OBJECTIVES

1

To develop an Engineering Model (EM) of the Quantum Space Gravimetry Pathfinder mission's instrument and to increase the Technology Readiness Level (TRL) of the critical subsystems up to TRL 5. An EM is a light representative model in terms of form, fit and function used for the design qualification test program. Complementary EU industrial partners develop the subsystems of the instrument (i.e. Physics Package, Laser System, Microwave Source and Ground Support Equipment) and increase its TRL by assessing the critical technologies in relevant environments.

2

To guarantee the adequacy of the hardware development with the future scientific needs. Through their knowledge of scientific applications, leading institutes in geodesy analyse and simulate potential mission scenarios for the Quantum Space Gravimetry Pathfinder Mission and future Post-Pathfinder scientific missions.

3

To establish a technical and programmatic roadmap for Quantum Space Gravimetry Missions, to be shared and validated by European stakeholders. It ensures the impact maximisation of the project's results through harmonisation with the European programmatic framework. CARIOQA-PMP will secure the capacities for implementing quantum gravimeters/accelerometers in the European space contributing to the EU strategic goal of independence.

CARIOQA-PMP

START DATE
December 2022

DURATION
40 months

BUDGET
17 millions €

CONSORTIUM
17 European partners

FUNDED UNDER THE PROGRAMME
HorizonEurope

PARTNERS

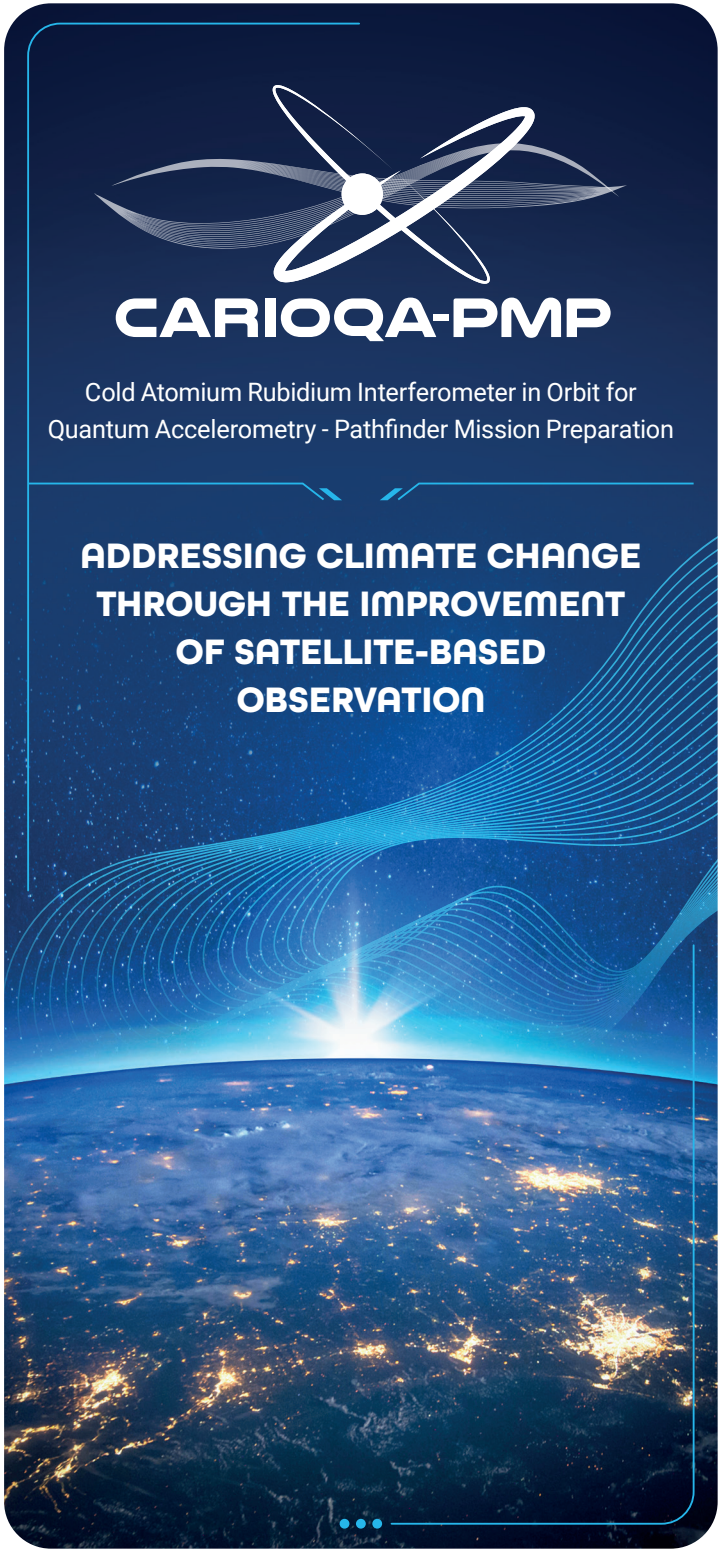
CNES – Centre National d'Études Spatiales
DLR
AIRBUS
Leibniz Universität Hannover
DTU Space – National Space Institute
SYRTE – Observatoire de Paris | PSL – Systèmes de Référence Temps-Espace
LP2N – Laboratoire Photonique Numérique & Nanosciences
ONERA – The French Aerospace Lab
Technische Universität München
POLITECNICO MILANO 1863
FORTH
LCAR – Laboratoire Collisions Agrégats Réactivité
exail
teletel
G.A.C. GROUP
LEONARDO

