

Strategic considerations for a new call for quantum research projects

By the Swiss Quantum Commission (SQC)

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1. Preface

The Swiss Quantum Initiative (SQI) aims to further strengthen the leading position of Switzerland in the field of quantum research, technology and application. To this end, the SQC has commenced its work in January 2023.

This document outlines a first set of considerations of the SQC with regards to strategic boundaries for a new call for research projects. The call is expected to be conducted by the Swiss National Science Foundation (SNSF).

Aiming specifically at a new call for research projects in 2023 and 2024, this document does not intend to provide a comprehensive vision for the future Swiss quantum landscape. Neither is it a strategy document for further activities within the SQI beyond this call. The Commission will deliberate on the strategic agenda for the SQI and develop it, step by step, in an ongoing dialogue with stakeholders in the research community and beyond.

With a view on already running and initiated quantum programs, the SQC acknowledges the immense contributions to quantum research and innovation within Switzerland to date and would like to strengthen and augment these developments with a new call.

The SQC is aware of the limited financial investment which is available for this research call for 2023 and 2024. Given this and with a view at tolerable success rates for applicants, the Commission recommends to focus the scope of this call on specific topic areas and goals as indicated below.

2. Considerations on the scope for a new research call

The rapidly developing landscape of quantum research comprises a wide range of fundamental research and applied research activities and it would seem premature to attempt a comprehensive and conclusive definition of the field(s) at this point. However, as working definitions towards the scope of this call, the SQC presently uses established terminology on research and applied research domains. In particular, relating to the developments of the so-called “second quantum revolution”.

The so-called “second quantum revolution”: Mastering quantum systems on the individual quanta level and engineered entanglement

The SQC recommends to support qualified researchers who perform research with self-chosen goals independently on the following topics:

- a) **Quantum communication** (including but not limited to quantum key distribution, quantum repeaters and communication between quantum computers)

- b) **Quantum computation** (including but not limited to quantum processors and architecture, new qubits, error correction, algorithms)
- c) **Quantum simulation** (*including but not limited to quantum simulators incl. atomic and solid-state systems and synthetic quantum materials exhibiting entanglement, algorithms*)
- d) **Quantum sensing and quantum metrology** (including but not limited to sensing platforms and approaches, algorithms, entanglement-enhanced sensing, quantum metrology standards, clocks)

Furthermore, applications in the following fields are welcome if they are key to the physical systems or engineering technologies within one of the above topics a) to d):

- Materials for quantum devices
- Quantum control hardware
- Quantum theory
- Computer sciences

Both, submissions from individual applicants and from research collaborations are possible. The SQC encourages researchers to establish, foster and extend new collaborations between different research groups and institutions in Switzerland and internationally.

In order to further strengthen the long-term attractiveness of Switzerland for scientists, the call should be formulated especially with early-career researchers in mind who would like to carry out, manage and lead an independently planned project at a Swiss university or research institution.

3. Goals

While the aim of the Swiss Quantum Initiative is to identify and enable contributions along the entire value chain from research to application, the SQC recommends dedicating this initial call to fundamental research, supporting the following goals:

- **Promoting excellent scientific research.**
The fields of quantum research and applications are still emerging and the Commission considers it important to continuously strengthen research capabilities within Switzerland, especially given recent complications relating to the EU/Swiss relationship.
- **Supporting and retaining talent in Switzerland.**
The SQC follows a long-term perspective with the present initiative. With a view on recent developments vis-à-vis the European research landscape and the detrimental effects for Swiss-based researchers, this call should encourage the participation of young scientists.
- **Providing additional access to equipment funding.**
Experimental work in quantum science is highly technical and benefits from state-of-the-art equipment. This calls for an augmented approach compared to the standard SNF research funding model which strongly favors funding for staff costs. The purchase of necessary equipment and equipment-related services up to 300 k CHF should be possible.
- **Extending and fostering collaborations.**
This national initiative aims to further strengthen the leading position of Switzerland in the field of quantum research, technology and application. A strength in quantum research is the commonality of ideas across different platforms, which creates an interdisciplinarity, including but not limited to different areas of physics, engineering, and information science. In addition to excellent research projects *within* established research institutions, there is room for and benefits from fostering *new* collaborations, partnerships and e.g., sharing of knowledge, experience and infrastructures. This includes researchers at higher academic research centers, non-commercial research centres outside the higher education sector and project partners from industry and abroad as needed.