

Report on

The habilitation thesis
RADIATIVE EFFECTS IN GAUGE EXTENSIONS OF THE STANDARD MODEL OF PARTICLE INTERACTIONS
by Ing. Michal Malinský, PhD.

The habilitation thesis of Michal Malinský is an ambitious project concerned with Beyond Standard Model Physics in general and Neutrino masses and Grand Unified models in particular. It takes a wide grip on these subjects and gives a broad introduction to the whole field which could be used as a complimentary text in a course on Particle Physics. Various extensions of the Standard Model that could be used to incorporate neutrino masses are systematically investigated and their pros and cons are discussed. The general conclusion is that none of the simple models suffice to give us a solid explanation of the neutrino masses found in nature. I found this part of the thesis highly informative and very well written.

After considering many possible models and explaining why they are not adequate using constraints not only from accelerator experiments but also from cosmology the author turns his attention to a set of more complicated models where quantum effects play a major role in the discussion. Also here the author does a good job in discussing the various models and their successes and shortcomings. Although the nature of the topic makes the text more technical the discussion is maintained at a level where enough details are provided to make it understandable while still not being overloaded with calculations.

The thesis then includes six selected publications that represents important contributions of the author to the topic chosen for the thesis. Each paper is summarized in a short note and the reason for including it is carefully explained. I think this was a wise choice since the author has written a large number of papers on this and related topics and they could not have been all included. I was also wise to restrict the theme of the thesis since the author has significantly contributed to many more areas of Particle Physics and to present all of them would not have made for a readable thesis. I have gone through the check of originality of the thesis done by the system Turnitin and it is absolutely clear that the thesis represents an original work with minimum overlap with the existing literature.

The text is written in a colloquial style in an English that is easy to understand. Sometimes symbols and notation are used that might not be understandable for a casual reader. Maybe it would have been a good idea to provide an appendix with this information. I have also found a few misprints like in the expression for δZ_ϕ on page 20 where the integration over the Feynman parameter is missing and in the following line where the expression for δm^2 should not have a \log in the last term. Also I think that the terminology in the discussion of homotopy, for the first time on page 38, is mixed up. The π_1, π_2 etc should be called homotopy *groups*. Their elements are homotopy *classes*, i.e. they are equivalence classes of maps under smooth deformations.

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These minor misprints in no way lowers the general merit of the thesis. If there is room for discussion I would rather be interested to hear the opinion of the author, as an authority on Physics beyond the Standard Model, on the following questions:

- High Energy Physics as a field is in a new situation. There are no new experimental discoveries clearly telling us where to go next. In your opinion which is the best way forward? Where should we invest our money?
- In the opinion of the author, what is the probability that supersymmetry is realized as a fundamental symmetry of nature?

The habilitation thesis entitled "Radiative effects in gauge extensions of the Standard Model of particle interactions" by Ing. Michal Malinský, PhD. by far fulfills the requirements expected of a habilitation thesis in the field of particle physics. Ing. Malinský is a well established and respected researcher in the field of High Energy Physics and I fully and enthusiastically support his application to become Associate Professor (to be given the title docent).



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