REVIEW
of the official reviewer of the dissertation work
Yernazarov Tursynbek Izmukhanovich on the topic "The effects of nonlinear vacuum electrodynamics and general relativity for the passage of the front of electromagnetic waves through the magnetic field of the magnetar", submitted for the degree of Doctor of Philosophy (PhD) in the specialty 8D05306 – Physics.

№	Criteria	Compliance with the criteria (underline one of the answer options)	Justification of the official reviewer's position (comments should be highlighted in italics))
1.	The topic of the dissertation (as of the date of its approval) corresponds to the directions of scientific development and/or state programs	1.1 Compliance with priority areas of scientific development or state programs:	The dissertation was completed in accordance with the plans of fundamental scientific research works (scientific research work).
		1) the dissertation was completed within the framework of a project or target program financed from the state budget (indicate the name and number of the project or program); 2) the dissertation was completed within the framework of another state program (indicate the name of the program); 3) the dissertation corresponds to the priority direction of scientific development approved by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan (indicate the direction).	The dissertation topic aligns with the priority scientific development area, "Research in Natural Sciences," within the framework of project AP22686542, titled «Numerical study of ray deflection on magnetars, taking into account dark matter», as well as, within the framework of project AP14869524, titled «Effects of Nonlinear Vacuum Electrodynamics and General Relativity on Magnetars».
2.	Importance for Science	The work makes/does not make a significant contribution to science, and its importance is/is not well explained.	The dissertation titled "The effects of nonlinear vacuum electrodynamics and general relativity for the passage of the front of electromagnetic waves through the magnetic field of the magnetar " explores a significant astrophysical phenomenon, highlighting its substantial scientific impact and thoroughly addressing its importance.
3.	The principle of independence	Level of independence: 1) high; 2) average; 3) short; 4) there is no independence.	The author demonstrates a high level of independence in conducting research. They independently completed all aspects of the dissertation, including the development of the methodology, solving the assigned tasks, and performing both analytical and numerical calculations.
4.	The principle of internal unity	4.1 Justification of the relevance of the dissertation: 1) justified; 2) partially justified; 3) not substantiated.	Research in nonlinear electrodynamics and nonlinear optics is highly relevant, particularly in their application to the study of magnetars.
		4.2 The content of the dissertation reflects the topic of the dissertation: 1) reflects; 2) partially reflects; 3) does not reflect.	The dissertation fully reflects the research topic and is presented as a complete and cohesive work.

		4.3. The goal and objective correspondence of the topic of the dissertation: 1) correspond; 2) partially match; 3) do not correspond.	The goals and objectives of the study, as well as the statements presented for defense, are consistent and aligned with the dissertation topic.
		4.4 All sections and provisions of the dissertation are logically interconnected: 1) completely interconnected; 2) partial relationship; 3) there is no connection.	The dissertation is structured with a clear logical flow, comprising an introduction, two chapters, a conclusion, and a list of references. The introduction justifies the relevance of the study and outlines the goal, objectives, object, subject, and methodology of the research. It also presents the scientific novelty, theoretical and practical significance of the study, along with the key propositions put forward for defense. Each section is cohesively linked. The conclusion summarizes the main findings of the research.
		4.5 The new solutions (principles, methods) proposed by the author are substantiated and evaluated in comparison with known solutions: 1) there is a critical analysis; 2) partial analysis; 3) The analysis does not represent personal opinions, but quotes from other authors; 4) analysis missing.	The author provides a thorough review of previous works by other researchers, supported by appropriate references.
5.	The principle of scientific novelty	5.1 Are the scientific results and provisions new? 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new).	The scientific results and findings presented in the dissertation are entirely novel. The author provides both qualitative and quantitative estimates of light deflection in the extremely strong magnetic field of a magnetar.
		5.2 Are the findings of the dissertation new? 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new).	All conclusions are grounded in substantial scientific evidence and are thoroughly justified. The work has been presented at international conferences both in Kazakhstan and abroad. As a result of this research, six scientific papers were published, including one article in a high-ranking journal indexed in the Scopus database (percentile - 80), and five articles in journals listed by the Science and Higher Education Quality Assurance Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan.
		5.3 Technical, technological, economic or managerial decisions are new and justified: 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new).	The findings provided by the doctoral student are entirely original, as evidenced by recent publications in peer-reviewed journals.

