Letter of motivation

Jacopo De Santis

April 7, 2021

To whom it may concern,

my name is Jacopo De Santis, and I am a 22-year-old Italian student with a bachelor's degree in physics. The main reason why I am applying for this master program in *Quantum Science & Technology* is that I believe this is absolutely the best choice to make my dreams come true: to live what is called the second quantum revolution as a protagonist. But first, I would like to briefly tell you about what brought me here.

In December 2020 I got my bachelor's degree in physics from the University of Trieste. Some of the classes that piqued my interest the most were *Quantum Mechanics*, held by Professor Benatti, and *Introduction to Quantum Optics*, held by Professor Fausti. In particular, Benatti's modern algebraic approach to quantum mechanics - based on the idea of developing the main concepts in finite dimensional systems first and only then moving on to laborious infinite dimensional wave functions calculations - taught me how to appreciate the simplicity and yet the power of the tools of quantum information theory (such as Bloch sphere and two-level systems, for instance). Moreover, for the exam of *Quantum Optics* I analyzed the BB84 QKD algorithm and one of its possible implementations using a conjugate homodyne detection system. This experience made me understand that the field that interests me the most is photonic quantum technologies. During summer and autumn 2020 I worked on my bachelor's thesis in experimental optics at Q4Q laboratory at Elettra Sincrotrone Trieste under the supervision of Professor Daniele Fausti. In particular, I took care of the commissioning of an infrared spectrometer to be implemented in the Pump & Probe set up in use to study phase transitions in high temperature superconductors. Although the topic of the thesis was not directly related to experimental quantum information, I really enjoyed the opportunity of working on a top-notch complex optical setup and strengthening my competences in experimental optics.

Due to the Covid-19 pandemic I decided not to start a master's degree immediately after my graduation, but rather to take a semester of break. I am trying to transform this forced stop into an opportunity, therefore I am working on my programming skills (Python and JavaScript in particular), and taking part to activities in the growing quantum community (hackatons, journal clubs and study groups). In particular, I looked for Summer internships to further improve my experimental skills. Fascinated by the work of Prof. Dr. Hugues de Riedmatten on quantum memories and of Prof. Dr. Morgan Mitchell on light atom interactions, I decided to apply for an internship at ICFO this summer. This is how I came to know about this new master's degree you are offering. It seems the perfect match for me. Indeed, during my bachelor years I realized that I wanted something more than just learning laws of physics, that is to see their technological applications. I therefore took part to the master's presentation on the 24th of March, and discovered that I am able to apply despite in Italy bachelor's degrees are only three years long. In the future I would like to apply for a PhD, so my best wish is to complete this master in *Quantum Science & Technology* and then another one-year master - maybe in photonics, still in Barcelona - before moving on to the next step of my education.