Quantum Space Gravimetry at European Commission
DG DEFIS: who we are

Directorate General for Defence Industry and Space (DEFIS)

A new Directorate General at European Commission (DoB JAN 2020)

Managing European Commission's activities in the Defense Industry and Space sector

Our space mission:
- Managing the EU Space Programme (among others Galileo, EGNOS, Copernicus, Govsatcom, SSA)
- Fostering a strong, innovative and EU non-dependence space industry…
Core Quantum Team of the Commission

- Quantum Space Technologies
- Earth Observation and Services
- Synergies between Defence and Space

- High Performance Computing
- Quantum Technologies (QT Flagship)
- Future & Emerging Technologies (FET)

- Support EU policies with independent scientific evidence throughout whole policy cycle
Quantum space gravimetry

• Long history of space gravimetry: CHAMP, GRACE, GOCE...

• But current technology is reaching its limit (accelerometer performance)

• Need for a new technology breakthrough, a fully-fledged quantum gravimetry mission

Why quantum technology?
Hypothesis:
✓ Quality data
✓ Drift-free measurements
✓ Higher absolute accuracy
✓ Higher sensitivity

In Space → Long atom Interferometry time, but CANNOT be tested on ground

Need for a pathfinder mission
CAI, need to test / demonstrate / improve the technology for space mission
Long-term Objectives

- Mature the QSG technology and improve TRL of QSG components (HE)
- Deploy an EU pathfinder mission within this decade:
  - To demonstrate the technology (BEC) in orbit
  - To assess the feasibility of mission concept
  - Ensure EU non-dependence, sovereignty and leadership in this domain
- Pave the way for the deployment of an EU space quantum gravimetry mission within the next decade

This will:
- Benefit our EU space programs, in particular the Copernicus programme
- Benefit the overall EO community with enhanced gravimetry data
- Possibly (technology) be used for other missions (Moon, Mars…) and other applications (Defence)
- Possibly combine with a ground network and ensure operational coverage
- Foster the development of a QSG industrial (supply chain) & academic ecosystem
Quantum Space Gravimetry (QSG) – State of play

**Jan 2021**
QSG Expert Group study
- Need for a pathfinder mission

**26th May**
1st meeting of QSG Consultation Platform
- Initiated the QSG for EO consultation platform with interested MSs

**In June**
COM-ESA QSG WG setup

**30th June**
1st Technical Meeting of QSG CP
- Technical discussion on Mission Statement

**30th Sept – 1st Oct**
QSG User requirement Workshop
- Further evaluation of user requirements for a gravimetry mission

**HE QSG call 2021-2022**
- Launch: 28 Oct 2021
- Deadline: 16 Feb 2022
Call topics HE CL4 WP21/22

2021-SPACE-01-62: Quantum technologies for space gravimetry

- **Enhance the TRL** of all (critical) components necessary to build quantum gravimetry for space
- **Development of EU technologies and components for a space quantum gravimeter or gradiometer**
- **Cold Atom Interferometry** (including Bose-Einstein Condensates) components
International cooperation on QSG

• European Commission is open to international cooperation:
  • Exploitation of gravimetry data for Earth science
  • Fundamental physics using QSG mission data

• Possibly implemented through Horizon Europe work programme
  • Need to set-up a political framework for cooperation (e.g. EU-JPN space dialogue)
  • Lab to lab cooperation
  • Mutual benefit and EU funding for EU labs
Thank you

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