6.	Validity of the main conclusions	All key findings are based/not based on sound scientific evidence or are reasonably well supported (for qualitative research and arts and humanities majors).	The theoretical research presented in the dissertation has yielded results that exhibit both scientific and practical innovation. The main conclusions are well-supported and validated, as the author bases them on previously analyzed scientific literature and factual data, which are corroborated by established methods and theories.
7.	The main provisions submitted for defense	The following questions must be answered for each provision separately: 7.1 Has the position been proven? 1) proven; 2) rather proven; 3) rather not proven; 4) not proven; 5) In the current formulation, it is impossible to verify the proof of the position. 7.2 Is it trivial? 1) Yes; 2) No; 3) in the current formulation it is impossible to verify the triviality of the position. 7.3 Is it new? 1) Yes; 2) No; 3) In the current formulation it is impossible to verify the novelty of the provision. 7.4 Level to use: 1) narrow; 2) average; 3) wide; 4) In its current formulation, it is not possible to verify the level of application of the provision. 7.5 Is it proven in the article? 1) Yes; 2) No; 3) in the current wording it is impossible to verify the proof of the position in the article	All the statements presented in the dissertation are thoroughly proven. The author demonstrates the parameters and estimates of ray deflection caused by both the gravitational and dipole magnetic fields, as well as the deformation of the electromagnetic radiation wavefront influenced by these fields in the magnetar, with application to the gamma-ray burst GRB 091006360. The propositions are not trivial, as evidenced by the complex numerical calculations included in the dissertation. All the propositions and results presented in the dissertation are original, as confirmed by recent articles published in peer-reviewed journals. The propositions presented for defense are well-proven, original, and non-trivial. Their scope of application is broad, as confirmed by published works. All the results in the dissertation are substantiated and validated by articles in peer-reviewed journals.
8.	The principle of reliability. Reliability of sources and information provided	8.1 The choice of methodology is justified or the methodology is described in sufficient detail: 1) Yes; 2) No;	The methodology chosen for this study is thoroughly justified and explained in detail.

		8.2 The results of the dissertation work were obtained using modern methods of scientific research and methods of processing and interpreting data using computer technologies: 1) Yes; 2) No;	The results of the dissertation were achieved by integrating established analytical methods with modern computational technologies.
		8.3 Theoretical conclusions, models, identified relationships and patterns are proven and confirmed by experimental research (for areas of training in pedagogical sciences, the results are proven on the basis of a pedagogical experiment): 1) Yes; 2) No;	Theoretical justifications, developed models, and discovered relationships and patterns are supported by rigorous mathematical proofs. Computational experiments have been conducted to validate the theoretical conclusions.
		8.4 Important claims are supported/partially supported/not supported by references to relevant and reliable scientific literature.	All key statements in the dissertation are supported by references to relevant and credible scientific literature. A comprehensive analysis of contemporary research has been carried out, with the main findings compared to those of other researchers. Articles from peer-reviewed journals, data from authoritative databases, and monographs have been utilized, ensuring the high reliability and relevance of the sources.
		8.5 The literature sources used are sufficient/not sufficient for a literature review.	The literature review includes both foundational classical works that established the theory and modern research reflecting the latest advancements and discoveries. The sources cited are adequate for conducting a thorough literature review. The inclusion of diverse, authoritative, and relevant sources enables a comprehensive analysis and strengthens the reliability of the dissertation's conclusions.
9.	The principle of practical value	9.1 The dissertation has theoretical significance: 1) Yes; 2) No.	The theoretical importance of the dissertation is reflected in the detailed quantitative and qualitative evaluations of magnetic lensing.
		9.2 The dissertation has practical significance and there is a high probability of applying the obtained results in practice: 1) Yes; 2) No.	The practical relevance is highlighted through its application to neutron stars with extremely strong magnetic fields (magnetars).
		9.3 The suggestions for practice are new: 1) completely new; 2) partially new (25-75% are new); 3) not new (less than 25% are new).	All the propositions in the dissertation are entirely original, as confirmed by recent articles published in peer-reviewed journals.
10.	Quality of writing and design	Quality of academic writing: 1) high; 2) average; 3) below average; 4) low.	The dissertation stands out for its high academic writing quality, characterized by clear and precise presentation, logical structure, strong argumentation and evidence, as well as adherence to scientific style and language.

11.	Notes on a thesis	
12.	Scientific level of the doctoral student's articles on the topic of research (in case of defense of the dissertation in the form of a series of articles, the official reviewers comment on the scientific level of each article of the doctoral student on the topic of research)	
13.	Decision of the official reviewer (pursuant to paragraph 28 of the present Model Regulations)	The dissertation work of Yernazarov T.I. on the topic " The effects of nonlinear vacuum electrodynamics and general relativity for the passage of the front of electromagnetic waves through the magnetic field of the magnetar " fully complies with all the requirements of the Committee for Quality Assurance in Science and Higher Education for dissertations for the degree of Doctor of Philosophy (PhD). Tursynbek Izmukhanovich Yernazarov deserves to be awarded the academic degree of Doctor of Philosophy (PhD) in the educational program "8D05306 - Physics"

Official reviewer:

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