



**Offer #2024-07856**

## **Post-Doctoral Research Visit F/M Postdoctoral position in Quantum Information Theory**

**Contract type** : Fixed-term contract

**Renewable contract** : Yes

**Level of qualifications required** : PhD or equivalent

**Fonction** : Post-Doctoral Research Visit

### **About the research centre or Inria department**

The Inria Saclay-Île-de-France Research Centre was established in 2008. It has developed as part of the Saclay site in partnership with **Paris-Saclay University** and with the **Institut Polytechnique de Paris**.

The centre has [40 project teams](#), 32 of which operate jointly with Paris-Saclay University and the Institut Polytechnique de Paris; Its activities occupy over 600 people, scientists and research and innovation support staff, including 44 different nationalities.

### **Assignment**

The research project will explore quantum protocols based on the concept of quantum nonlocality and quantum networks (see [arXiv:2104.10700](#)). A non-exhaustive list of potential projects is:

- Methods for characterizing quantum correlations beyond the Bell scenario:
  - mathematical foundation of these methods (C\* algebras, noncommutative polynomial optimization): see e.g. [arXiv:2210.09065](#), [arXiv:2212.11299](#), [arXiv:2301.12513](#)
  - improve/find new algorithms for characterizing these correlations
  - numerical developpement of these algorithms, see e.g. [arXiv:2211.04483](#)
- Understanding the foundational implications of quantum correlations in networks, see e.g. [arXiv:2101.10873](#) and [arXiv:2105.09381](#)
- Develop the applications of network nonlocality to certification protocols, such as
  - randomness generation: [arXiv:2209.09921](#)
  - self testing of measurements and states: [arXiv:1807.04956](#), [arXiv:2201.05032](#)
- Adapt existing protocols for their experimental implementation
- Develop practical benchmarks of the concept of 'Genuine Multipartite Nonlocality' introduced in [arXiv:2105.09381](#)
- Develop SDP relaxations for condensed matter problems, see e.g. [arXiv:2212.03014](#), [arXiv:2310.05844](#), [arXiv:2311.18707](#), [arXiv:2311.18706](#)
- Explore the limits of quantum distributed computing, see e.g. [arXiv:1810.10838](#), [arXiv:0903.113](#)

Any other suggested research project in quantum information theory can be discussed (both from the physics, the computer science or the mathematical viewpoint).

### **Main activities**

The position will be funded through a QuantERA project involving a large european consortium: see the project website <https://project.inria.fr/compute/>

It will be achieved by collaborating with Marc-Olivier Renou, other members of the group (Xiangling Xu, Lucas Tendick, Isadora Veeren, and also Titouan Carrette and Filippo Vicentini), as well as the consortium members:

- Mariami Gachechiladze (TU Darmstadt, Germany) and David Gross (Cologne)
- Victor Magron (LAAS-CNRS, Toulouse, France)
- Igor Klep (University of Ljubljana, Slovenia)
- Antonio Acín (ICFO Barcelona, Spain)

Long stays in the groups of the consortium members will be encouraged.

The starting date is flexible.

### **Skills**

The applicant should hold a PhD degree in computer science, physics, mathematics, or a related field and have an excellent track record of publications in quantum information theory. Familiarity with Bell nonlocality, operator algebras, SDP relaxations of polynomial optimization problems, quantum correlation protocols, experimental physics and / or synchronous distributed computing is a plus.

## Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

## Remuneration

According to the candidate profil

## General Information

- **Town/city** : Palaiseau
- **Inria Center** : [Centre Inria de Saclay](#)
- **Starting date** : 2024-10-01
- **Duration of contract** : 2 years
- **Deadline to apply** : 2025-06-30

## Contacts

- **Inria Team** : AT-SAC AE
- **Recruiter** :  
Renou Marc-olivier / [marc-olivier.renou@inria.fr](mailto:marc-olivier.renou@inria.fr)

## About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

**Warning** : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

## Instruction to apply

**Defence Security** :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy** :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.

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