

Prague, 25<sup>th</sup> August 2021

### **Report of the supervisor on the doctoral studies of RNDr. Patrik Švančara**

RNDr. Patrik Švančara has been for several years a diligent student of condensed matter physics at the Faculty of Mathematics and Physics of Charles University. He started in October 2017 his doctoral studies under my supervision, that is, he submitted his doctoral thesis on time, which is, I believe, a neat manifestation of his diligence. He was awarded his bachelor and master degrees in 2015 and 2017, respectively, and in both cases his final-year works were carried out under my guidance.

He is already co-author of several journal papers, including four in the Journal of Fluid Mechanics and three in Physical Review B – he also presented relevant results at international conferences, such as those on Quantum Fluids and Solids. The experimental investigation of turbulent flows of superfluid helium-4, mainly by visualization, has been the focus of his research activity to date. His doctoral thesis specifically reports on a number of experiments investigating in unprecedented detail similarities and differences between flows of this unique liquid and those of classical fluids, such as water. More generally, his work belongs to the study of quantum turbulence, an active and challenging field of scientific research, which is not only interesting in its own right but that has also broader implications, related, for example, to turbulence in viscous fluids or to neutron stars. Note also that in 2016 he was awarded a three-year student grant by Charles University on a pertinent topic and that, during his doctoral studies, he spent a few months at CNRS Grenoble, France, for research projects that are discussed in the thesis – these stays abroad were partly supported by travel grants directly awarded to him by French and Czech institutions.

We met in 2014, when he became interested in the research performed at the cryogenic visualization laboratory of Charles University – I am responsible of this laboratory. It soon became apparent that he was not only willing to contribute to the laboratory scientific activity but also capable of doing so. Over the years he has learnt how to perform low-temperature experiments, including their preparation, and how to process the obtained data, which are both demanding tasks. He is also capable of applying his knowledge of physics to the interpretation of the obtained results in a fruitful manner. Additionally, I believe that he will soon choose by himself physical problems worthy of investigation – this is specifically testified by the little supervision that was required on my side for the recent second sound experiments he performed in Prague and Grenoble.

In summary, RNDr. Patrik Švančara has been a very diligent doctoral student and he has also demonstrated to a large extent the ability of performing independent scientific research. It is therefore easy for me to strongly support his application to be awarded a Ph.D. title after the successful defence of his doctoral thesis.

doc. Dr. Marco La Mantia, Ph.D.