

German Federal Ministry for Research and Education

Call for project proposals

Funding directive regarding the topic

“Quantum international - International Cooperation in Quantum Technology”

Translation of selected excerpt

Date: 19.05.2023

1 Aim and purpose of funding, legal basis

The Federal Ministry of Education and Research (BMBF) intends to promote international cooperation in quantum technologies as part of its “Research Programme on Quantum Systems. Developing high-tech. Shaping the future.” (“Forschungsprogramm Quantensysteme. Spitzentechnologie entwickeln. Zukunft gestalten.”)

Quantum technology is an important futures field and plays a central role in both Germany’s and Europe’s technological sovereignty. Quantum computers promise to perform calculations that will remain unsolvable for conventional computers well into the future. Quantum sensors open up opportunities, for example, for new processes in medical diagnostics and for GPS-free navigation. Exploiting the full potential of these technologies, however, usually requires an interplay between their various components. For example, the accuracy of processors, the robustness of lasers and the efficiency of detectors all play an essential role. This also applies to the highly specialised expertise needed to build successful quantum-based systems. The task at hand, therefore, is to bring together the best players from a range of different countries, consolidate resources for joint research and development (R&D), and both inspire and train the quantum technology specialists needed now and in the future.

1.1 Aim of funding

Germany along with its European partners aims to achieve technological sovereignty in quantum technologies. It is thus essential that they are able to build their own quantum technology systems and produce their key components. Germany cannot master the tremendous challenges this poses alone. It must thus cooperate with value partners – as equal partners – in Europe and beyond.

The challenges this brings are many and varied: Quantum technologies must be further developed with a strict focus on application. This calls for collaboration between a wide range of scientific and technical disciplines, and the inclusion of private sector companies in the research performed. Complex technical challenges need to be solved to enable development of scalable quantum

computers and build quantum sensors in sufficiently compact form for use. Individual components must be significantly improved technologically. Specialist expertise is also required in both the manufacture and use of quantum technologies. The first signs of a shortage of skilled workers can already be seen.

Based on the challenges outlined above, this funding directive has two sub-objectives:

- A) To bring together German and international research partners from science and industry with complementary cutting-edge expertise in the respective disciplines to perform collaborative research and development work (R&D).
- B) To inspire and motivate German and international specialists of today and tomorrow to rise to the challenges posed by quantum technologies and prepare them for the task by providing vocational and continuing education and training.

At national level, these aims are already being pursued by means of various funding measures as part of the BMBF “Research Programme on Quantum Systems. Developing high-tech. Shaping the future.”. The realistic and ambitious goal of the international funding directive is to strengthen national measures in a synergistic approach. This is to be achieved during the lifecycle of the respective projects. Criteria for success in achieving objective A include patent registrations, publications and especially the transfer of results from science to practice. For objective B, focus is placed among other things on the number and quality of newly developed international vocational and continuing education and training approaches, and the reach of the measures involved (number of skilled workers and talents). Overall, the funding directive is designed to accelerate joint international advancement of quantum technologies and enable participating companies and research institutes to position themselves collaboratively in the international market.

1.2 Funding purpose

The purpose of funding directive is to promote international cooperation between universities, research institutes and companies in developing quantum technology. The funding directive also provides a framework for international cooperation, especially at bilateral and trilateral level. Although Germany already has a comprehensive innovation ecosystem in place, collaborative research in the form of international consortia or partnerships in selected areas should facilitate faster progress. The funding enables researchers to find the best collaboration partners and, through targeted and close cooperation, achieve long-term advantages for the partners involved.

For objective A, funding will be provided for technological research and development (R&D) projects involving quantum technologies. For objective B, projects will be funded which in the form of pilot or model projects tackle the challenges involved as regards motivation and vocational and continuing education and training of the skilled workers needed now and in the future. For this reason, in the development of new formats, projects should take in the different international perspectives of quantum technology providers and users.

The results of a funded project may only be used in the Federal Republic of Germany, the EEA and Switzerland; results may be used in countries outside the EU solely subject to prior written approval from the funding provider in the respective project partner countries.

2 Funding object

Funding is split across the two modules: A – “Advancing Technology” and B – “Motivating skilled workers and talents, providing vocational and continuing education and training”. The modules do not build on one another.

Module A: Advancing Technology

Funding is provided for application-oriented, international collaboration projects involving quantum technologies where faster and more effective progress can be verifiably expected when compared with purely national projects.

Research topics can include the following:

- New methods for quantum error correction
- Chip integration of optical components, e.g., for photonic quantum computing
- Platforms and materials for quantum simulation
- Interfaces between quantum computers and communication systems
- New architecture and programming paradigms for quantum calculations, including hybrid approaches
- Micro and nano quantum sensors

This list is not exhaustive and serves only to provide examples. Projects which exclusively address quantum communications can be funded through the Federal Government’s “IT-Sicherheit “Digital. Sicher. Souverän.” funding programme (IT Security. Digital. Safe. Sovereign.).¹

That private sector companies play a central role is a prerequisite in Module A.

