

Statement of Purpose

Vo Chau Duc Phuong

January 7, 2025

As a member of Generation Z, I've experienced firsthand the transformative role technology plays in our lives, which has fueled my passion for its applications. During high school, I was part of a gifted physics program, which laid the groundwork for my scientific career. I participated in various competitions, earning two gold medals at the traditionally national 30/04 Olympiad for talented students and a bronze medal in a regional camp contest.

I began my academic journey at the University of Science, where I focused on pursuing my passion for physics. During my time there, I contributed to my team's success by achieving second place in the National Physics Olympiad for College Students. After completing my undergraduate studies, I was selected for the postgraduate program at the Abdus Salam International Center for Theoretical Physics (ICTP), which offered a comprehensive pre-PhD curriculum to further my education.

With this background, I am eager to apply for the PhD program in Physics at the University of Birmingham, under the guidance of Prof. Tom Sidan. My academic journey in solid-state physics, along with my research experiences, has deepened my dedication to advancing knowledge in this captivating field.

Graduating with an honours degree in physics from the University of Science, I achieved the top 1 position in my class. In the third year, I chose my major to be theoretical physics, where I studied and undertook significant research in both my two final years. My project focused on simulating group-VI dichalcogenide monolayers using the Tight-Binding (TB) method. This research allowed me to explore the exciton binding energy in transition metal dichalcogenides (TMDs) and compare my computational results with experimental findings. However, I found the limitations of this method, strain, and external field that can impact the stability of the system.

During my internship at the Ho Chi Minh Center of Physics in IAMI, I worked under the guidance of Dr. Huynh Thanh Duc. My project involved investigating the properties of monolayer TMDs and culminated in a presentation at The 2024 International Conference on Energy, Infrastructure, and Environmental Research. This experience not only honed my analytical and research skills but also provided me with insights into the latest advancements in solid-state physics in particular and condensed matter in general. Additionally, I developed proficiency in programming by optimizing Fortran and Python scripts to numerically solve the Semiconductors Bloch Equation, which significantly enhanced my computational skills.

In addition to my research activities, I am highly dedicated to teaching and mentorship. My engagement with the academic NES club at the University of Science has provided me with invaluable opportunities to learn from my seniors, particularly regarding representation skills and teamwork. As I took on a senior role, I prioritized sharing the knowledge and skills I gained from my experiences, both within the club and beyond, with incoming freshmen.

I have also attended several summer schools that deepened my understanding of essential topics, especially in solid-state physics and related fields. At the Math and Science Summer Program, I had the honour of designing and delivering lectures on Solid State Physics to high school and undergraduate students. This experience not only reinforced my knowledge but also sparked a passion for effectively engagingly presenting complex concepts.

Moreover, I am actively involved in volunteer efforts at my university and the Ho Chi Minh City Youth Union. During the volunteer spring campaign, I helped organize a warm Lunar New Year celebration for underprivileged students and their families. Additionally, in the Green Summer campaign, I prepared and presented a scientific report to high school students to inspire them to pursue careers in science and to showcase how scientific advancements can enhance our everyday lives.

Participating in the Vietnam School on Neutrinos gave me valuable hands-on experience with supercomputers, significantly improving my technical abilities. I was also honoured to represent Vietnam as the only selected student at the School on Fusion of ASEAN in Thailand. This opportunity broadened my expertise and enriched my collaborative and experimental skills while working with the GOLEM Tokamak and the Thailand Tokamak TT-1. It also symbolized the connection between Vietnam and the member states of the Association of Southeast Asian Nations (ASEAN).

Currently, I am enrolled in the post-graduate diploma program in the condensed matter and statistical physics at the Abdus Salam International Center for Theoretical Physics (ICTP) in Trieste, Italy. This experience has been transformative, placing me in a diverse academic environment that has sharpened my research capabilities and boosted my confidence as a physicist. Interacting with peers from diverse backgrounds has encouraged me to think critically and creatively about scientific challenges.

For further research interest, I currently investigating the topology in condensed matter physics. As scientists have researched many materials, there still are questions on the reaction of the system to the change in the external parameter. Berry phase has proven itself to be an interesting research field as it can be used to explain quantum phenomena such as the Quantum Hall effect. Another subject that catches my interest is experimental physics. As the ultimatum answer for science, experimental physics is an aspect that I have to understand before diving deeper into theoretical research. Even though there is a difference in theoretical and experimental physics, I am confident and ready to use the skills achieved while studying at the University of Science and ICTP to study and do a mix of research for the PhD project.

As I consider the next step in my academic journey, I am particularly excited about the prospect of joining the University of Birmingham. I am drawn to the program's emphasis on advanced research and innovation, and I am eager to contribute to ongoing projects in solid-state physics. I believe that my background in computational simulations and my passion for both research and teaching align well with the objectives of the PhD program. I am enthusiastic about the opportunity to further my studies at the University of Birmingham and look forward to the possibility of contributing to the academic community while honing my skills as a physicist. Thank you for considering my application.