Santo André, April 18th, 2023

Referee report on the project “Quantum gravity, cosmology and strings”

The project is aimed at solving the fundamental problems of classical and quantum gravity and conducting advanced theoretical research in this area. In classical gravity, the project proposes two main directions. The first direction is studying gravitational wave phenomena, including shock waves in General Relativity, and various sources of gravitational wave background, such as cosmic strings. The second direction is focused on cosmological models that explain the properties of the observable Universe based on field theory methods and modified gravity.

In the field of quantum gravity, the aim of project is to develop existing and novel methods of quantum field theory in external gravitational backgrounds, including various approximations of the effective gravitational action in different regimes. Asymptotic symmetries in gravity, the relationship between gravity, thermodynamics and quantum entanglement, the holographic properties of gravity, and the AdS/CFT correspondence will also be explored.

The team of the Project has a necessary background and world recognition in the field of the Project. The proposed areas of research are on frontiers of the modern mathematical physics. It is especially valuable that thanks to advances in the development of experimental methods for studying gravitational phenomena, the expected results of the project in the field of gravitation may be compared with the data of astrophysical observations. We also note that using the relationship between gravity, thermodynamics and quantum entanglement, one can obtain important results in the field of condensed matter physics.

Another positive side of the proposed project is an impressive network of international collaborations which will be established or continued. These collaborations will definitely contribute to success of the project and to visibility of the obtained results.

As I have always mentioned above, the project has ambitious scientific goals. At the same time, all steps of executions of the project are very well described. The coordinators have prepared a detailed description of particular problems which

they are going to address. The logical structure of the project is also clearly described. I am quite confident that the aims of the project can be achieved within the proposed time period.

I strongly recommend supporting this project.

Please do not hesitate to contact me in case you have any questions.

With best regards,

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