



CHARLES UNIVERSITY
Faculty of mathematics
and physics

Thesis Review

presented at the Faculty of Mathematics and Physics
Charles University

- supervisor opinion opponent opinion
 bachelor thesis diploma thesis

Author: Radka Křížová
Thesis title: Observational Aspects of a Massive Graviton
Study program and field: Physics, Physics FP
Year of submission: 2024

Name and Titles of Opponent: Dr. Sante Carloni, M.A., Ph.D.
Workplace: Institute of Theoretical Physics
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Professional level of work:

- excellent very good average below average unsatisfactory

Content mistakes:

- almost none a reasonable number relative to the scale numerous, but less serious serious

Results:

- original original and adapted from literature nontrivial compilation work compilation from literature descriptive

Length:

- long standard sufficient insufficient

Graphics, linguistic, and formal aspects:

- excellent very good average below average unsatisfactory

Typos:

- almost none a reasonable number given the scope numerous

The overall level of the thesis:

- excellent very good average below average unsatisfactory



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Comments and observations of the leader/opponent:

The thesis deals with several realizations of the oscillation phenomena due to the interaction between gravitons and photons and the description of some observable phenomena associated with such mixing. Starting from the simple case of the mixing of photons with scalars and via more and more complex cases, the thesis builds towards its original part: the description of the oscillation effects in the context of a bi-metric theory of gravitation with massive gravitons. While bi-metric theories are not really new and are generally disfavoured by Solar System tests (i.e., PPN tests), an independent confirmation of those results on a different scale would be relevant. I found the application to experimental phenomena and the connection with observed data particularly interesting. However, in some of the examples (like the LSW), the text could have used a comment on how easy it would be to implement such tests concretely.

The thesis is generally well-written, and the exposition is clear. However, the readability is sometimes reduced by the introduction of some material, like the variation of the action for each theory and the gauge choice, which would probably be more suited for one or more appendixes.

Possible questions during the defence and topics for discussion:

- (1) The thesis's findings suggest a significant difference in observable phenomena between the cases of massive and massless graviton. Could tests be devised to determine the existence of a massive graviton? And if so, which of the experimental settings explored in the thesis would be most suitable for this task?
- (2) Some of the observational effects described in the thesis relate to cosmological scale phenomena. How would the cosmological "environment" (e.g. plasmas) and expansion of the universe impact the results given in the thesis?

Thesis work

recommended

not recommended

to be recognized as a bachelor's degree.

I suggest grading by grade:

excellent very good good failed

Place, date, and signature of the opponent:

Prague, 03/06/2024