Module B: “Motivating skilled workers and talents, providing vocational and continuing education and training”

This module is designed to fund targeted collaboration between different vocational and continuing education and training systems in the quantum technology sector. Topics could include:

- Development and pilot/model project-based implementation of international study programmes
- Development and implementation of international student academies/summer schools with a strong focus on application (e.g., similar to the Quantum Future Academy)
- Design and pilot/model project-based implementation of innovative measures and low threshold training programmes for vocational and continuing education and training of potential users of quantum technologies
- Design and pilot/model project-based implementation of innovative measures and low threshold training programmes for target group-appropriate motivation of potential users of quantum technologies
- Introduction of targeted international exchange programmes between industry and research institutes and/or universities to simplify both knowledge transfer and requirements (e.g., collaborative doctoral programmes, sabbatical programmes for temporary secondment of employees from industry to research and vice versa)

¹ Please turn to the following website for more information: <https://www.forschung-it-sicherheit-kommunikationssysteme.de/>

- Design of innovative, research-related elective subject content, taking account of industrial users' needs

This list is not exhaustive and serves only to provide examples. In each of these formats, a strong focus on application is required.

3 Funding recipients

Applications may be submitted by private sector companies, universities, and non-university research institutions. Applicants are required to have a plant or branch (company) or another entity serving the non-commercial activities of the funding recipient (universities, research institutions) in Germany at the time the grant is paid out.

Only under certain conditions can research institutions which receive basic funding from the Federal Government and/or the Länder be granted project funding supplementary to their institutional funding to cover additional project-related expenditure or costs.

For the conditions under which funding constitutes or does not constitute state aid and the extent to which funding can be provided without constituting aid, please see the European Commission's Framework for State Aid for Research, Development, and Innovation (R&D&I).²

Small and medium-sized enterprises (SMEs) as defined for the purposes of this funding directive are companies that meet the requirements of the EU definition of SMEs.³ In their written application for funding, applicants will declare to the granting authority their classification pursuant to Annex I of the General Block Exemption Regulation (GBER).

4 Special prerequisites for funding

The prerequisite for funding is cooperation in the form of an international collaborative project. Normally, funding recipients from Germany will collaborate with partners from one or two other countries. Each project partner in the collaboration must have access to funding in an amount of at least €100,000. The international partners must provide plausible proof of the availability of the respective funds (see also Section 7). Ideally, available funding should be distributed as equally as possible between the countries involved. Under no circumstances may partners from a given participating country account for more than 70 percent of the total funding available to a collaborative project.

The partners in a collaborative project will set out the terms of cooperation in a written agreement. All project partners, including those which are research institutions as defined in Article 2 (83) of the GBER, must ensure that companies do not receive any form of indirect aid as part of the collaboration. The provisions of Section 2.2 of the EU Framework for State Aid for R&D&I must be observed.

² Please see EU Commission communication (2014/C 198/01) of 27.06.2014 (ABl. C 198 of 27.6.2014, p. 1 ff.) in the version of the communication of the EU Commission C(2020) 4355 final of 02.07.2020 (ABl C 224 of 8.7.2020, p. 2) especially section 2.

³ Please see [<http://eur-lex.europa.eu/legal-content/DE/TXT/PDF/?uri=CELEX:32003H0361&from=DE>].

5 Type, scope and rates of funding

Funding will be awarded in the form of a non-repayable project grant.

Grants for private sector companies and for projects of research institutions which fall into the category of economic activities⁴ will be calculated based on the eligible project-related costs. Part of these costs can be covered, taking legislation on state aid into account. The BMBF's policy requires that applicants make an appropriate own contribution towards the eligible costs incurred.

For the purposes of this funding directive, it is deemed appropriate when the own contribution covers at least 50 percent of the eligible costs incurred. A lesser own contribution can, however, be deemed appropriate for SMEs. This means that the funding rate can be increased by 20 percent for small businesses and by 10 percent for medium-sized businesses. A further increase of the funding rate will not be granted.

Grants for higher education institutions, research and science institutions and similar establishments that do not fall into the category of economic activities are calculated based on the eligible project-related expenditure (in the case of the Helmholtz centres and Fraunhofer, eligible project-related costs), up to 100 percent of which can be funded in individual cases, taking legislation on state aid into account.

In the case of non-commercial research projects at universities, a flat-rate grant amounting to 20 percent of total expenditure will be awarded in addition to the eligible expenditure funded by the BMBF.

Eligible expenditure/costs are governed by the BMBF's regulations governing applications for expenditure-based grants (AZA) and/or cost-based grants (AZK).

The duration of a project is usually three years.

In Module A – Advancing Technology, it is expected that, given their involvement in project implementation and commensurate with their capabilities, private sector companies contribute appropriately to the expenses incurred by higher education institutions and publicly funded research institutions, provided that the latter participate as consortium partners. An appropriate contribution is deemed to have been made if, in total, the partners in the consortium contribute at least 20 percent of the total costs/expenses of the collaboration project. This amounts to a funding rate of 80 percent for the collaboration project.

