Application forms – Part 1
„COMPETITION FOR FINANCIAL SUPPORT FOR RESEARCH PROJECTS – 2017"
Administrative description of the project

Competition:	
Competition for financial support of research projects – 2017	
Main research/thematic area, of the project:	
Physical Sciences/Theoretical and Mathematical Physics	
Additional research/thematic area – for interdisciplinary projects:	
Mathematical Sciences and Informatics/ Applications of Mathematics in Physics	
Project title:	
Symmetries of the Fundamental Laws of Nature	
Type of the planned research (fundamental or applied):	
Fundamental	
Applying organization:	
Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences	
Partner organizations:	
Faculty of Physics, Sofia University "St. Kliment Ohridski"	
Coordinator of the research team (academic position and degree, name):	
Corresponding member of BAS, Prof. ,Dr.Sc. NISSIMOV Emil Rafaelov	
Coordinator's address (postal, electronic, phone):	
Postal: Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences Boul. Tsarigradsko Chaussee 72, 1784 Sofia, Bulgaria E-mail: nissimov@inrne.bas.bg , Website: http://theo.inrne.bas.bg/~nissimov/ Phone: +359 2 9795 647	
Requested budget for accomplishment of the project (in BGN, 1.00 EUR = 1.95583 BGN):	
120 000 BGN	

Coordinator of the research team: *For applying organization (position):*

    (signature)   *(signature and stamp)*

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Abstract of the project:

A symmetry in Physics is a principle of invariance. Symmetry principles play an important role with respect to the laws of nature. They summarize the regularities of the laws that are independent of the specific dynamics. Thus invariance principles provide a structure and coherence to the laws of nature.

All interactions among the basic building blocks in the Universe are governed by four fundamental forces: strong and weak nuclear forces on the level of elementary particles and atomic nuclei, gravity on astrophysical and cosmological scales (origin, structure and evolution of the Universe), and electromagnetism on all intermediate scales. The most basic unifying property of all fundamental forces is the principle of gauge invariance, which embodies a powerful synergetic symbiosis of modern theoretical physics with most modern branches of pure and applied mathematics, especially group theory.

Gravity claims a central role in physics. Essentially all challenges in astrophysics, cosmology and fundamental physics include gravity as a key ingredient, making it a subject of strong interdisciplinarity. On the other hand, (noncommutative) geometry is at the heart of quantum physics, and its many facets and developments have widely influenced both physics and mathematics. In particular, (noncommutative) geometry is closely related to a quantum theory of gravity and a possibly unified perspective on the fundamental forces of Nature.

The synthesis of the results of the comprehensive studies in modern theories of gravity and cosmology, extending by far the classical Einstein theory of general relativity, as well as the advance in modern fundamental mathematics, offer exciting opportunities and scientific prospects to answer some of the most pressing issues in our understanding of the cosmos and the laws of Nature: (i) acquiring new knowledge about the structure and behavior of matter at ultra-microscopic and galactic distances; (ii) contributing to a solution of the most challenging "mysteries" and cardinal problems of modern physics with a global conceptual significance - "supersymmetry", "extra space-time dimensions", black holes and "wormholes", "dark matter" and "dark energy" in the universe.

The project is interdisciplinary (theoretical physics and modern mathematics) and it is thematically connected with a number of prestigious international projects, incl. several with European funding (COST actions). The project involves young specialists and is aimed at contributing to the preparation of highly qualified specialists for professional realization in such important innovative fields of science as studies of gravitational waves and the emerging radically novel gravitational-wave astronomy. We plan to setup up working groups in close collaboration: (1) Extended gravity and quantum cosmology; (2) String theory and gauge-gravity duality; (3) Mathematical aspects - group-theoretic, algebraic and geometric approaches to quantum field theory and quantum mechanical aspects of generalized gravitational theories.

Distribution of the requested budget for accomplishment of the project (in BGN) between the applying and partner organizations

Organization:	
INRNE, BAS	
Amount: 95 400 lv	
Organization:	
Faculty of Physics, Sofia University "St. Kliment Ohridski"	
Amount: 24 600 lv	
Organization:	
Amount:	
Organization:	
Amount:	
Requested total budget for accomplishment of the project (in BGN):	
120 000 lv	

Members of the research team

Organizations/team members[1]	Note[2]	Signature[3]
Applying organization:		
Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences		
Coordinator of the research team		
1. Corresponding member of BAS, Prof. ,Dr.Sc. NISSIMOV Emil Rafaelov		
Team members:		
2. Corresponding member of BAS, Prof.,Dr.Sc. PETKOVA Valentina Borisova 3. Prof., Dr.Sc. DOBREV Vladimir Krastev 4. Prof., Dr.Sc. PACHEVA Svetlana Jordanova 5. Assoc. Prof., Dr.Sc. STOILOVA Nedialka Ilieva 6. Assist. Prof., Dr. STAICOVA Denitsa Rumenova 7. MARINOV Kalin Kamenov	PD PS	
Partner organization:		
Faculty of Physics, Sofia University "St. Kliment Ohridski"		
Team members:		
8. Prof., Dr.Sc. RASHKOV Radoslav Christov 9. MLADENOV Stefan Budyoniev	PS	
Partner organization:		
Team members:		
Partner organization:		
Team members:		

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[1] Please, include the academic position and degree of each team member.

[2] Please, include the following notes: JR for junior researchers, PD for post-doc, PS for PhD student, ST for student, or RA for researcher from abroad. In this column, please, indicate the affiliation of the team member if she/he is not working in the corresponding applying or partner organization.

[3] For scholars from abroad, no signature is required. Instead a written agreement signed by the foreign scientist should be provided. For the application the agreement can be provided as a scanned document. If the project is funded, the original signed document will be required at the time of signing the contract.