Quantum Space Gravimetry at European Commission

DG DEFIS

DG DEFIS: who we are

European Commission | DEFIS
Directorate General for Defence Industry and Space
#StrongerTogether

Directorate General for Defence Industry and Space (DEFIS)

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

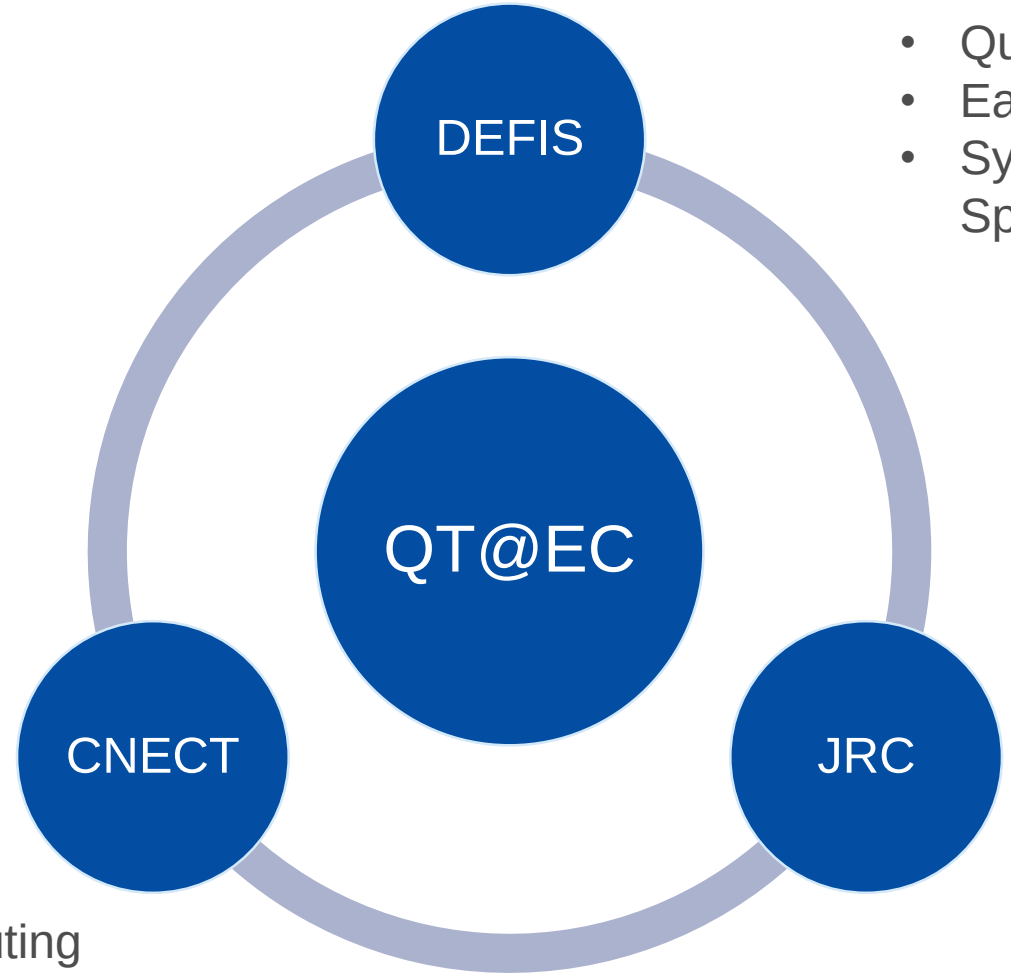
Managing European Commission's activities in the **Defense Industry and Space sector**

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**…

European Commission

Core Quantum Team of the Commission



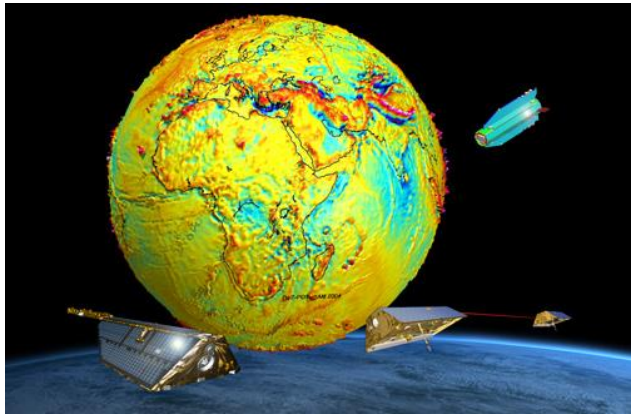
- Quantum Space Technologies
- Earth Observation and Services
- Synergies between Defence and Space

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

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

European Commission

Quantum space gravimetry



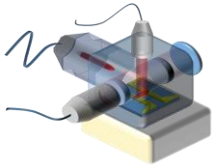
- Long history of space gravimetry: CHAMP, GRACE, GOCE…
  - **But** current technology is reaching its limit (accelerometer performance)
  - **Need for** a new technology breakthrough, a fully-fledged **quantum gravimetry mission**

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



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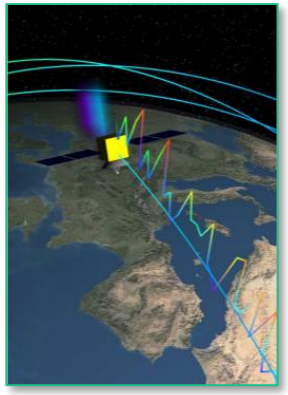
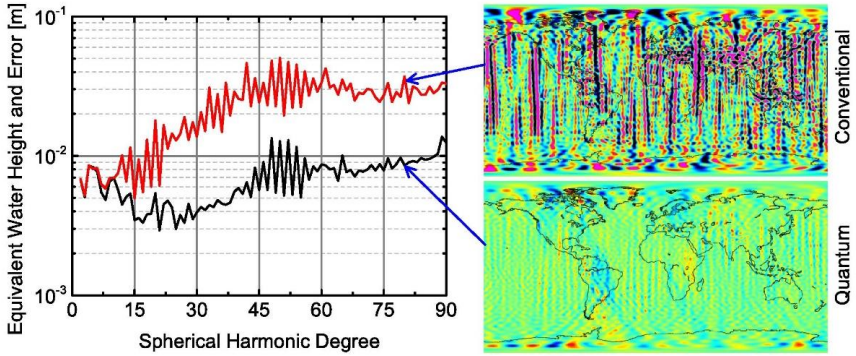
Long-term Objectives



- **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

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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**

European Commission

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

European Commission

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

European Commission