



QUANTERA

ERA-NET Cofund in Quantum Technologies

QuantERA Co-funded Call 2017: Scientific Scope

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NARODOWE CENTRUM NAUKI

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Quantum Technologies: Background



EUROPEAN
COMMISSION

Brussels, 19.4.2016
SWD(2016) 107 final

COMMISSION STAFF WORKING DOCUMENT

on

QUANTUM TECHNOLOGIES

Accompanying the document

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

European Cloud Initiative

Building a competitive data and knowledge economy in Europe

{COM(2016) 178 final}
{SWD(2016) 106 final}



Quantum Manifesto

A New Era of Technology

May 2016

<http://europe.eu/manifesto>



Co-funded Call 2017



Call 2017 for Transnational Research Proposals

Supporting the topics of

Quantum Information and Communication Sciences & Technologies

Deadline (pre-proposals): 15th of March 2017, 17:00 CET

Deadline (full proposals): 30th of June 2017, 17:00 CET

- Co-funded by the EU Future and Emerging Technologies (FET) scheme
- Projects with potential to initiate or foster new lines of quantum technologies
- Collaborations exploring advanced multidisciplinary science and/or cutting-edge engineering



FET Gatekeepers

http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-fet_en.pdf

- Long-term vision
- Breakthrough scientific and technological target
- Novelty
- Foundational
- High-risk
- Interdisciplinary



Target Outcomes

1. Quantum Communication
2. Quantum Simulation
3. Quantum Computation
4. Quantum Information Sciences
5. Quantum metrology, sensing, and Imaging
6. Novel ideas and applications in quantum science and technologies



1. Quantum Communication

Methods/tools/strategies to deal with the issues of distance, reliability, efficiency, robustness and security in quantum communication; novel protocols for multipartite quantum communication; quantum memory and quantum repeater concepts.

Novel photonic sources for quantum information and quantum communication, coherent transduction of quantum states between different physical systems; integrated quantum photonics; quantum communication embedded in optical telecommunications systems; other communication protocols with functionality enhanced by quantum effects.



2. Quantum Simulation

Platforms for quantum simulation; development of new measurement and control techniques and of strategies for the verification of quantum simulations.

Application of quantum simulations to condensed matter, chemistry, thermodynamics, biology, high-energy physics, quantum field theories, quantum gravity, cosmology and other fields.



3. Quantum Computation

Development of devices to realise multiqubit algorithms; demonstration and optimisation of error correction codes; interfaces between quantum computers and communication systems.

Development of novel quantum algorithms; demonstration of quantum speed-up; new architectures for quantum computation.



4. Quantum Information Sciences

Novel sources of non-classical states and methods to engineer such states.

Development of device-independent quantum information processing.

Methods for the reconstruction and estimation of complex quantum states or channels and certification of their properties.

Development of resource theory for quantum information.

Study of topological systems for quantum information purposes.

Understanding and control of open quantum systems; development of methods to confine dynamics in controllable decoherence-free subspaces.

Study of thermodynamics processes at the quantum scale.



5. Quantum Metrology, Sensing, and Imaging

Use of quantum properties for time and frequency standards, light-based calibration and measurement, gravimetry, magnetometry, accelerometry, and other applications.

Development of detection schemes that are optimised with respect to extracting relevant information from physical systems; novel solutions for quantum imaging and ranging.

Implementation of micro- and nano- quantum sensors, for instance for quantum limited sensitivity in the measurement of magnetic fields at the nanoscale.

Extension of the reach of quantum sensing and metrology to other fields of science including e.g. the prospects of offering new medical diagnostic tools.



6. Novel ideas and applications in quantum science and technologies

Quantum phenomena, such as superposition and entanglement, as means to achieve new or radically enhanced functionalities.



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