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Warszawa, 14.07.2025

FORM FOR EMPLOYERS

INSTITUTION Center for Theoretical Physics, Polish Academy of Sciences
CITY Warsaw
POSITION PhD student fellowship
DISCIPLINE physics
POSTED2025-07-14
EXPIRES2025-08-08
WEBSITE www.warsaw4phd.eu
KEY WORDS: quantum information theory, entanglement, nonlocality, Brll in self-testing, quantum contextuallity

OPENING FOR PHD SCHOLARSHIP IN QUANTUM INFORMATION AT THE CENTER FOR THEORETICAL PHYSICS PAS

We are seeking candidates for one PhD position at the Center for Theoretical Physics of the Polish Academy of Sciences in Warsaw within the **SONATA BIS** project titlted "Characterization and certification of quantum resources" financed by the Polish National Science Centre (grant agreement no. UMO-2019/34/E/ST2/00369). The project's leader is dr hab. inż. Remigiusz Augusiak (http://raugusiak.weebly.com/).

Background:



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Quantum correlations, such as quantum entanglement and Bell nonlocality, are among the most fundamental, if not the most important, resources in quantum information theory. They are used, for example, in the quantum cryptographic key distribution protocols.

With the rapid development of quantum technologies in recent years such as random number generators and quantum computing devices the problem of thorough characterization and detection of these resources in realistic physical systems has become increasingly important. These include, in particular, many-body quantum states and quantum networks, i.e., systems composed of nodes connected in arbitrary ways via classical communication channels and entanglement sources, which are crucial for instance for quantum communication protocols.

Another fundamental challenge in the field of quantum technologies is the development of effective tools for certifying and validating the behavior of quantum devices, that is, verifying whether they operate according to specification, truly exploit quantum effects, and produce correct results. A key question in this context is whether a given device operates on a specific quantum state and performs the intended quantum operations. Of particular importance is the device-independent approach, which makes no assumptions about the internal workings of quantum devices. In this setting, Bell nonlocality plays a central role as the key phenomenon enabling such certification.

Main aims of the project:

- (i) Development of metods of characterization and detection of quantum entanglement and Bell nonlocality in many-body systems and quantum networks, with particular emphasis on systems with subsystems of arbitrary dimension;
- (ii) Application of Bell nonlocality for development of experimentally feasible methods for the certification of entangled quantum states and quantum measurements (so-called self-

testing).

The research has a fundamental character and will be conducted in collaboration with ICFO in Barcelona.

Requirements:

- Master's degree in physics or mathematics
- Very good command of English
- Very good knowledge of quantum physics
- Familiarity with basic concepts of quantum information theory
- High motivation for scientific research



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- Good programming skills
- Knowledge of mathematical methods in physics will be considered an asset
- Research experience in the field of quantum information will be considered an asset

Terms of Employment:

Scholarship: 4.700 zł net/month.

The employment period is 48 months, with the first 12 months funded under the SONATA BIS research project "Characterization and Certification of Quantum Resources", based on grant agreement no. UMO-2019/34/E/ST2/00369 from the National Science Centre (NCN). The remaining 36 months will be financed from other sources.

The scholarship will be awarded in accordance with the applicable laws in Poland and in accordance with the Resolution of the NCN Council no. 25/2019 of March 14, 2019, regarding the Regulations for the Awarding of NCN Scientific Scholarships in Research Projects Funded by the National Science Center.

Required documents:

- The scientific CV, including the progress in the university studies, scientific achievements (publications, participation in research projects and conferences), with the clause "I agree to the processing of my personal data contained in the application documents for the purposes necessary for the implementation of the process recruitment by the doctoral school WARSAW-4-PhD".
- 2. A cover letter, including a brief overview of previous achievements and planned future research.
- A copy of the Master's diploma or a statement from the supervisor confirming the 3. planned date of the Master's thesis defense.
- Copies of documents confirming scientific or professional achievements. 4.
- At least one letter of recommendation from an academic staff member with a 5. doctoral degree or higher, evaluating the candidate and their previous research activity.
- 6. Application for admission to the Warsaw4PhD Doctoral School.

Application submission:

Documents must be submitted electronically through the recruitment system available at https://warsaw4phd.eu/en/admissions/ between July 25, 2025 and August 8, 2025.



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All inquiries should be directed to the project leader at: augusiak@cft.edu.pl.

Selection Process:

Shortlisted candidates will be invited for an interview, which will be conducted via online communication platforms.

The final decision of the selection process will be announced by **September 15, 2025**. Candidates will be informed of the results by email.

Admission to the Doctoral School and the beginning of the fellowship are scheduled for **October 1, 2025**.

Information Clause - Job Recruitment

Information Obligation under the Article 13 of the RODO *:

1. Data Administrator

The administrator who is a deciding entity on how your personal data will be used is the Center for Theoretical Physics PAN represented by the Director with the seat in Warsaw Al. Lotników 32/46. You can contact the Administrator by using one of the contact forms available on the website: http://www.cft.edu.pl/

2. Data Protection Inspector

The Director of the Center for Theoretical Physics of the Polish Academy of Sciences has appointed the Data Protection Inspector (Inspektor Ochrony Danych - IOD) with whom you can contact in all matters relating to your personal data. You can contact the Inspector by sending an email to: iod@cft.edu.pl

3. The Purposes of Processing and the Legal Basis for Processing

Your personal data will be processed for the purpose of running the current recruitment.

The basis for the processing of personal data are the provisions of the Labor Code Act of June 26, 1974 (uniform text: Dz. U. of 2018, item 917) and based on your consent for data processing.

4. The Period of Storage of Personal Data

Your personal data will be kept for the duration of the present recruitment.



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5. Data Recipients**

The recipients of your personal data will be only entities authorized to obtain personal data on the basis of the law. Access to your data is provided only to employees authorized by the administrator and associates who must have access to the data to perform their duties.

6. Your Processing Rights

You have the right to access your data and the right to correct it or limit processing, as well as the right to appeal against the processing.

6. The Obligation to Provide Data and the Consequences of not Providing Data

Providing your personal data specified in the Labor Code is obligatory, and for the remaining extent voluntary.

7. The right to make a complaint to the President of the Office for the Protection of Personal Data
When you feel that the processing of personal data violates the provisions of the general regulation on the protection of personal data, you have the right to make a complaint to the President of the Office for the Protection of Personal Data.

Consent to Data Processing I consent to the processing of my personal data by the Center for Theoretical Physics PAN for the needs of:			
informatio		ey are truthful. I got acquainted with the contents of the above e and methods of processing personal data and the right to access	
		date, signature of the candidate	

^{*} Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46 / EC (general regulation on data pr