Physical Review D - Particles, Fields, Gravitation and Cosmology 2013 vol.88 N4

Static cylindrically symmetric dyonic wormholes in six-dimensional Kaluza-Klein theory: Exact solutions

Aminova A., Chumarov P.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

We study cylindrically symmetric Abelian wormholes in (4+n)-dimensional Kaluza-Klein theory. It is shown that static, four-dimensional, cylindrically symmetric solutions in (4+n)-dimensional Kaluza-Klein theory with maximal Abelian isometry group U(1)n of the internal space with diagonal internal metric can be obtained, as in the case of a supersymmetric static black hole, only if the isometry group of the internal space is broken down to the U(1) e×U(1)m gauge group; they correspond to dyonic configurations with one electric (Qe) and one magnetic (Q m) charge that are related either to the same U(1)e or U(1)m gauge field or to different factors of the U(1) e×U(1)m gauge group of the effective six-dimensional Kaluza-Klein theory. We find new exact solutions of the six-dimensional Kaluza-Klein theory with two Abelian gauge fields, a dilaton field and a scalar field, associated with the internal metric. We obtain new types of cylindrically symmetric wormholes supported by the radial and longitudinal electric and magnetic fields.

http://dx.doi.org/10.1103/PhysRevD.88.044005