REVIEW

of a domestic scientific consultant on the research work of
Suliyeva Gulnara
"Application of field theories to astrophysical problems",
submitted for the degree of Doctor of Philosophy (PhD)
of the educational program in "8D05306 – Physics"

The research work of Suliyeva Gulnara is devoted to the theoretical study of black hole models in the framework of field theories extending general relativity.69 The work addresses gravitational effects in spacetimes modified by nonlinear electrodynamics and scalar-vector fields, with particular attention to regular black holes (Fan-Wang, Dymnikova) and dilatonic black holes. The relevance of the research is determined by the development of high-precision observational astrophysics, which allows testing alternative models of black holes.

The author performed analytical derivations of geodesic equations, obtained exact and semi-analytical expressions for perihelion shift, light deflection in the Fan-Wang spacetime, and established the dependence of orbital parameters on the dilaton coupling constant and charges. She also carried out calculations of accretion disk properties in the Fan-Wang and Dymnikova spacetimes, determining the flux, luminosity, temperature profiles, and efficiency.

The scientific novelty of the work is characterized by the following:

- Derivation of analytical expressions for classical effects of general relativity in the Fan-Wang spacetime, showing the influence of nonlinear electrodynamics on particle dynamics.

- Determination of the radiative properties of accretion disks around the Fan-Wang and Dymnikova black holes, revealing enhanced temperature and efficiency compared with the Schwarzschild case.

- Establishment of the dependence of circular geodesic characteristics in dilatonic black holes on coupling parameters, with Schwarzschild and Reissner-Nordström solutions obtained as limiting cases.

The results obtained are of theoretical and applied significance, expanding the study of black holes with additional fields and enabling possible comparison with astrophysical observations.

The dissertation work clearly demonstrates the author's ability to carry out the scientific work. Gulnara Suliyeva shows analytical skills, proficiency in modern mathematical methods, and the ability to interpret complex results within a broad physical context. The structure of the publications is logical and coherent.

The results of the dissertation work were published in 5 peer-reviewed journals with high impact factors included in WoS and Scopus databases, and in 4 journals recommended by the Committee for Quality Assurance in Science and Higher Education of the Ministry of Science and Higher Education of the Republic of Kazakhstan. They were also presented at international scientific conferences and seminars confirming the relevance and academic value of the work.

Gulnara Suliyeva completed all assigned tasks, achieving the research objective. The dissertation work fully meets the requirements for PhD dissertations established by the Ministry of Science and Higher Education of the Republic of Kazakhstan. Therefore, I recommend that the Dissertation Council award her the degree of Doctor of Philosophy (PhD) in the educational program "8D05306 – Physics".

01.11.25

Domestic scientific consultant
PhD, professor K.A. Boshkayev

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