REVIEWER´S ASSESSMENT OF FINAL WORK

I. IDENTIFICATION DATA

Title:	Higher-order derivative gravity
Author´s name:	Aneta Pjatkanová
Type of assignment:	Bachelor Project
Faculty:	Faculty of Nuclear Sciences and Physical Engineering (FNSPE)
Department:	Department of Physics (DP)
Reviewer:	Prof. Massimo Blasone
Reviewer´s affiliation:	Dipartimento di Fisica, Università di Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy.

II. ASSESSMENT OF CRITERIA

Work assignment — **demanding**

Assess how demanding the work topic is.

Classical Einstein gravity is a very challenging field, both conceptually and technically. For higher-dimensional gravity, the situation is even more pronounced.

Fulfilling the assignment — **fulfilled**

Consider whether the work submitted meets the assignment. If necessary, give your comments on items of the assignment not fully answered, or judge whether the scope of the assignment has been broadened. If student failed to fully treat the assignment, try to assess the importance, impact and/or the reasons for the failings.

In my opinion, the student did a very good job. She covered all the required points in sufficient depth and with appropriate mathematical rigor.

Chosen approach to solution — **appropriate**

Assess whether student applied a correct approach or method of solution.

The student uses mostly analytical techniques in her reasoning. No numerical simulations are part of the work. The analytical methods used seem appropriate for the task at hand.

Professional standard — **excellent**

Assess the professional standard of the work, application of course knowledge, references, and data from practice.

I found the professional standard of the thesis to be quite high. The text shows that the student has a good knowledge of the material and knows how to use it effectively. I did not notice any problems with citations, although it would not be a problem to add more citations, as the subject of higher-derivative gravity is quite a broad one.

Level of formality and of the language used — **average**

Assess the use of scientific formalism, the typography and language of the work.

The student's command of English is average. I did notice a few typos in places, e.g. in chapter 1.2.2 "Gauss=Bonnet" instead of "Gauss-Bonnet", or frequent switching between the word "universe" and its capitalized version "Universe" (for no apparent reason). These typos could perhaps be explained by the typical rush to write a final draft. As far as I can tell, the scientific formalism is written and used correctly.

Choice of references, citation correctness — **excellent**

Assess student´s effort in finding and using study sources for completing their work. Give characteristics of the references chosen. Assess whether student made use of all the relevant sources. Verify whether all items used are properly distinguished from the results obtained by student and their deliberations, whether there are no violations of citation ethics, and whether the bibliography presented is complete and complies with the citation usage and standards.

The thesis provides an extensive list of references. In my opinion, the references are well chosen and balanced, and I could not find any essential reference missing.

Further comments and assessment

Give your opinion on the quality of the main results obtained in the work, e.g. the theoretical results, or the applicability of the engineering or programming solutions obtained, publication outputs, experimental skills, and the like.

The thesis is well structured and provides a nice, easy to read introduction to the subject of higher-derivative gravity. This is what one would expect from a BSc thesis.

III. OVERALL ASSESSMENT, QUESTIONS TO BE ASKED DURING THE WORK DEFENCE, SUGGESTED GRADE

Summarize those aspects of the work that were significantly influential for your overall assessment. Suggest questions to be answered by student during the defence of the work before the examination board.

Overall, the BSc thesis is a nice, well-written introduction to the subject of higher-derivative gravity, with a number of interesting mathematical derivations done by the student. I have no particular criticism of the style or choice of material, which are fine. I do not have even any specific question. I have perhaps only two comments regarding some of the statements in the thesis:

a) The student states in the conclusions that "In four dimensions the Gauss-Bonnet term is identically zero". This is not true (at least not in general), since in D = 4 the Gauss-Bonnet invariant is a total derivative and thus does not contribute to classical gravitational dynamics. On the other hand, it is relevant e.g. in quantum gravity, where integration over all topologies should be considered.

b) Although the exposition is quite complete, I missed a discussion of such a key concept as Birkhoff's theorem. Surely there are, at least in some higher-derivative gravity theories (e.g. conformal gravity), corresponding generalizations for the spherically symmetric solution of the vacuum field equations.

Suggested grade: **A - excellent.**

Date: 23/08/2024

Signature: