FRANKLIN & MARSHALL

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I have examined the Habilitation Thesis *Precision calculations of light atomic spectra* and accompanying materials submitted by **Mgr. Vojtěch Patkóš, Ph.D.** In my opinion, Mgr. Patkóš is well qualified for the habilitation degree.

Mgr. Patkóš is an established expert in the field of theoretical calculations of the properties, usually energy levels, of "simple" atomic systems. In order to do this kind of work, one must be expert in several advanced areas of physics, including special relativity, quantum mechanics, quantum field theory [specifically quantum electrodynamics (QED) and its non-relativistic derivative non-relativistic QED (NRQED)], atomic physics (specifically, the application of quantum mechanics to multi-electron atoms), some aspects of nuclear physics (such as nuclear charge radii and various electric and magnetic moments of nuclei), and the standard model of elementary particle physics (for the calculation of some small corrections and for an understanding of how his work fits into the larger picture of fundamental physics). Mgr. Patkóš has demonstrated his expertise in these areas by producing a masterful habilitation thesis and by a number of significant publications over the past twelve of so years.

Mgr. Patkóš has established a productive and long-lived collaboration with two of the top people in the field, Krzysztof Pachucki and Vladimir Yerokhin. Together they have published 22 scientific papers, mostly in the peer-reviewed and highly respected journal Physical Review A. They have also published in Physical Review Letters (a premiere letters journal for rapid dissemination of important results), Annals of Physics (Berlin), Symmetry, European Physical Journal D, and Physics Letters B. These are all highly regarded journals. Four of Mgr. Patkóš's early papers included his dissertation director doc. Mgr. Jaroslav Zamastil, Ph.D.

Because all of his publications are joint with other authors, one might wonder whether Mgr. Patkóš is an independent researcher or is somehow dependent on others. Two pieces of evidence suggest that his personal contributions are significant. One is the length of the Patkóš, Pachucki, Yerokhin collaboration. One cannot imagine that Pachucki and Yerokhin, as top people in their field, would maintain a twelve-year collaboration with someone who wasn't making important contributions to the collaboration. In addition, the author lists are not simply

alphabetical. Of the 22 joint publications with Pachucki and Yerokhin, Pachucki is listed as first author on three, Yerokhin on seven, and Patkóš on ten. (The other two have first authors outside of the central collaboration.) In addition, of his four papers joint with doc. Mgr. Zamastil, two list Mgr. Patkóš as first author. This indicates that Mgr. Patkóš made the main intellectual contribution on half of his published work. Because of the nature of the field, with a central focus on being absolutely careful not to make mistakes, either conceptually or in the numerical results, collaborative work is extremely common. It is not a surprise that Mgr. Patkóš has so many joint publications.

I have read several of Mgr. Patkóš's publications because of their connection with my own work, and I have examined the rest. In summary, I can say that his publications address and make important progress on many of the central issues in the field. His work supports the efforts of experimentalists who are making the most precise measurements of atomic properties. Without theoretical results of the sort that Mgr. Patkóš is producing, the high precision experiments would have nothing to compare against and would lose much of their significance. Theory and experiment support each other closely and it is crucially important to have younger, highly capable workers continue to enter the field. These papers are particularly useful because (1) they address important topics of interest to others in the field, (2) they supply tables of results that are of use to experimentalists, and (3) they provide sufficient information so that other theorists can follow the details of the calculations. I have worked in this field for many years as a theorist, and greatly appreciate it when publication authors are careful to explain their reasoning and give sufficient details so that others can understand their calculations. The papers presented here are useful for all of these reasons.

In summary, I have found Mgr. Patkóš's work to be of extreme high quality and of international significance. I support strongly his application to be awarded the habilitation degree.

Respectfully submitted,

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