

## Particle and Photon Trajectories near the Black Hole Immersed in the Nonstatic Cosmological Background

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**Abstract :** The question of constructing a consistent model of the cosmological black hole remains to be unsolved and still attracts the interest of cosmologists as far as it is important in a wide set of research problems including the problem of the black hole horizon dynamics, the problem of interplay between cosmological expansion and local gravity, the problem of structure formation in the early universe etc. In this work, the model of the cosmological black hole is built on the basis of the exact solution of the Einstein equations for the spherically symmetric inhomogeneous dust distribution in the approach of the mass function use. Possible trajectories for massive particles and photons near the black hole immersed in the nonstatic dust cosmological background are investigated in frame of the obtained model. The reference system of distant galaxy comoving to cosmological expansion combined with curvature coordinates is used, so that the resulting metric becomes nondiagonal and involves both proper 'cosmological' time and curvature spatial coordinates. For this metric the geodesic equations are analyzed for the test particles and photons, and the respective trajectories are built.

**Keywords :** exact solutions for Einstein equations, Lemaitre-Tolman-Bondi solution, cosmological black holes, particle and photon trajectories

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