

HORIZON
EUROPE

Exploring nonclassical states of center-of-mass mechanical motion with superconducting magneto- and levitomechanics

Fact Sheet

Project Information

SuperMeQ

Grant agreement ID: 101080143

DOI

[10.3030/101080143](https://doi.org/10.3030/101080143)

EC signature date

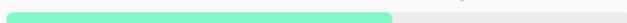
18 August 2022

Start date

1 October 2022

End date

30 September 2026



Funded under

Digital, Industry and Space

Total cost

€ 2 988 644,00

EU contribution

€ 2 988 644,00

Investment in EU policy priorities

Digital agenda	<input checked="" type="radio"/>	Clean air	<input type="radio"/>
Artificial Intelligence	<input type="radio"/>	Climate action	<input type="radio"/>
Biodiversity	<input type="radio"/>		

Coordinated by

CHALMERS TEKNISKA

HOGSKOLA AB

 Sweden

Objective

SuperMeQ addresses three basic science goals in quantum technologies, targeting to gain new insights into quantum control over the center-of-mass motion of mechanical resonators: (i) We will push to the limits of decoherence mechanisms of massive objects, (ii) we will maximize the vacuum coupling of the center-of-mass motion of a mechanical resonator to a quantum system, and (iii) we will generate useful nonclassical states such as squeezed states or states with a negative Wigner function, which have direct relevance for quantum-enhanced force and inertial sensing. Our project follows a unique approach by realizing two complementary experimental platforms that are tailored to our goals and that are mutually beneficial through parallel development: (a) magnetically levitated superconducting microparticles that access a mass regime spanning more than seven orders of magnitude between picogram and sub-milligram masses, and that are expected to exhibit ultra-low mechanical decoherence, and (b) integrated clamped magnetic or superconducting mechanical resonators that are expected to reach strong vacuum coupling rates, two orders of magnitude larger than the state-of-the-art. Key in each of these approaches is that we will couple both types of mechanical resonator inductively to superconducting quantum circuits, which allow for full quantum control over the center-of-mass degree of freedom of the mechanical resonators. Our project results will lead to a breakthrough in the development and growth of novel quantum sensing technologies and give new insights into foundational aspects of quantum physics.

Keywords

[decoherence](#)

[massive quantum systems](#)

[superconducting quantum circuits](#)

[nanomechanical resonators](#)

[optomechanics](#)

Programme(s)

[HORIZON.2.4 - Digital, Industry and Space](#)

MAIN PROGRAMME

[HORIZON.2.4.2 - Key Digital Technologies](#)

Topic(s)

[HORIZON-CL4-2021-DIGITAL-EMERGING-02-16 - Basic Science for Quantum Technologies \(RIA\)](#)

Call for proposal

[See other projects for this call](#)

Funding Scheme

[HORIZON-RIA - HORIZON Research and Innovation Actions](#)

Coordinator



CHALMERS TEKNISKA HOGSKOLA AB

Net EU contribution

€ 738 889,00

Total cost

€ 738 889,00

Address

-

412 96 Goteborg

 **Sweden** 

Region

Södra Sverige > Västsverige > Västra Götalands län

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Participants (4)



BAYERISCHE AKADEMIE DER WISSENSCHAFTEN

 **Germany**

Net EU contribution

€ 562 500,00

Address

ALFONS GOPPEL STRASSE 11

80539 Munchen 

Region

Bayern > Oberbayern > München, Kreisfreie Stadt

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Total cost

€ 562 500,00



KARLSRUHER INSTITUT FUER TECHNOLOGIE

 Germany

Net EU contribution

€ 500 000,00

Address

KAISERSTRASSE 12

76131 Karlsruhe 

Region

Baden-Württemberg > Karlsruhe > Karlsruhe, Stadtkreis

Activity type

Higher or Secondary Education Establishments

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Total cost

€ 500 000,00



OESTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN

 Austria

Net EU contribution

€ 1 051 000,00

Address

DR. IGNAZ SEIPEL-PLATZ 2
1010 Wien 

Region

Ostösterreich > Wien > Wien

Activity type

Research Organisations

Links

[Contact the organisation](#)  [Website](#) 

[Participation in EU R&I programmes](#) 

[HORIZON collaboration network](#) 

Total cost

€ 1 051 000,00



UNIVERSITAT AUTONOMA DE BARCELONA

 Spain

Net EU contribution

€ 136 255,00

Address

EDIF A CAMPUS DE LA UAB BELLATERRA CERDANYOLA V
08193 Cerdanyola Del Valles 

Region

Este > Catalunya > Barcelona

Activity type

Higher or Secondary Education Establishments

Links

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Total cost

€ 136 255,00

Last update: 6 September 2024

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European Union, 2025