7 Procedure

7.1 Involvement of a funding agency, application documents, other documents, and use of the electronic application system

The BMBF has currently entrusted the following funding agency (PT) with implementing the funding measure:

⁴ For the definition of economic activity, see notes under number 2 of the EU Commission's communication on the concept of state aid (ABl. 2016 C262 of 19.7.2016, p. 1) and section 2 of the R&D&I Union framework.

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Additional information on potential (value) partner countries and the respective funding opportunities can be obtained, for example, from either the International Bureau (<https://www.internationales-buero.de/en/index.php>) or the EU Bureau (<https://www.eubuero.de/en/index.html>) operated by the BMBF.

Any modifications will be announced in the *Bundesanzeiger* (Federal Gazette) or in another suitable form.

Application forms, guidelines, information for applicants and the auxiliary terms and conditions are available online at:

https://foerderportal.bund.de/easy/easy_index.php?auswahl=Formularschrank&formularschrank=bmbf and can also be obtained from the project management agency cited above.

The “easy-Online” electronic application system must be used for drafting project outlines and formal proposals (<https://foerderportal.bund.de/easyonline>). The portal enables electronic submission of the application which must be submitted in writing. An electronic document that bears a legally recognised digital signature is sufficient for electronic submission.

7.2 Two-step application procedure

The application procedure consists of two separate steps.

7.2.1 Submission and selection of project outlines

In the first step, project managers are required to register by telephone by calling the funding agency cited in 7.1 above. Project outlines which are ready for evaluation can then be submitted in electronic form. The “easy-Online” electronic application system must be used for both drafting and submitting project outlines (<https://foerderportal.bund.de/easyonline>). For collaborative projects, the joint project outline must be submitted by the coordinating entity.

The deadlines for submitting project outlines are May 15 and November 15 of a given year. The final deadline for submitting formal proposals is 15 November 2026. These submission deadlines are not cut-off deadlines. However, it could happen that project outlines received after a specified deadline cannot be considered until the subsequent deadline (i.e., six months later).

Project outlines should not exceed 20 DIN-A4 pages (Arial 11, 1.15-spaced, margin 2 cm), including the cover sheet and attachments. The accompanying project description should usually be prepared in English and be structured as follows:

- a. Project title and acronym
- b. Name and address of the applicant, including telephone number and e-mail address
- c. Project objective and aims
- d. Description and added value gained from international cooperation
- e. State of the art in science and technology, and own preliminary works on the research question addressed by the project (publication list in a separate attachment)
- f. Brief description of the project partners
- g. Preliminary work performed and networking within the Community
- h. Consortium structure and work programme of all partners involved
- i. Rough financial plan (including figures concerning the international partners)
- j. Exploitation plan, use concept for third parties, relevance as regards practical application, societal relevance, and market potential, and, where applicable, the patent situation – including an evaluation regarding both the use and scalability of the results after project completion.

In addition, the contact details of and a declaration of intent from the project funders of the participating countries must also be submitted. These should indicate the availability of the required project funds – subject to a mutually agreed positive evaluation of the project outline. Deviation from the prescribed project outline structure may be allowed with prior consent from the project funding agency in cases where international cooperation makes this necessary. This includes the addition of further sections.

When preparing the project description, it is recommended that the commented sample structure provided under the following link be used:

https://www.quantentechnologien.de/fileadmin/public/Redaktion/Dokumente/Formularschrank/Service/Musterskizze_QT_Internationale_Kooperation_v4_C1.doc

The project outlines received will be evaluated on the basis of the following criteria:

- Accordance to the funding announcement from a scientific/ technical perspective
- Level of innovation and quality of the scientific-technical approach or the concept for education and training
- Quality and robustness of the utilisation concept, especially concerning the inclusion of companies from the private sector
- Contribution to the technological sovereignty of the EU (and its value partners)
- The consortia's effectiveness in achieving its objectives and goals

In accordance with the criteria and evaluation procedure outlined above, project ideas deemed eligible for funding will be evaluated and, in agreement with the respective international funding organisations, subsequently selected. The outcome of the selection process will be notified to applicants in writing.

The project outlines and any other documents submitted in this step of the procedure will not be returned.

7.2.2 Submission of formal applications and decision-making procedure

The second step of formal application only affects grant recipients from Germany.

In the second step of the procedure, applicants whose project outlines have been evaluated positively will be requested to submit formal proposals. For this purpose, the respective AZK and AZA forms and a detailed sub-project description must be submitted in which, where appropriate, requirements from the first step are implemented. The funding applications must contain the following:

- Detailed description of the work of the collaborative partner with quantified objectives and goals
- Detailed work programme outlining the staffing effort for each work package
- Description of a halftime milestone with verifiable criteria
- Detailed financial plan
- Detailed description of how the project results will be utilised by the respective project partner

For collaborative projects, grant applications must be submitted in consultation with the designated collaborative coordinator. In addition, the funding commitment of the international project partners is a condition for the funding.

The use of the electronic application system "easy-Online" (in compliance with the requirements specified in the annex) is required for the preparation of formal grant applications (<https://foerderportal.bund.de/easyonline/>).