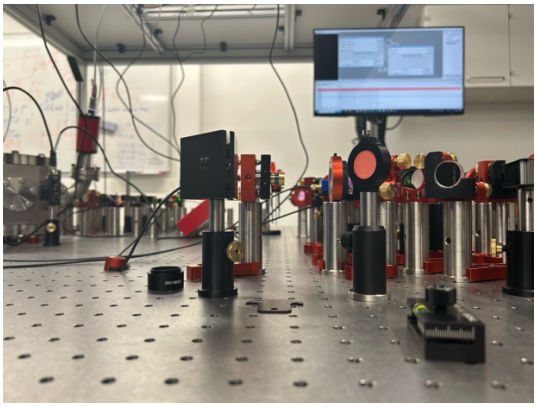
PhD Position in Quantum Levitodynamics

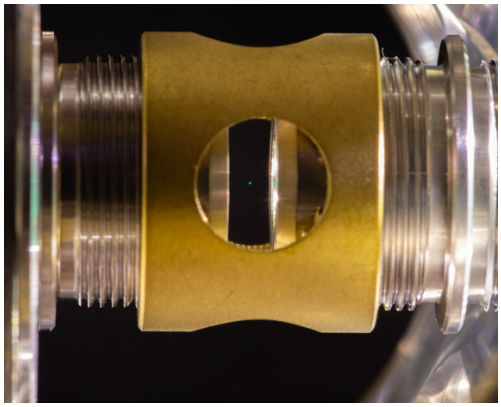
Faculty/Department	Faculty of Applied Sciences/Department of Quantum Nanoscience
Job type	PhD-position
Scientific field	Quantum Mechanics
Desired level of education:	MSc

Join us at TU Delft to levitate nanoparticles, harness quantum control, and explore how the macroscopic world can behave quantum mechanically!

Job description

Quantum physics has revolutionized the way we live—just think of the billions of transistors working to enable you to read this advert. But its phenomena only dominate at the “small” scale of atoms and molecules. Imagine being able to extend effects like quantum superposition or entanglement to “big” objects that we usually think of as classical particles. This is exactly what you will do at TU Delft. As a PhD student in Quantum Levitodynamics, you will explore how solid bodies, containing billions of atoms, can be made to behave like quantum systems, using techniques such as optical levitation, interferometry and active cooling to control their motion.





You will conduct research on how quantum effects can be exploited for nano and microparticles, building on our recent results. Levitation in vacuum allows the study of quantum-mechanical motion of macroscopic bodies, providing a way to explore the classical-quantum boundary at unprecedented mass and length scales. Combined with the quantum-limited measurement capabilities of optical interferometers, state estimation protocols and ultra-high vacuum engineering, such systems become extremely sensitive probes for a wide range of phenomena, including collisions, fictitious forces and gravitational fields to name but a few. Building on this framework, we have recently developed methods to manipulate the motion of levitated nanoparticles with a precision far better than its zero-point motion (ZPM). In this role, you will explore alternative quantum measurement schemes to prepare exotic quantum states. You will also help us bridge the gap with the macroscopic world and explore potential applications of such systems.

You will join a diverse and motivated team of academic staff and students in Delft. We foster an inspiring, friendly and supportive environment and meet regularly to share ideas and knowledge or socialize. As a PhD student, you will develop your levitation apparatus, run the lab, analyze the data, gain experience with modelling, coding, programming and operating complex equipment in our state-of-the-art lab. You will also receive all the training you need to develop as a scientist in this fast-moving field. This will give you great prospects for a professional career in the future.

Job requirements

As a highly motivated researcher, you want to work at the cutting edge of science. You have a particular affinity for quantum mechanics and enjoy discussing its intricacies. Driven by curiosity, you are creative, independent and eager to take the initiative. And you have the planning skills to deal with a very complex PhD project. You also have:

- An MSc degree in physics, or a closely related field.
- Knowledge of quantum mechanics, laser and optics is an advantage.
- General experience of experimental physics is preferred.

The outcomes of this project will be disseminated to the scientific community and a general audience through presentations at (inter)national conferences and through publications in peer-reviewed journals. You will also participate in English-taught Doctoral Education courses and write scientific articles and a final thesis. In addition, you may be involved in training and teaching BSc and MSc students. A certain level of English proficiency is therefore required, as well as the social skills to deal with many stakeholders.

We are committed to building a diverse and inclusive research environment, where different perspectives drive innovation. We strongly encourage applications from female researchers and individuals from underrepresented groups in physics—your ideas and talents are essential to shaping the future of this field!

If you would like more information about this role, please contact Massimiliano Rossi, project PI, by email at m.rossi-1@tudelft.nl. You can find more information about our lab on our website (https://rossilab.tudelft.nl).

Apply now!

Are you interested in this vacancy? Please prepare the following documents and send them via email to m.rossi-1@tudelft.nl specifying “PhD Quantum Optomechanics application” in the subject.

1. Cover letter, including (1) a brief personal introduction, (2) an explanation of how your previous studies and experience have prepared you for this position, and (3) why you are interested in this position. The maximum length is one page.
2. Detailed CV.
3. Copies of your BSc and MSc degrees and transcripts.
4. Names and contact information of at least two relevant references. We will not contact references without your consent.