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The vector fluctuations around the Wesson's solutions

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Abstract

In Wesson's canonical model, the universe is assumed to be five dimensional (5D) empty space time. This model corresponds to a solution of the Einstein field equation in five dimensions which, from a four dimensional point of view, is equivalent to a universe with a positive cosmological constant. In this model, the fifth direction is perpendicular to the four dimensional space time and is not compacted. Furthermore, the mass of particles in the four dimensional space time is related to their distance from the origin in the fifth direction while all particles are assumed to be massless in the 5D space time. In this article, we show that the vector fluctuations around the Wesson's solutions are tachyonic, i.e. the Wesson's vacuum is unstable. The mass of tachyon is proportional to square root of cosmological constant which is consistant with the experimental upper bound on photon's less mass. Furthermore, the geodesic equations in the 5D space time give the Lorentz force in four dimensions. In this model, all massive particles are electrically charged and the charge-to-mass ratio depends on the age of universe, which exponentially tends to one.

Keywords: Wesson's canonical model, five dimensional space time, cosmological constant, Tachyon

For full article, refer to the Persian section