

## Internship and Research program in Quantum Technology – South Korea

[The Ministry of Science and ICT of Korea](#) encourages excellent Korean students and researchers (Master/PhD students and Post-doctoral researchers) in Quantum technology to experience Swiss ecosystem in quantum science and technology (universities, research institutes, companies). The ministry supports travel and living costs of the selected students/researchers through the program run by [QCenter](#).

The program consists in two types of scholarships covering travel and living allowance.

Type	travel & living cost	Duration	Comment
Graduate students (Master/PhD)	Max. 30Millions KRW (20,500CHF)*	6 months	Additional 6 months can be extended up to request of students
Post-doctoral researchers	Max. 70Millions KRW (47,800CHF)*	1 year	Additional 1 year can be extended up to request of researchers

\*exchange rate (26 May 2023)

### Timeline for the program

- Launch pre-announcement: Mid-June 2023
- Call launch: End of June
- Call closed: End of July
- First review by Qcenter: Mid-August
- **Second review CV, research plans of applicants by Swiss hosting organizations: End of August to Early September**
- Final decision by Qcenter: Mid-September
- Start Program: Between September–October (Earliest start date depending on agreement of applicant and hosting organization)

At the end of the program, the Korean participants shall submit to the Qcenter a final report about their research report based on the initial plan agreed with the Swiss hosting organizations. (For postdoc, an interim report is required)

Swiss organizations interested to receive Korean students/researchers supported by Korean ministry can submit the following form to: [seoul.science@eda.admin.ch](mailto:seoul.science@eda.admin.ch)

#### General Information and host organization key contact

<b>Organization Name</b>	<b>Paul Scherrer Institut / ETH Zurich</b>
<b>Organization address</b>	<b>Quantum Photon Science Group / Quantum Technologies Group</b>
<b>Type of Research (Keywords)</b>	X-ray Quantum Optics, X-ray Time-Domain Interferometry, Fully Coherent X-ray Laser
<b>Contact person (name, first name)</b>	<b>Gerber, Simon Aeppli, Gabriel</b>
<b>Contact person email (internal use only)</b>	<a href="mailto:simon.gerber@psi.ch">simon.gerber@psi.ch</a> <a href="mailto:aeppli@ethz.ch">aeppli@ethz.ch</a>
<b>Contact person phone number (internal use only)</b>	<b>+41 56 310 39 65 +41 44 633 66 84</b>
<b>Organization website (link)</b>	<a href="http://www.psi.ch/en/lxn/quantum-technologies">www.psi.ch/en/lxn/quantum-technologies</a> <a href="https://qt.ethz.ch">https://qt.ethz.ch</a>
<b>Max number of students/researchers to host in the Swiss organization</b>	<b>Graduate students (Master/PhD): 0 Post-doctoral researchers: 1</b>

#### Organization / Research description

Our efforts are based at the Paul Scherrer Institut, Switzerland's largest research institute specializing in large-scale facility research, including the development, build-up and use of accelerator-based photon sources such as the SwissFEL X-ray free-electron laser. Our group uses these sources to investigate and develop coherent control and detection schemes to gain fundamental insights of quantum condensed matter systems and for the purpose of quantum information processing.

The proposed project aims at working towards a fully coherent X-ray laser which will open the door for X-ray time-domain interferometry and X-ray quantum optics (see also [www.psi.ch/en/science/scientific-highlights/opening-the-door-to-x-ray-quantum-optics](http://www.psi.ch/en/science/scientific-highlights/opening-the-door-to-x-ray-quantum-optics)). To do so, we pursue two directions: On the one hand, optical laser-based seeding will be implemented locally at the soft X-ray beamline of SwissFEL to generate mode-locked X-ray pulses. On the other hand, we have recently also devised a solution for accelerator-based generation of coherent copies of X-ray pulses, where the PAL-XFEL at the Pohang Accelerator Laboratory is ideal for an experimental demonstration due to its ultrahigh-resolution self-seeding capabilities.

The postdoctoral researcher on this project will be directly supervised by the two hosts, Dr. Simon Gerber and Prof. Dr. Gabriel Aeppli. Research will be conducted in close collaboration with an interdisciplinary team of local accelerator simulation (Dr. Sven Reiche and Dr. Eduard Prat) and laser-seeding (Dr. Alexander Trisorio and Prof. Dr. Adrian Cavalieri) experts, as well as, the respective teams from PAL-XFEL, whom we have already contacted about this project which will serve to cement a substantive long-term scientific relationship between Korea and Switzerland.

#### Task description (If you have, max 1000 characters)

You will develop theoretical concepts for the experimental exploitation of phase-locked soft and hard X-ray pulses, and calculate expected signal strengths for respective experiments at free-electron lasers, e.g., both SwissFEL and PAL-XFEL.

In close collaboration with members of our interdisciplinary team – with expertise in quantum condensed matter physics, X-ray scattering and accelerator physics – you will line up and perform the experimental verification of the developed concepts at SwissFEL and PAL-XFEL with the goal of demonstrating the applicability for X-ray time-domain interferometry and X-ray quantum optics experiments. You will also be expected to publish the scientific results, and present them at conferences and workshops.