

## 1. Position identification

**Title of post : Postdoctoral position on experimental manipulation of trapped atoms for digital quantum computing**

**Type of contract : Post-doctoral contract**

**Category (A,B or C) : A**

**Contract/project period : 01.07.2024 - 30.09.2025**

**Expected date of employment : 01.07.2024**

**Proportion of work : Full time**

**Workplace : Institut de Science et d'Ingénierie Supramoléculaires (ISIS) – Centre Européen de Sciences Quantiques (CESQ)**

**Desired level of education : PhD or equivalent**

**Experience required : PhD and/or postdoc experience in experimental atomic, molecular and atomic physics**

**Contact(s) for information on the position (identity, position, e-mail address, telephone) : WHITLOCK Shannon, Professor, [whitlock@unistra.fr](mailto:whitlock@unistra.fr);**

**SEMAK Svitlana, Project manager, [ssemak@unistra.fr](mailto:ssemak@unistra.fr)**

**Date of publication : April 29<sup>th</sup> 2024**

**Closing date for the receipt of applications : 31 May 2024**

## 2. Research project or operation

The “European infrastructure for Rydberg Quantum Computing (EuRyQa)” project is aimed at establishing Rydberg quantum processors as a leading platform for scalable quantum computing in Europe. Assembling eleven partners from seven countries, EuRyQa is funded under the highly competitive Horizon Europe programme. Arrays of atoms or atomic ensembles in optical tweezers hold enormous potential for quantum technology applications, including quantum sensors, quantum simulators and quantum computers. However, it is an outstanding challenge to realize high fidelity quantum operations on large atomic registers. The University of Strasbourg operates a state-of-the-art ultracold potassium experiment with precisely controlled interactions mediated by highly excited Rydberg states. As part of the EuRyQa project, we are developing new strategies for controlling quantum states of many atoms using precisely shaped laser fields.

## 3. Activities

➤ **Description of the research activities :**

The successful candidate will conduct independent research and work with the group of Professor Shannon Whitlock on the operational prototype quantum processor based on ensembles of K atoms for scalable quantum computing. The focus of the research project concerns the manipulation of atomic systems with light fields toward the realization of quantum logic gates and many-body quantum states in trapped atom arrays using amplitude and phase shaped laser pulses.

➤ **Related activities :**

The post-doctoral researcher will help manage day-to-day activities in the lab, upgrade parts of the experiment and provide guidance to PhD researchers in the group. It is expected that the researcher will publish papers and present research results at national and international conferences.

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## 4. Skills

➤ **Qualifications/knowledge :** We require experimental experience in atomic, molecular and optical physics, including optics, lasers, and experimental automation.

➤ **Operational skills/expertise :**

Proven record of research in atomic physics, publications and presentations, external research grants, or other relevant indicators. Some expertise in numerical modelling would be beneficial but not essential.

- Demonstrated ability to conduct research collaboratively and independently.
- High-level communication skills.
- Experience in supervising postgraduate students is considered favourably

➤ **Personal qualities :** curiosity, strong motivation for research, ability to learn new subjects. Ability to work in group. Skills for written and oral presentation of research results.

## 5. Environment and context of work

➤ **Presentation of the laboratory/unity :**

We offer the possibility to do exciting experiments embedded in a culturally and scientifically rich research environment, situated in the heart of Europe. The new European Centre for Quantum Sciences (CESQ), attached to ISIS (Institut de Science et d'Ingénierie Supramoléculaires), develops new lines of research and technology exploiting quantum principles, at the frontiers to chemistry, physics, materials science, and computing. CESQ hosts an operational prototype Rydberg quantum processor based on optically trapped Rydberg atom qubits and leads the development of the next generation dual species Rydberg quantum computer with >400 fully addressable qubits for scalable digital QC (aQCess - Atomic

Quantum Computing as a Service) currently under construction. For more information and recent publications, visit: [eqm.unistra.fr](http://eqm.unistra.fr) / [aqcess.cesq.fr](http://aqcess.cesq.fr)

➤ Hierarchical relationship : The EQM lab is lead by Shannon Whitlock with Tom Bienaime as Senior Scientist. The postdoctoral will be a member of the CESQ, currently directed by Guido Pupillo.

➤ **Special conditions of practice (notice attached): None**

**To apply, please send your CV, cover letter and diploma to :**

WHITLOCK Shannon [whitlock@unistra.fr](mailto:whitlock@unistra.fr);

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