity, the nonlinear electromagnetic theory can produces regular black holes solutions. In this work we obtain a class of regular black hole solutions in *f(R)* gravity coupled to a nonlinear electromagnetic source. These solutions must recover General Relativity for some choose of parameters. We show that these solutions satisfy the energy conditions in the whole space-time, except the strong energy condition, that is violated in somewhere inside the event horizon. We also study the regularity of the solution analyzing the curvature invariants and we show that, because the coupled with *f(R)* gravity, new terms appear in the electromagnetic field and in the electromagnetic Lagrangian.

Keywords: *f(R)* theory, regular black holes, energy conditions.