Funded by the European Union

CARIOQA-PMP

Cold Atomium Rubidium Interferometer in Orbit for Quantum Accelerometry - Pathfinder Mission Preparation

ADDRESSING CLIMATE CHANGE THROUGH THE IMPROVEMENT OF SATELLITE-BASED OBSERVATION



CHALLENGE

Major challenges such as climate change may be better tackled through the improvement of space gravity data.

The last generation of quantum sensors represents a technological breakthrough while offering new opportunities of application in the field of climate and environmental sciences.

Satellite-based observation through quantum sensors allows to collect and monitor climate data that will further improve our understanding of complex climate phenomena such as climate change.

Satellite Gravimetry is a unique tool for monitoring climate change.

CONCEPT

CARIOQA aims at developing quantum gravimeters/ accelerometers in space within the next decade through a Quantum Space Gravimetry Pathfinder Mission.

Such technology will be used for satellite-based Earth Observation in order to monitor climate change and thus support the development of mitigation and adaption measures.

EXPECTED OUTCOMES & IMPACT

- Prepare the ground for **new services related to Earth observation** through new applications of quantum gravimeters/accelerometers in space.
- Pave the way for deploying a **quantum-based mission** monitoring the mass transport phenomena on Earth.
- Advance **European leadership** and independence in spatial R&I.

VISION

CARIOQA-PMP prepares a European Quantum Space Gravimetry Pathfinder Mission by developing an Engineering Model of its instrument and assessing its performance through mission scenario analysis and simulations.

UNIQUE FEATURES

Comprehensive approach including scientific, industrial and programmatic features. Space quantum gravimeter/ accelerometer based on Chip-based Rubidium Bose Einstein Condensate compatible with microgravity.

HOW DOES THE CONSORTIUM MAKE A DIFFERENCE

CARIOQA-PMP brings together the main players of quantum sensors in Europe. CARIOQA-PMP gathers a world-unique know-how and expertise to prepare a Quantum Space Gravimetry Pathfinder Mission and develop its related instrument.

ROADMAP FOR THE PATHFINDER MISSION PREPARATION

Enable to fly a Quantum Pathfinder Mission for space gravimetry within the decade

Establish the ground to launch a Quantum Space Gravimetry Mission

2020 — 2030 — 2040

CARIOQA-PMP
Pathfinder Mission Preparation

CARIOQA-PMP

CARIOQA
Quantum Space Gravimetry Pathfinder Mission

Flight Model

Platform

Exploitation

Quantum Space Gravimetry Mission(s) Post-Pathfinder Missions for Earth gravity mapping

Engineering Model

Flight Model

Platform

Exploitation

Quantum Technology Validation

End-users: new applications in geosciences

Ensure EU leadership and independance on quantum sensors in space

Respond to environmental and societal challenges of climate change through the impromvement of space gravity data