Dark energy fingerprints in the nonminimal Wu-Yang wormhole structure

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Abstract

We discuss new exact solutions to nonminimally extended Einstein-Yang-Mills equations describing spherically symmetric static wormholes supported by the gauge field of the Wu-Yang type in a dark energy environment. We focus on the analysis of three types of exact solutions to the gravitational field equations. Solutions of the first type relate to the model, in which the dark energy is anisotropic; i.e., the radial and tangential pressures do not coincide. Solutions of the second type correspond to the isotropic pressure tensor; in particular, we discuss the exact solution, for which the dark energy is characterized by the equation of state for a string gas. Solutions of the third type describe the dark energy model with constant pressure and energy density. For the solutions of the third type, we consider in detail the problem of horizons and find constraints for the parameters of nonminimal coupling and for the constitutive parameters of the dark energy equation of state, which guarantee that the nonminimal wormholes are traversable. © 2014 American Physical Society.