Uniwersytet Gdański

NARODOWE CENTRUM NAUKI

International Centre for Theory of Quantum Technologies

STIPEND OFFER no. PhD_student_MP_2023_12

Position in the project:	**PhD position in project CHIST-ERA Call 2022 [MoDIC] no. DEC-2023/05/Y/ST2/00005**
Scientific discipline:	quantum physics
Involvement type:	Stipend contract
Number of positions offered:	1
Remuneration:	monthly stipend PLN 3.500 (gross stipend, tax included)
Position starts on:	**January 1st 2024** (negotiable for candidates who are already doctoral students the starting date is negotiable) **October 1st 2024** (for candidates who aren't doctoral students and already have MSc degree and candidates who plan to defend their MSc thesis no later than July 31, 2024)
Maximum period of contract	**36 months**
Institution:	**International Centre for Theory of Quantum Technologies,** **University of Gdansk, Poland**
Project leader:	**dr hab. Marcin Pawłowski, prof. UG**
Project title:	**Modern Device Independent Cryptography (MoDIC)** *The project financed within the Chist-ERA Call 2022 program by the National Science Center.*
Project description:	**About ICTQT** We are looking for **a PhD student Researcher** to work in Quantum Cybersecurity and Communication Group at the International Centre for Theory of Quantum Technologies (ICTQT), funded by the Foundation for Polish Science, and hosted by the University of Gdansk. The Centre's official foreign partner is IQOQI-Vienna of the Austrian Academy of Sciences. Gdansk is the pioneering and leading center of quantum information research in Poland. Gdansk, and the whole Tri-City, is one of the most beautifully located urban areas in Poland, with sandy sea beaches, lakes, and woods within in it and in the nearby area. It is the birthplace of Polish jazz and rock festivals, and vibrant in many fields. **The Centre consists of 6 groups:** Multiphoton Quantum Optics for Quantum Information (leader Marek Żukowski); New Quantum Resources (leader Paweł Horodecki); Foundational Underpinnings of Quantum Technologies (leader Ana Belen Sainz); New Quantum Resources and Thermodynamics (leader Michał Horodecki); Quantum Cybersecurity and Communication (leader Marcin Pawłowski); Quantum Open Systems in Relation to Quantum Optics (leader Łukasz Rudnicki).

	About the group The broad aim of the Quantum Cybersecurity and Communication Group would be to perform research concerning quantum phenomena which could be used for quantum methods for information transfer, coding and processing, aimed towards applied physics and possible commercialization. The goals of the group are: - Development of self-testing protocols - Security analysis of information processing protocols - Research towards increasing efficiency and reliability of quantum protocols - Studies of general rules for information processing - Studies on quantum hacking and cryptanalysis to identify possible attacks and ways of preventing them - Investigations of the role of information processing protocols as a tool to analyze the fundamental laws of Nature - Finding experimental, applied physics, and industrial partners and collaborating with them towards building commercial quantum devices, prototypes, or obtaining patents. About the “Modern Device Independent Cryptography (MoDIC) “project Quantum cryptography offers unprecedented levels of security but is susceptible to implementation level attacks, which exploit the differences between the theoretical model of the devices and their physical realization. Moreover, some hacking attacks can artificially induce such differences. This results in a situation in which the current generation of quantum technology is less trustworthy than the well-tested classical solutions. A new version of quantum cryptography – device independent can solve this problem as it is, by definition, impervious to physical flaws. Its name stems from the fact that inner workings of the hardware are not taken into account when testing security. The probability distribution of outputs being the only figure of merit. Unfortunately, state-of-the-art device independent experiments are many orders of magnitude too slow and work at much shorter distances than required for practical purposes. The aim of the project is to improve the theoretical background that device independent quantum cryptography is based on, to such a level that it becomes feasible in real life applications. We will achieve this by investigating new nonclassicality tests which are the foundation of whole quantum cryptography, streamlining security proofs and inventing new experimental setups. The goal of the PhD student will be designing efficient methods for numerical estimation of security parameters in device independent cryptography. Keywords: Device independent quantum information; quantum protocols; tests of nonclassicality; quantum cryptography; randomness generation.
Key responsibilities include:	1. Fulfilling the duties of a doctoral school participant in accordance with the study program. 2. Active scientific research. 3. Presentation and discussion of ideas and results with a diverse audience at the ICTQT and at the external events. 4. Active participation in seminars, group meetings, etc. organized by the ICTQT.

Profile of candidates/requirement	1. The candidate should hold a MSc degree in physics (preferable), computer science or mathematics. 2. The candidate should be interested in mathematical and conceptual foundations of quantum mechanics and quantum information, and related topics, especially those which are within the research agenda of ICTQT. 3. The candidate should be committed to working collaboratively within inclusive and diverse environment. 4. Experience in doing numerics on such platforms as Python is appreciated.
We offer:	1. Monthly stipend. 2. Work in a rapidly developing unit The International Centre for Theory of Quantum Technologies at the University of Gdansk. 3. Scientific and organizational support. 4. Basic equipment and core facilities. 5. Travel funds for scientific collaboration and participation in conferences. 6. Friendly, inspiring, interdisciplinary environment.
Required documents:	All required documents should be prepared in English: 1. Recruitment form. 2. Curriculum vitae. 3. A research resume with a list of publications, a list of ongoing research projects (with specification of candidate role in the research if unclear), a list of talks at conferences and workshops, and a list of prizes and awards; 4. Motivation letter (including a statement of current scientific interests) – up to 2 pages. 5. Documents confirming scientific degrees (copy of diploma); 6. Reference letters about the candidate sent directly by one senior researcher (the candidate is expected to contact the referee and ask him/her to send the reference letter directly to ictqt-careers@ug.edu.pl. The letter must be sent before the deadline).
Recruitment process:	1. The recruitment procedure has three stages: ○ Pre-selection candidates by the Selection Commission (SC), based on send documents; ○ Interview of pre-selected candidates by SC; ○ Recruitment to the UG Doctoral School of Natural Sciences or the UG Doctoral School of Quantum Information Theory (a formal procedure). 2. A PhD student position is offered to candidates who have received a MSc degree and who are already PhD students at other Universities/Institutions. 3. A PhD student position is also offered to candidates who plan to defend their MSc thesis no later than July 2024. 4. An interview is expected in December 2023. 5. ICTQT Selecting Commission (SC) reserves the right to invite for the interview only pre-selected candidates. 6. SC's decision is final and is not subject to appeal. 7. SC reserves the right to close the competition without selecting a candidate.

	8. The decision will be made by SC within 1 months from the date of recruitment completion. 9. In the event of resignation from accepting the position of the selected candidate, the SC has the right to send the offer to the person placed on the reserve list, and in the absence of such a list, the SC has the right to reconsider the applications submitted to the competition and to indicate a new candidate application submitted to the competition and to indicate a new candidate.
Submit application to:	ictqt-careers@ug.edu.pl
Application deadline:	December 12, 2023