11th Call for proposals for interdisciplinary Seed Fund Projects – thematic call: Engineering challenges of scalable quantum information processing (QIP)

Background
The Exploratory Research Space @ RWTH Aachen (ERS) is a section within the university that supports the generation of new and unconventional ideas. It will comprise activities which give a leeway for creativity to both senior and junior researchers and which foster interdisciplinary exchange and discussion. One activity is the funding of Seed Fund Projects. The typical duration of a Seed Fund Project is 6 to 12 months.

1. Description of the research field
The field of quantum information processing (QIP) embraces all efforts aimed at exploiting essential aspects of quantum mechanics for processing information. This change of paradigm is expected to enable an exponential speed-up for certain computational tasks and to put a firm physical basis to the security and privacy of data. Along with other quantum technologies, the field is currently attracting major attention, which is manifest in substantial private investment and large-scale research programs such as the EU Quantum Technology Flagship and a national effort planned by the BMBF. Further strengthening QIP research is also prominent in the research strategies of the RWTH and of the Forschungszentrum Jülich (FZJ).

The basic building blocks of quantum-information processing-devices are the quantum mechanical bits (qubits). So far research has focused mostly on questions related to the physics of qubits, and the technologies for creating and manipulating qubits. It is foreseeable that competences available, for example, in the engineering disciplines but currently underrepresented in the field will become increasingly relevant for working towards practical applications, which require much more complex systems than those currently available. Examples include system architecture, the classical control-infrastructure for manipulating a large number of qubits (circuit designs, cryogenic electronics, systematic modelling...), high-yield implementation of multi-qubit devices, packaging and software infrastructure.

With its engineering strength and its substantial (mostly physics-oriented) QIP research activities within JARA, the RWTH is in a strong position to build a convergent research effort in the field of QIP, with major contributions from other disciplines. This topic-specific ERS Seed Fund-Call aims at promoting this development by bringing new players with relevant competence into the field.

2. Type and aim of projects:
The aims of the proposed projects should address specific research targets of QIP, preferably relating to scalable solid-state approaches. The activities should be original,
creative and bring complementary expertise into (local) QIP research. They must not already be addressed by national or international public funding programs, and should contribute to extending the base of QIP research within JARA in a convergent way. The funding should thus primarily benefit groups that do not yet have major QIP research activities. The participation of QIP experts is nevertheless recommended and their activities necessary for an effective collaboration can also be supported. Proposal packages that aim at creating a larger coherent effort are particularly welcome.

3. Selection and evaluation criteria:
The projects will be selected and evaluated by an evaluation group. The selection process may involve external experts.

The selection criteria for submitted proposals will be
- Originality (new, creative, explorative),
- Interdisciplinarity (participation of researchers from different disciplines ideally involving different departments, participation of researchers with relevant expertise for QIP but without current major activities in the field in cooperation or consultation with established players),
- Subsidiarity (funding through other sources is not yet possible),
- Team structure (senior and/or high-potential young researchers, new and established players in QIP),
- Potential impact on the research strategy and structure of RWTH Aachen,
- Adequateness of research approach,
- Adequateness of research data management plan.

Major evaluation criteria after project completion will be the quality of obtained research results and the future perspectives of the research topic as described in a final report which has to be provided 18 months after project closure:
- A promising proposed third-party funded follow-up project (DFG, BMBF, EU, …),
- Publications in peer reviewed journals,
- Granted patents or promising patent applications.

4. Funding
The budget for a Seed Fund Project is provided by the “Hans Hermann Voss-Stiftung” and the excellence initiative of the German federal and state governments and makes allowances to the allocation model aiming for 30 % share of females funded by the Institutional Strategy. The total budget for all new Seed Fund Projects in the field of QIP is at most 300,000 €. Half of the budget must be spent within 2018 and the other half in 2019. This will need to be done with two separate accounts. Funds cannot be transferred from one account to the other.

Eligible costs are: Staff expenses, travel and subsistence costs, support for workshops and conferences, hiring students to work on the project, consumables and equipment.
5. General conditions
Research Partners: typically 2-3 researchers from different disciplines, ideally involving different departments.

We encourage the participation of young scientists (junior professor, group leader, research fellow, etc.) who are scientifically independent and are leading a research group.

The researchers should not be part of the same institute.

Joint Proposals with partners from Forschungszentrum Jülich (FZJ) are welcome. The research topics and the expertise of the FZJ partners must be different from those of the RWTH partners and they have to complement each other. The funding for the partners from FZJ needs to be provided by their institutes and cannot be covered by RWTH Aachen University.

Each research team (professor with his/her group) can participate in a maximum of 3 Seed Fund Project Proposals.

Progress evaluation: final report

6. Proposal structure and content
Length of proposal: 10 pages max., type size: Arial 11, line spacing: 1.5

- Project partners and principle investigators
- Summary
- Current State-of-the-Art
- Relevant work of the applicants
- Goals and approach (methodology)
- Working plan
- Financial plan
- Expected long term impact (targeted third party funding, implementation of new scientific infrastructure, new significantly visible, interdisciplinary competences, action plan to achieve these strategic goals)
- Research data management plan
- References

Language: English or German

Please note: Proposals that do not comply with the formal criteria will be excluded from the reviewing process.

7. Deadline for submission: 20th March 2018

8. Project start: July 2018

9. Project duration: 6 to 12 months
10. Please apply at: [http://portal.ers.rwth-aachen.de](http://portal.ers.rwth-aachen.de)

**Call:** Quantum information processing

11. **Preparatory workshop**

It is planned to organize an internal workshop to bring interested researchers together and to give an overview of (some of) the challenges for QIP before the proposal deadlines. Participation is encouraged but not required. Please contact ers to express interest.

For additional information on the selection process, please refer to our website: [http://www.rwth-aachen.de/ers](http://www.rwth-aachen.de/ers)

**Contact:**

Dr.-Ing. Vera Eckers  
Exploratory Research Space  
RWTH Aachen  
Wüllnerstr. 5b, 52062 Aachen  
Tel. 0241-80-90492  
Fax. 0241-80-92490  
E-mail: ers@ers.rwth-aachen.de